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THE DEVELOPMENT OF MEDICAL BIBLIOGRAPHY

BY

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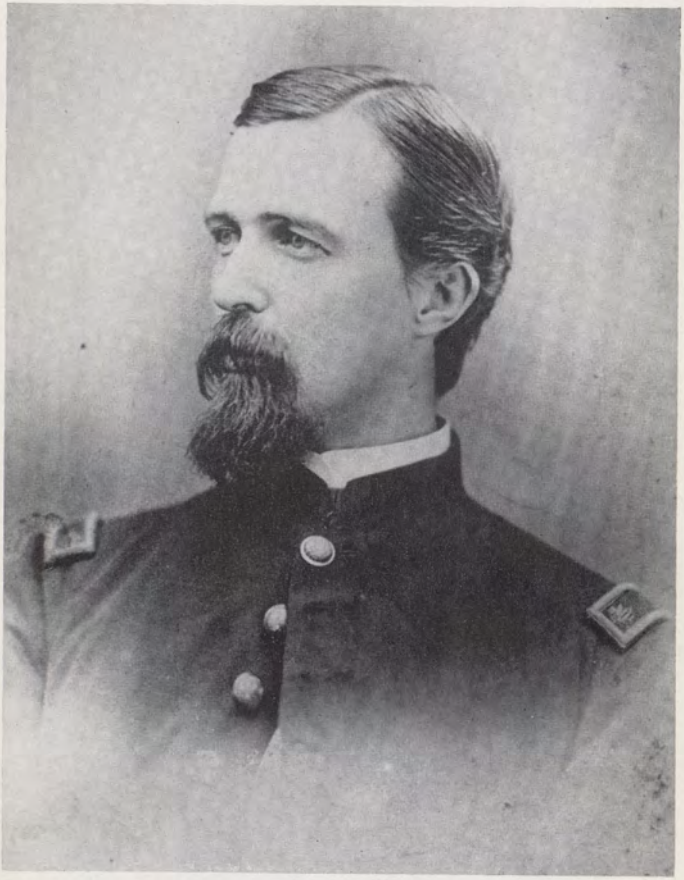

John Shaw Billings During the Civil War

Preface

No large-scale history of the development of medical bibliography has appeared before; since this work is the first such attempt, it suffers from all the expected, and probably a number of the less usual, defects of first tries. The great range of the book results in more superficiality than is desirable. Whole masses of information appear to be missing or unavailable. My interpretation of at least some of the facts is likely to be questioned by certain readers; my erudition may easily be doubted. Working on the collection of data and their explanation over a period of four years, between other full-time professional duties, I have often wanted to echo the words of Ploucquet, "I began the work, and have done what anyone could do who is occupied by other duties of a public nature. It has been a huge task, and I hope that this work, such as it is, will be of some use. I hope that posterity will use it as a basis on which to build further, to attempt the completion of a structure which from its very nature can never be completed."

The method used in this work consisted of: learning of the existence of the medical bibliographies, examining all that were available to me (either by going to the library possessing them or borrowing them on interlibrary loan), and drawing conclusions about the place of each one in the history of medical bibliography. To learn of as many bibliographies as possible, I started by searching general bibliographies of bibliographies, such as Petzholdt, Stein,

Besterman, and Schneider, and the largest bibliographies of medicine, such as the *Index-Catalogue* and the Catalogue of the medical section of the Bibliothèque Nationale. With a list of medical bibliographies in hand, obtained in this fashion, I proceeded to examine all the bibliographies I could. For the more elusive titles, the Union Catalogue of the Library of Congress was searched. Each bibliography was in turn examined for its inclusion of further bibliographies of medicine, and any title so listed was added to the basic list, until finally a feeling of coming to the point of diminishing returns set in, as fewer and fewer new titles were uncovered. At that point active searching for new titles was discontinued.

As I examined each bibliography, I asked a series of questions: 1. Is this really a medical bibliography as defined in my work? 2. What differences are there in this work as compared to its predecessors or contemporaries? 3. To what are these changes due, especially in relation to the history of bibliography in general, to medical practice and medical education, and to the history of the times? 4. What influences did this work have on its contemporaries or successors? (This is particularly difficult to judge, since we possess only indirect evidence of the use of these works.) The most important works, to my mind, for the history of medical bibliography were then discussed in detail in the body of the work; the lesser works were relegated to the list in the appendix.

Such a system, of course, has many drawbacks, of which the most serious is the necessity for withholding judgment until a large number of the works has been examined; indeed, of being willing to change one's hypotheses several

times in the course of the work. As a pioneer attempt to view a large field, however, it is probably the only feasible method. I look forward to seeing what others will do with the subject in the future.

I have been asked what conclusions emerge from my study. I come away from the examination of these bibliographies with a belief that medical bibliography is still groping in the dark for techniques which will allow it to do successfully what it has been so painfully and incompletely doing since its very beginning: namely, to cover the entire medical literature, in whatever form, wherever published, and in whatever language, and to cover it accurately, promptly, and in easily usable form. Each time medical bibliography has reached the point where it seemed to have gained mastery over the literature, the literature has grown in size or changed in form, or otherwise made the previous techniques of medical bibliography inadequate to the tasks. This I have tried to point out in the last chapter, where I have also said that medicine must continue making its present bibliographic techniques as adequate as possible so that it can gain time to do the fundamental research necessary to determine how medical bibliography must be changed to fulfill its mission.

There remains now only the very pleasant task of publicly thanking those who have helped me in preparing this work. Although I am indebted to so many people that I cannot possibly name them all, I should like to call attention here to those who gave most generously of their time and knowledge. Looking back on it, I am appalled by the amount of their time which I must have consumed; nothing I can say could repay their manifold kindnesses. What

is good in this volume is as much theirs as mine; what is bad is mine own.

Miss Gertrude L. Annan, Associate Librarian of the New York Academy of Medicine, and Dr. Dorothy M. Schullian of the History of Medicine Division, Armed Forces Medical Library, checked many quotations and references for me and made numerous suggestions throughout the work. Mr. W. J. Bishop, formerly Librarian, Wellcome Historical Medical Museum Library, London; Miss Janet Doe, Librarian, New York Academy of Medicine; Dr. W. B. McDaniel, II, Librarian, College of Physicians of Philadelphia; Miss Mary Louise Marshall, Librarian, Rudolph Matas Medical Library, Tulane University; and Mr. W. D. Postell, Librarian, Louisiana State University School of Medicine, discussed, both verbally and by lengthy letters, many of the theories expressed in the text. Dr. W. W. Francis, Librarian, Osler Library, McGill University, made helpful suggestions for the first two chapters. Mr. Verner Clapp, now Acting Librarian, Library of Congress, took time from his busy schedule to read and criticize Chapters I through IV. Dr. Henry Viets of Boston and Dr. John Fulton of Yale University have given me the benefit of their wide knowledge of medicine and of bibliography. Dr. W. J. Wilson, Chief, History of Medicine Division, Armed Forces Medical Library, has helped in the determination of the extent of medical publication. My brother, Keeve Brodman, has given me a physician's view of the medical literature; he and Mr. Jerome Deutschberger are responsible for the mathematical interpretation of the curve in Chapter IV. Mr. Deutschberger also compiled the index. Miss Dorothy L. Goodenow, formerly Head Cataloger,

College of Physicians and Surgeons, Columbia University, read the entire manuscript for grammar and sentence structure. The members of the Reference Division of the Armed Forces Medical Library read the text critically and aided in running down obscure references. Lt. Col. Frank B. Rogers, MC, USA, Director, Armed Forces Medical Library, not only opened the files of the Library to the investigation, but took time to discuss each chapter of the work analytically.

Advice on many points and proof-reading help came from Miss Mildred E. Blake, Rudolph Matas Medical Library, Tulane University; Miss Anna E. Dougherty, Armed Forces Medical Library; Miss Marie Harvin, University of Maryland Medical Library; and Mr. Seymour I. Taine, Editor, *Current List of Medical Literature*. Miss Eleanor Johnson, of the New York Academy of Medicine Library, checked the entire manuscript, including the bibliographies, for accuracy and consistency, and read proof in all stages of the work.

And finally I must acknowledge the great help from the members of the doctoral committee of the Joint Faculties of the Graduate School at Columbia University: Dr. Austin Evans of the History Department, Chairman, Mr. Thomas P. Fleming of the School of Library Service, Miss Margaret Hutchins of the School of Library Service, Dr. Fred A. Mettler of the Department of Anatomy, Dr. Maurice F. Tauber of the School of Library Service, and Dr. Lynn Thorndike of the History Department.

Washington, D. C. ESTELLE BRODMAN
January, 1954.

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INTRODUCTION

BIBLIOGRAPHY of any subject is developed in response to a need. This need is usually caused by the volume of the literature, which makes it necessary to develop some means by which an individual can select the information he needs easily and expeditiously from the entire mass of available material. Wherever there is a fairly large literature on the subject, guides to its contents have grown up, since without such guides the student would be obliged to hunt laboriously through every work on the subject before locating the desired information. The first requirement for any bibliography, therefore, is that there be a need for it, since without such a need, bibliography is useless and wasteful and not likely to be cultivated.

The second requirement is that there be available a person or group of persons who are interested in preparing such bibliographies and capable of producing them; in other words, the man and the time must meet. And the last requirement for bibliography, as for any advance in knowledge, is adequate equipment or apparatus. Just as the final proof of the circulation of blood through the capillaries had to wait until the development of the microscope, through which the passage of the blood from the arteries to the veins could actually be observed, so bib-

liography has had to wait for the development of suitable equipment to solve many of its problems. Indeed, some of the problems presented to bibliographers today seem impossible of solution because of a lack of machines adequate to today's demands.

Just as in other fields, bibliography in the field of medicine developed as a result of the need for it, the existence of the men willing and able to produce it, and the requisite equipment to do the task; indeed, medical bibliography has paralleled that of other fields in many respects. In the present work the primary attempt will be to describe this development in medical bibliography, paying special attention to the techniques, the people who developed them, and the equipment used. For each bibliography discussed there will be a biographical sketch of the compiler; a description of the work which will emphasize advances in technique; and a discussion of the importance of this work in the history of medical bibliography. A list of bibliographies not discussed in the body of the work is included in Appendix II.

Since the term "medical bibliography" will be used throughout this work, it is necessary to define it. Medical bibliography is the general term used for any lists of books on medicine; but in this discussion it will have a more circumscribed meaning: namely, lists of books or journals pertaining to medicine in general but not to any of its subdivisions or specialties. For example, a bibliography on eighteenth century medicine in Germany will be discussed, but a bibliography on ophthalmology in Germany will not be included. It should, of course, be pointed out that

general bibliographies on all aspects of medicine would naturally contain material on specialties such as ophthalmology; however, by the very fact that they contain material on all the specialties and subdivisions of the field they become general medical bibliographies and are, therefore, proper objects of study for this work.

In addition to circumscribing medicine to mean what formerly was called "the practice of medicine," the term "bibliography" is defined in more specific terms also. Not all lists of works on medicine are included. Indeed, catalogs —whether of libraries or of booksellers and publishers— are intentionally omitted. The only exception to this rule is the *Index-Catalogue of the Library of the Surgeon-General's Office*,[1] which is included on the pragmatic ground that it influenced medical bibliography to such an extent that no true picture of the field could be given without a study of this work. Also omitted are personal bibliographies and those bibliographies which are not the main portions of a work.

Only printed medical bibliographies in the western languages are included. No distinction is made between indexes and abstracting tools as bibliographies.

[1] U. S. Armed Forces Medical Library. Index-Catalogue of the Library of the Surgeon-General's Office, U. S. Army (Army Medical Library). Wash., Govt. Print. Off., 1880–. 57v.

CHAPTER I

The Infancy of Medical Bibliography

ALTHOUGH printing from movable type began in the western countries about the middle of the fifteenth century, the amount of printed literature in any field remained small for some time thereafter. It was not until the beginnings of the sixteenth century that true subject bibliography can be said to have begun. According to Besterman[1] four medical bibliographies were published in the sixteenth century, but two more are listed by Thornton.[2] Each will be discussed here.

SYMPHORIEN CHAMPIER

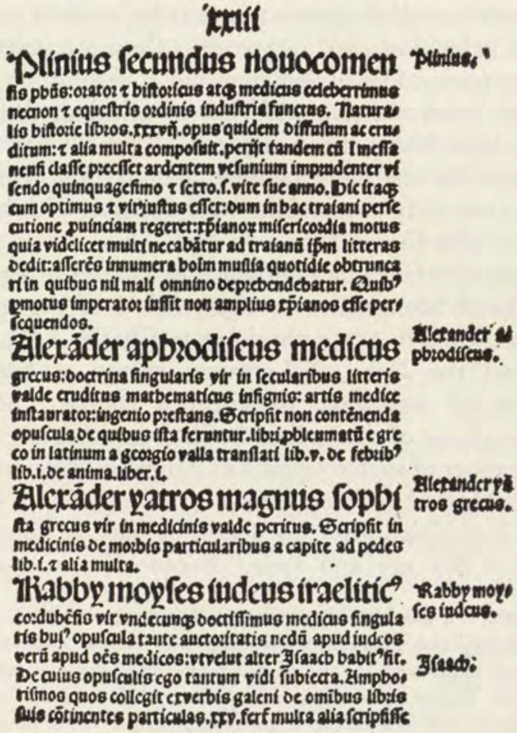
(1472–1539?)

Symphorien Champier is generally considered to have been the first bibliographer of medicine after the invention of printing. His work, *De medicine claris scriptoribus*,[3] is divided into five sections following the pattern laid down by the scholastics: ancient medical writers; philosophical

[1] Besterman, Theodore. The Beginnings of Systematic Bibliography. 2nd ed. London, Oxford University Press [1936]

[2] Thornton, John L. Medical Books, Libraries, and Collectors. London, Grafton, 1949.

[3] Champier, Symphorien [Champerius, Symphorianus] . . .De medicine claris scriptoribus in quinque partibus tractatus . . . [Lyons, 1506]



xxiii

Plinius secundus nouocomen — *Plinius.*
sis phus: orator et historicus atque medicus celeberrimus necnon et equestris ordinis industria functus. Naturalis historie libros .xxxvii. opus quidem diffusum ac eruditum: et alia multa composuit. periit tandem cum Imessanensi classe preesset ardentem vesunium imprudenter visendo quinquagesimo et sexto. s. vite sue anno. Hic itaque cum optimus et vir iustus esset: dum in hac traiani persecutione prouinciam regeret: xpianorum misericordia motus quia videlicet multi necabantur ad traianum ipsum litteras dedit: asserens innumera hominum milia quotidie obtruncari in quibus nil mali omnino deprehendebatur. Quibus permotus imperator iussit non amplius xpianos esse persequendos.

Alexander aphrodiscus medicus — *Alexander aphrodiscus.*
grecus: doctrina singularis vir in secularibus litteris valde eruditus mathematicus insignis: artis medice instaurator: ingenio prestans. Scripsit non contemnenda opuscula de quibus ista feruntur. libri problematum e greco in latinum a georgio valla translati lib. v. de febribus lib. i. de anima liber. i.

Alexander yatros magnus sophista grecus vir in medicinis valde peritus. Scripsit in medicinis de morbis particularibus a capite ad pedes lib. i. et alia multa. — *Alexander yatros grecus.*

Rabby moyses iudeus iraelitic[us] cordubensis vir vndecunque doctissimus medicus singularis huius opuscula tante auctoritatis necdum apud iudeos verum apud omnes medicos: vtvelut alter Isaach habitus sit. De cuius opusculis ego tantum vidi subiecta. Amphorismos quos collegit ex verbis galeni de omibus libris suis continentes particulas. xxv. fert multa alia scripsisse — *Rabby moyses iudeus.* — *Isaach.*

Fig. 1. Champier, Symphorien. De Medicine Claris Scriptoribus. 1506.

medical writers; ecclesiastical writers on medicine; Italian medical writers; and French, Spanish, German, and English (i.e., modern) medical writers. Within these divisions the writers are listed more or less chronologically. There is also a general author and subject index at the beginning

of the volume which is more of a detailed table of contents than an index. For each author cited there is a descriptive word or phrase identifying him and a description of his writings. From the point of view of printing, the entire volume looks like a manuscript; in all probability it was designed with the more familiar manuscripts in mind—much as the early automobiles were designed with buggies in mind.[4] (See Figure 1.)

Symphorien Champier himself was a native of Lyons; a graduate of Montpellier in 1498; fellow of the medical school at Paris in 1515; physician to Charles VIII, Louis XII, and the Duke of Lorraine; patron of Servetus; historian of medicine; Renaissance courtier; scholar; compiler of one of the earliest medical dictionaries; as well as biographer of such scientists as Arnold of Villanova and Joannes Mesue.[5] Although he was condemned as a heretic by the Inquisition after his death, he may be considered typical of his age and time.[6] Because he was acutely

[4] "There is a considerable similarity in appearance between early printed books and manuscripts dealing with similar subjects. The form of the type used, the use of decorated initial capitals, writing in colors, and hand-painted illustrations all tended to make an early printed book look not unlike a good manuscript. This resemblance was sometimes even closer than one would have expected, since there was often a relation between the formal book-hand written in a certain district and the form of printed letters in that district." E. Ashworth Underwood. The Evolution of the Medical Book. Chemist and Druggist; Export Review, 11 (no. 121): 63, 1950.

[5] Thorndike, Lynn. History of Magic and Experimental Science. N. Y., Columbia University Press, 1941, v. 5: 111–126.

[6] See, however, Lynn Thorndike's comment on this: "... when Scaliger called [Champier] 'insolens, tumens, turgens,' perhaps this

aware of all the currents of thinking which had come down to his time, Champier attempted the conciliation of Greek and Arab doctrines, hoping thus to unite the knowledge of Hippocrates, Galen, Celsus, and Avicenna into one unified system consistent with Church teachings. In this he failed; as a result he was censured by the Church and his body was exhumed for sentence.

Short manuscript lists of writings on medicine—as on any practical subject—probably existed long before Champier's time; if for no other reason than that students of medicine would have needed them in their studies. On the other hand, they were probably slight things of no great lasting value; otherwise we might surmise they would have been printed at the time of the spread of printing in Europe, much as the manuscripts of other useful works, the Galens, the Hippocrates, the Donatuses, the rhetorics, and the Church Fathers, were reproduced. Either there was not a really large body of medical literature to which to refer, or the purchasers of medical bibliographies were so few in number that early printers would not wish to risk their capital on such ventures.[7] But with the multiplication of works by the printing press, at least one of these conditions changed. Soon there was a comparatively large body of literature to refer to, and this body of

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should be interpreted as an indication that he was full of the 'spirit of the Renaissance'; that rare gas which the historical laboratory has never yet succeeded in holding in solution." *Ibid.*, p. 113.

[7] Walsh, J. J. Debt of Medical Science to the Early Printers. Scient. Month., 18: 181–195, 1924.

literature increased greatly year by year.[8] Furthermore, because the literature in its printed form could be owned by so many people simultaneously, the number of people who might wish to refer to any edition of a work increased also. Under the stimulus of changing conditions, therefore, bibliographies in all fields began to appear, and we see a multiplication of a type of work which had existed earlier only in slight and inconsequential forms.[9] We shall see later, also, how the multiplication of editions and copies required the information in the bibliographies to be more exact with imprints, sizes, and pagination carefully noted.

The first significance of Champier's work is that it reveals the existence, as early as the sixteenth century, of a real need for indexes to medical literature; that publishers were aware of this need and could now afford to issue bibliographies of medicine without fear of financial difficulties; and that a scholarly and professionally prominent man did not consider it belittling to produce such a bibliography. But there is another significance to the first bibliography on medicine, which has been brought out by Fulton in his Rosenbach lectures for 1949–50;[10] that is, it was one means whereby the ideas of the Italian Renais-

[8] Much has been written on the number of books printed at various times. See especially: Peignot, Gabriel. Traité du Choix des Livres. Paris, Renouard, 1817, p. vi; Pollard, A. W. Incunabula (In: Encyclopaedia Britannica. 14th ed. Chicago, Encyclopaedia Britannica [c1930] v. 12: 146–147.); and Iwinski, B. La Statistique Internationale des Imprimés. Bull. Inst. Internat. Bibliog., 16: 1–139, 1911.

[9] Besterman. *Op. cit.*

[10] Fulton, John F. The Great Medical Bibliographers. Philadelphia, University of Pennsylvania Press, 1951, p. 4–10.

sance were spread to southern France and thence to the rest of Europe. Symphorien Champier had been physician to Charles VIII, whom he had accompanied when Charles invaded Italy in an attempt to back up his claim to the throne of Sicily and to a few other Italian principalities. There Champier absorbed the spirit of the new discoveries in science and the arts being made during the Italian Renaissance; returning to France, he transmitted the new learning and the new zeal for discovery shown by Titian, Copernicus, Leonardo da Vinci, and others to a wide circle of friends and disciples. The very arrangement of the *De medicine claris scriptoribus* shows the influence of the Italian school, for an entire section is devoted to Italian medical writers, a section comparable in length to that allotted to the ancient writers and to all other modern writers combined.

Symphorien Champier's work is thus also important because it shows the growth of medical literature after the discovery of printing, because it gives evidence of the distribution of books at that time, because it presents us with a picture of the esteem in which bibliographic work was held by important scholars of the sixteenth century, and because it is an example of the spread of humanism from Italy to France.

After the publication of Symphorien Champier's list in 1506, there were several other attempts at medical bibliographies, but it was not until the last decade of the century that any real advances were made in the techniques used in the first medical bibliography.

Otto Brunfels

(1488–1534)

A bibliography similar in style to Champier's was published in Strasbourg in 1530 by Otto Brunfels of Bern.[11] This is a list of the writings of approximately three hundred eminent physicians, arranged chronologically, with an alphabetical index of authors (by first names), and with a rough classification of the specialties represented by the writers included. The prefatory essay of this work is valuable in itself for its compact history of medicine and for the short biographical sketches of some of the most important authors contained in the main portion of the work.

Just as Symphorien Champier can be considered a representative of the Italian Renaissance, so Otto Brunfels appears to mirror in his life the turbulence and change of the Reformation. He was born in Mainz in 1488, studied theology, and became a Carthusian monk. Later, however, he was influenced by the teachings of Luther and his disciples, and after several years of indecision finally renounced Catholicism to become the Protestant pastor first of Steinheim and then of Neunberg. Unsatisfied in this also, Brunfels turned to another interest—science—going to Basel to study medicine, from which university he received his degree in medicine in 1530, the same year in which the first volume of his great herbal was published. In 1533 he settled in Bern as city physician, continuing

[11] Brunfels, Otto [Brunsfeld, Othon]. Catalogus illustrium medicorum, sive De primis medicinae scriptoribus. Strasbourg, Schott, 1530.

his botanical studies there until his death from tuberculosis in 1534.

Brunfels has been called one of the four "fathers of the new botany."[12] He appeared at a time when the re-discovery of the manuscripts of earlier writers had led to the spread of ancient knowledge throughout Europe, when the printing press had been perfected to the point where illustrations could be faithfully reproduced, and when a school of scientific illustrators had already developed.[13] It is not surprising, therefore, that the first real advance in botany since Pliny should have come at this time, nor is it surprising that the advance should have been preserved for future generations through printing. Brunfels' *Contrafayt Kreuterbuch*, although it is pictured as a description of local plants without any attempt at classification and with little botanical terminology,[14] is the first attempt after

[12] Greene, Edward Lee. Landmarks of Botanical History; a Study of Certain Epochs in the Development of the Science of Botany . . . Wash., Smithsonian Institution, 1909. (Smithsonian Miscellaneous Publications, v. 54, no. 1870)

[13] "The invention of printing exerted an important effect upon the literature of therapeutic substances. The prospect of preparing illustrations and descriptions of plants by separate processes had discouraged the production of really accurate, illustrated, botanical works . . ." Cecilia C. Mettler. History of Medicine. Philadelphia, Blakiston, 1947, p. 198. See also Arber, Agnes. Herbals, Their Origin and Evolution . . . New ed. Cambridge [Eng.], Cambridge University Press, 1935.

[14] Brockhaus Konversations-Lexikon. 14. Aufl. Berlin, Brockhaus, 1898, v. 3: 619; and Singer, Charles. Biology-History. (In: Encyclopaedia Britannica. 14th ed. Chicago, Encyclopaedia Britannica [c1930] v. 2: 611) See also the Rosenbach lectures by George Sarton, delivered in January, 1953 (to be published).

Pliny to look at the plants themselves and describe them as they are.

Since Brunfels' *Catalogus* was published in the year in which he received his medical degree, it may very well have been the result of a compilation which Brunfels made for himself to care for his needs as a medical student. The printer of this work (Johann Schott) in contrast to Champier's printer[15] had learned to use his printing press with more freedom and with less of a slavish following of the forms of the manuscript. There is much more leading between the lines of type; the headings are set off from the main body of the entry clearly and in a non-stereotyped form (see Figure 2), capitals are of a different font from lower case letters, and non-Roman alphabet letters (for example, Hebrew and Greek) are interspersed where needed. A clear, simple letter is used; interestingly enough it looks more Italian than does the type used by the Italophile, Symphorien Champier.

In Brunfels' work a short biographical account is given for each author, followed by a general description of his writings; in this, however, Brunfels has gone no further along the path to exact citation than has Champier. It is interesting, although futile, to speculate on the number of copies of Champier's and of Brunfels' bibliographies which were printed and the speed with which they were distributed. Certainly only a comparatively small number of copies has come down to us in America. (This is shown in the Union Catalog in the Library of Congress; a copy is

[15] Said by Osler to be Jannot de Campis, although this fact is questioned by some. Osler, Sir William. Bibliotheca Osleriana. Oxford, Clarendon Press, 1929, no. 2264.

MEDICORVM.

DE PHILIPPO, & CHRYSIPPI quo- A
dam diſcipulo. Et Philippo Epirote.

NON IGNorabilis medicus Chryſippi diſcipu-
lus. Apud Antigonū regem, amicum quendam eius,
notæ intemperantiæ, mediocriter in hydropico mor-
bo implicitum, negauit poſſe ſanari. Cumq; alter me-
dicus Epirotes Philippus ſe ſanaturum pollicitaretur,
reſpondit, illum ad morbum ægri reſpicere, ſe ad ani-
mum. Necq; eum res fefellit. Ille enim cum ſumma di-
ligentia, non medici tantummodo, ſed etiam regis cu-
ſtodiretur, tum malagmata ſua deuorando, biben-
doq; ſuam urinam, in exitium ſeſe præcipitauit. Cel-
ſus libro tertio, cap. xxi.

DE QVINTO SERENO SAMmonico.

QVINTVS Serenus Sammonicus, Gordiani iu- B
nioris pædagogus fuit. Cuius meminit Spar-
tianus in Caracalla his ỹbis. Occiſi ſunt & in balneis
plures, & in cœnis, inter quos Sammonicus Serenus:
cuius libri plurimi ad ſalutem extant.

DE PAVLO AEGINETA.

PAVLVS uniuerſam medicinam a Galeno & O-
ribaſio, per innumeros fere libros traditam, in ſeptem
libros compendioſe redegit. Suidas. Παῦλος Αἰγινήτης ἰα-
τρός, ἔγραψεν ἰατρικὰ βιβλία διάφορα.

DE ALBERTO MAGNO.

ET NOMine, & eruditione, experientiaq; rerum
multarum, magnum Albertum ego medicum fuiſſe
non dubito, naturarūq; archanas uires perſpectas ha-

Fig. 2. Brunfels, Otto. Catalogus Illustrium Medicorum . . . 1530.

in the Bibliothèque Nationale in Paris, but no copy is listed in the British Museum *Catalogue of Printed Books.* Unfortunately, the *Deutscher Gesamtkatalog* has not reached this portion of the alphabet.) We may hazard a guess that Brunfels' book was not a success because two other attempts at providing bibliographies of medicine appeared comparatively soon after his book; these are the appendix to Remaclus Fuchs' work *Illustrium medicorum qui superiori saeculo floruerunt, ac scripserunt vitae* (1541),[16] and the list by Guolphgangus Justis or Justus (Wolfgang Jobst) published in 1556.[17] On the other hand, as an alternative guess, we may conclude that copies of the work were consulted so frequently that they deteriorated physically and this may account for the present scarcity of copies, or else the success of Brunfels' work emboldened others to publish medical bibliographies.

Remaclus Fuchs

(1510?–1587)

Since the list in Fuchs' work is just an appendix, and not the main body of the work, it is outside the scope of this history. Because it is often cited incorrectly as the work of Fuchs himself, it seems useful to mention here that it was compiled by Symphorien Champier, and not

[16] Eloy, N. F. J. Dictionnaire Historique de la Médecine . . . Mons, Hoyois, 1778, v. 2: 280.

[17] Jobst, Wolfgang (Justis, Guolphgangus). Chronologia sive Temporum supputatio, omnium illustrium medicorum, tám veterum, quàm recentiorum, in omni linguorum cognitione, à primis artis medicae inventoribus et scriptoribus usque ad nostram aetatem et seculum. Frankfort-on-Oder, 1556.

by Remaclus Fuchs. Complete descriptions of it can be found in Eloy[18] and in Haller.[19] We might also mention, as a piece of general information, that many of the biographical sketches found in this work came to Fuchs from Otto Brunfels at the latter's death.[20]

Just as the emphasis in Fuchs' work was on the biographical sketches and not on the bibliographic lists, so in Jobst's compilation the main purpose was to give an historical outline of medical thought; the writings mentioned in it were given only as examples. Neither Fuchs' nor Jobst's work is particularly good and neither influenced medical bibliography to the extent that Champier's did; nevertheless, they represent forms of literature of ancient and honorable lineage which are still in use today, that is, histories of medicine with bibliographic notes and biobibliographies.

Conrad Gesner

(1516–1565)

It is well known to students of the history of bibliography that Conrad Gesner, the so-called "father of bibliography," never published the medical portion of the index to his great universal bibliography, the *Bibliotheca universalis* (1545). Various theories have been advanced to explain this defect, ranging all the way from the belief

[18] Eloy. *Op. cit.*

[19] Haller, Albrecht von. Bibliotheca medicinae practicae . . . Basel, Schweighauser, 1777, v. 2: 60. "Annexus in calce quorumdam neotericorum medicorum catalogus, qui nostro seculo vixerunt. Auctore Symphoriano Campigio."

[20] See the biographies of Brunfels previously cited.

that Gesner, like many specialists, could not refrain from continuous polishing of the work in his own field and would never consider it finished, to the more unlikely suggestion that Gesner's literary executor stole the manuscript of the *De re medica* at Gesner's untimely death from the plague, in the hopes of publishing it as his own work.[21] Gesner himself gives a half-hearted explanation of the delay as a note to the table of contents for the *Pandectarum*, the index to the *Bibliotheca universalis*:[22]

> the last two books are not here because of the short time available, but they will be produced separately as soon as possible, with the help of God, with one index for the whole volume and perhaps also an appendix of the first volume, which we regard as sufficiently complete.

Although Conrad Gesner never published his medical bibliography, we can speculate on the kind of work it would have been after examining the bibliography he placed in his *Chirurgia*.[23] Although this book does not really belong here, according to our definition of medical bibliography, since it is on a subdivision of medicine, it is discussed because it illustrates both Gesner's method

[21] Bay, J. C. Conrad Gesner (1516–1565) the Father of Bibliography. Papers Bibliog. Soc. America, 10: 53–86, 1916.

[22] "Duo postremi libri* ob temporis angustiã in praesentia non additi; seosorsum quam primum licebit, Deo facurente, prodibunt: una cum Indice in totum hunc Tomum: et fortassis etiam Appendice primi Tomi, quam satis luculentam habemus.

* XX De re medica

XXI De theologia christiana"

[23] Gesner, Conrad. Chirurgia. De chirurgia scriptores optimi . . . Zurich, Gessner, 1555.

of compiling bibliographies and the first appearance of analytics in printed medical bibliographies.

The *Chirurgia* of Gesner is a collection of texts on surgery, in much the same fashion as our present-day sourcebooks which are compiled for students without access to the originals, or who perhaps lack the time or the linguistic facility to read the original. Approximately 150 of the leading writers on surgery are presented in selections ranging from half a page to twenty or thirty folio pages; appended to the volume is the bibliography, arranged alphabetically by the Christian names of the authors. The contents of the writings of each author are analyzed in minute detail, and particular attention is paid to the surgical portions of writers on general medicine, to whom readers would not be likely to turn for information on surgical matters, unless directed there. In addition, copies of the works are located in public or private collections. Only one thing is needed to make this bibliography a true analytic index: an alphabetical list of the subjects covered with references back to the pages in the main portion of the work where the authors who discussed these subjects are to be found.

We can only guess that had Gesner lived to complete his bibliography on medicine, he would in all probability have produced a work which listed not only purely medical authors but writers on medicine from other fields, even going so far as to analyze the individual sections of the works listed, so that small subjects as well as the larger fields would have been available to the reader. In this, however, Gesner was far ahead of his time, for it is not

until a hundred years later that we find another bibliography of medicine with the same thoroughness and completeness of indexing as are found in the *Chirurgia*; certainly, the two other medical bibliographies published in the sixteenth century are a retrogression from the high standards set by Conrad Gesner.

Paschalis Gallus

(1567–1631?)

Of the two sixteenth century medical bibliographies which appeared after Gesner's, the first was the work of Paschalis Gallus (also known as Pascal Le Coq) entitled *Bibliotheca medica* (1590);[24] the second (which appeared the next year, 1591) was compiled by Israel Spach and entitled *Nomenclator scriptorum medicorum*.[25] These have both been considered to be condensations of the work of Conrad Gesner in inexpensive form[26] and the estimates of their worth vary considerably. Viets,[27] for example, considers the Spach work decidedly inferior to the one by

[24] Gallus, Paschalis (LeCoq, Pascal). Bibliotheca medica; sive Catalogus illorum, qui ex professo artem medicam in hunc usque annum scriptis illustrarunt . . . Basel, Waldkirch, 1590.

[25] Spach, Israel. Nomenclator scriptorum medicorum, hoc est: Elenchus eorum qui artem medicam suis scriptis illustrarunt . . . Frankfurt am Main, Bassaeus, 1591.

[26] Thornton. *Op. cit.*, p. 159.

[27] Viets, Henry R. Bibliography of Medicine. Bull. M. Library A., 27: 105–117, 1938. But in a personal communication Viets points out "Gallus is all medicine; Spach is largely philosophy, but is a better edited and a more carefully done job. The two books are so different in scope that they cannot be easily compared. Both Viets and Besterman are right—from different view points."

Gallus, while Besterman[28] feels that Spach improved considerably on the work of Gallus in the number of writers included, in the logic of the arrangement, and in the ease of use.

Paschalis Gallus, who lived from 1567 to approximately 1631, was a native of Poitiers, in which city he obtained his medical degree in 1597. Practically nothing else is known about him. His *Bibliotheca medica* is useful principally because of its list of Latin writers of medicine, which makes up the main portion of the work; this portion is arranged alphabetically by the Christian name of the author and is prefaced by an index of surnames. The rest of the bibliography is arranged by country and is decidedly inferior to the Latin list both in number of writers cited and in the information given for each work. Approximately 1500 authors are found in the entire work, but only the 1200 or so in the Latin list can be relied on. The annotations to the Latin list are taken bodily and uncritically from Gesner's *Bibliotheca universalis*, and they leave much to be desired. The name of each author is given in upper case type with space between letters; Greek type is employed where necessary; Gothic lettering is used for German authors; cross references from titles of works published anonymously to their authors are provided; copies are located; and some publishers and dates of printing are provided.

In this bibliography for the first time we come upon a work which can be studied today for its bibliographic information, and not merely as a curiosity or a stepping

[28] Besterman. *Op. cit.*, p. 27.

stone to later and more directly useful works. Although not so complete as Gesner, Gallus represents the first general bibliography of medicine arranged by authors which gives us adequate information about the items listed in its pages. It can be used in conjunction with Israel Spach; together they make a pair, since Gallus' contribution is important as the first fairly complete author bibliography, whereas Spach's work is valuable as the first subject bibliography of any standing in general medicine.

Israel Spach

(1560–1610)

Israel Spach, although a native of Strasbourg, took his medical degree at the university in Tübingen, after which he returned to become professor of medicine in his native city. He appears to have had very catholic tastes, both within and outside medicine, for he is also the compiler of an encyclopedia on gynecology[29] and a bibliographer of philosophy and of classical writers.

Spach's *Nomenclator scriptorum medicorum*, although arranged in minute classes and subclasses, contains both an alphabetical subject index and an alphabetical list of the Christian names of the authors cited. The minute classification seems quaint to us today, but Spach's realization of the need for alphabetical indexes to classed works is a real advance in the technique of bibliography making. This is the second great advance found so far, Gesner's use of analytics being the first.

[29] According to Professor T. P. Fleming, this edition (1597) was an enlarged edition of Gesner's 1566 work.

Since an expanding literature creates a need for guides to that literature, as well as providing economic conditions favorable to the investment of capital in the publication of bibliographies, it is natural that the development of medical bibliography in the sixteenth century was bound up with the development of medicine itself. A brief recapitulation of the highlights of medicine in the sixteenth century may, therefore, be useful.

The sixteenth century opened with the new spirit in medicine already in evidence. Mundinus' *Anatomia*[30] and Ketham's *Fasciculus medicinae*[31] had already appeared in print by the time the century began. The *Anatomia* was probably the first western textbook on anatomy in more than a thousand years to be founded on human dissection; while the *Fasciculus medicinae* gave accurate references to the newly discovered works of ancient writers along with the new anatomical knowledge. How widespread was the interest in these works is shown by the fact that no less than thirty-three editions of Mundinus had been printed by the middle of the sixteenth century;[32] but it was only in the sixteenth century that the culmination of much of the earlier work occurred, the revolution being completed in the writings of such men as Vesalius, Paré, Paracelsus, Fracastorius, and Fallopius.

At the start of the sixteenth century, anatomy and physi-

[30] Mundinus [Mondino] de Luzzi. Anatomia . . . Leipzig, 1493. See also, Walsh, J. J. The Popes and the History of Anatomy. Med. Lib. and Hist. J., 2: 10–28, 1904.

[31] Ketham, Johannes de. Fasciculus medicinae. Venice, Gregorius, 1495.

[32] Thornton. *Op. cit.*, p. 14.

ology were taught from the Galenic point of view; by the end of the century, the emphasis had shifted to attempting to demonstrate the truth of the Galenic statements.[33] As Thornton has pointed out, "Up to the beginning of the thirteenth century anatomical teaching had been based upon the dissection of animals, but during that century it was superseded by teaching from the text. Later came the dissection by an assistant while the professor mechanically read from a book, but now [in the sixteenth century] arose a group of men determined to investigate for themselves."[34]

The prime mover in this revolution was, of course, Andreas Vesalius.[35] Born in Brussels in 1514, the son of the court apothecary, Vesalius studied medicine at Louvain and Paris, where, as a pupil of Sylvius (Jacques du Bois), he came into conflict with the faculty over his refusal to accept the Galenic anatomy. In the preface to

[33] Singer, C. Some Galenic and Animal Sources of Vesalius. J. Hist. Med. & Allied Sc., 1: 6–24, 1946.

[34] Thornton. *Op. cit.*, p. 32. On the other hand Thorndike and others hold that Hippocrates and Galen, re-translated from more correct copies during the Renaissance, were held in even greater esteem than during the Middle Ages.

[35] "The masterpiece of Vesalius is not only the foundation of modern medicine as a science, but the first great positive achievement of science itself in modern times. As such it ranks with another work that appeared in the same year, the treatise of Nicholas Copernicus, *On the revolution of the celestial spheres* . . . Between the two they destroyed forever the medieval theories on the subjects of which they treat." Charles Singer. A Short History of Medicine. N. Y., Oxford University Press, 1928, p. 88. See also his Studies on the History and Method of Science. N. Y., Oxford University Press, 1921, v. 2: 3.

the *De humani corporis fabrica*,[36] which he published after he had gone to Padua to teach at the University there, Vesalius sets forth in biting language the scorn of an investigator at authoritarianism in science.[37]

Since it questioned hitherto accepted views of anatomy, the publication of the *De humani corporis fabrica* loosed a storm of protest by some influential people. These Vesalius at first undertook to answer, but finally he became discouraged, destroyed his notes, and left university life to become court physician to the Emperor Charles V (Charles I of Spain). This must have been a singularly unsatisfactory life for one so alert intellectually. It is not surprising, therefore, that in a few years Vesalius resigned his position at the Spanish court; he then began the travels, which are called by some a pilgrimage.[38] While in Jerusalem Vesalius was again offered his former position at Padua,

[36] Vesalius, Andreas. De humani corporis fabrica, libri septem. Basel, Oporinus, 1543.

[37] "It is true that this deplorable dispersion of the curative role brought a detestable procedure into our Gymnasiums, wherein some were accustomed to administer the cutting of the human body while others narrated the history of the parts. The latter, indeed, from a lofty chair arrogantly cackle like jackdaws about things which they have never tried, but which they commit to memory from the books of others or which they place in written form before their eyes . . . And thus all things are taught wrongly, and days go by in silly disputations. Fewer facts are placed before the spectators in that tumult than a butcher could teach a doctor in his meat market." Andreas Vesalius. De humani corporis fabrica . . . Tr. by W. P. Hotchkiss (In: Clendening, Logan. Source Book of Medical History. N. Y., Hoeber [c1942] p. 133)

[38] Cullen, G. M. Vesalius and the Inquisition Myth. Lancet, 1: 105–107, 1928.

which he accepted; but on the return voyage to Italy he died in a shipwreck off the island of Zante.

The intellectual ferment which produced the discoveries in anatomy is to be found in other medical fields also. For example, Philippus Aureolus Theophrastus Bombastus von Hohenheim, known as Paracelsus, said he considered it his bounden duty to destroy the teachings of Galen, Hippocrates, and Avicenna and to substitute for them the knowledge to be gained from actual investigations. Swiss by birth, Paracelsus led a wandering life, moving from one university to another throughout Europe, studying medicine and what would now be considered chemistry. He gained not only the theoretical knowledge of the schools, but the practical knowledge obtained from visiting and working in mines, vineyards, and industrial plants, all of which he mixed with a basically occult philosophy. When he returned to Switzerland to become professor of medicine and surgery at Basel, he so imbued his students with the idea of repudiating the ancient writers that it is said they prepared a bonfire of the classics.[39]

Paracelsus' contributions to medicine have been evaluated differently at different times.[40] There seems little doubt that he made advances in chemistry and in occupational medicine. Because of the mixture of the obscene and the occult in his writings and because of his unpleasant personality, however, he spent the last few years of his

[39] Mettler. *Op. cit.*, p. 123. See also Garrison, Fielding H. Introduction to the History of Medicine. 4th ed., rev. & enl. Philadelphia, Saunders, 1929, p. 205.

[40] See for example Shakespeare's reference to him in *All's Well That Ends Well*, Act II, scene 3, "Both of Galen and Paracelsus."

life in wandering and disgrace, dying at the age of forty-eight at Salzburg as a result of a tavern brawl according to Garrison, or as a result of cancer according to Sudhoff.[41]

Economic Conditions and Bibliography

It is interesting to note that medical bibliographies of the sixteenth century were published, for the most part, in European cities which were on the great river trade routes of the continent: the Rhine and its tributaries, the Main, the Rhone, and the Oder.[42] These cities were cosmopolitan ports whose wharves held goods consigned there from many ports of the world and whose merchants traded far and wide for the foreign wares which their citizens demanded. In such a cosmopolitan atmosphere publishing has always tended to become established and to grow in a healthy fashion.[43] The importance of Venice,

[41] Garrison. *Op. cit.*, p. 205. But see Sudhoff, Karl. Paracelsus, ein deutsches Lebensbild aus den Tagen der Renaissance. Leipzig, Oktav, 1936. (Meyers Kleine Handbücher)

[42] The bibliographies were published in Lyons, Strasbourg, Basel, Zurich, Frankfurt am Main, and Frankfurt an der Oder.

[43] "Aus der Notwendigkeit, weitere Absatzgebiete zu suchen, bildete sich der Stand der Reisediener oder Buchführer heraus, die als Angestellte der Druckerverleger mit deren Büchervorräten volkreiche Städte mit lebhaftem Handel aufsuchten. Sie hatten den Geschmack und die literarischen Bedürfnisse verschiedener Gegenden zu erforschen und bevorzugten dabei naturgemäss die Zeiten, in denen viele Kauflustige an einem Ort zusammenströmten, also die Kirchenfeste und die Messen. Bald wurden einzelne Buchhändler an ihrem Handel besonders günstigen Orten sesshaft, in erster Linie natürlich in Städten mit lebhaftem Verkehr, wie Frankfurt, Nürnberg, Augsburg, Nördlingen, Basel, Leipzig." Ernst Kuhnert. Geschichte des Buchhandels (In: Milkau, Fritz, ed. Handbuch der Bibliothekswissenschaft. Leipzig, Harrassowitz, 1931, v. 1: 737).

Rome, Leipzig, Paris, Lyons, London, The Hague, New York, Philadelphia, and Boston in the spread of printed books is probably due to their foreign trade, to the presence in the city, therefore, of both capital and foreigners with strange new ideas. In this, as in other facets of its work, medical bibliography has followed the trends of publishing in other fields.

Conclusions

Medical bibliography in the sixteenth century was truly in its "swaddling clothes" with a groping for a new and exact form of bibliography which would take care of the greatly enlarged stock of books available to the student, and which would meet the needs of scholars working with a new form of publication, namely printed books, with all copies of each edition exactly alike.

The earliest medical bibliographies gradually moved away typographically from books which resembled manuscripts to works which took into account the diverse possibilities of the printing press and the comparative abundance of paper and parchment. References gradually became more exact, giving, in the last few bibliographies of the century, a fairly complete citation: authors' names, titles of volumes, places of publication, dates, and pagination. Christian names had not yet been superseded by surnames as a means of identifying authors; the location of copies, so important when volumes were scarce, tended to disappear; at the same time exactness of citation was given a more prominent role.

In the sixteenth century the publishing of medical bibliography had not yet been standardized; much varia-

tion is still encountered. A relationship seems to exist between medical bibliography and the great outburst of activity in medical investigation occurring at this time; the economic effects of foreign trade on places of publication also appears to have influenced the development of medical bibliography. Some of these influences continued into the seventeenth century; at the same time new influences, notably the rise of clinical teaching, appeared.

CHAPTER II

Development of Bibliographic Technique in the Seventeenth Century

MEDICAL bibliography has, of course, always been affected by the events around it. Although the seventeenth century was one "of bitter political dissensions, religious wars and ever-recurring turmoil of many kinds throughout Europe,"[1] it was also a century of great intellectual achievements; the age which produced the most mature works of Shakespeare; which gave us Milton's *Paradise Lost* and *Areopagitica* in literature, Lully and Purcell in music, Rembrandt and Breughel in art, and Boyle, Newton, and Wren in science. It was the seventeenth century which saw the Great Plague and the London Fire, the revocation of the Edict of Nantes, the beheading of Charles I of England and the restoration of his son to the throne, the political struggles of Richelieu and Mazarin, the excesses of both the Stuarts and the Puritans. Perhaps nothing is more typical of the confused character of the age than the traditional portrait of William Harvey, tutor to Charles II as well as discoverer of the circulation of the blood, reading a scientific treatise under

[1] Walsh, J. J. Seventeenth Century. (In: Encyclopedia Americana. N. Y., Encyclopedia Americana, 1925, v. 24: 613)

a tree while a battle between the Royalists and Roundheads rages nearby.

In medicine, also, the seventeenth century was a period both of turmoil and of great advances. In the hands of Leeuwenhoeck and Harvey, methods of experimentation began to be worked out; under Sydenham and Boerhaave clinical medicine again oriented itself toward the patient. Bedside teaching, chemistry, and pathological anatomy began to be a part of medical education. Coincidental with this change in medical education came an expansion of medical literature which resulted in more elaborate schemes of bibliography than had been published previously.

Of the many medical bibliographies printed in the seventeenth century, probably only three made important advances in the science of bibliography; these were the lists of Linden, Lipenius, and Beughem. All of them were better constructed than earlier works, but were in turn overshadowed by the work of the bibliographers of the next century.

J. A. van der Linden

(1609–1664)

Joannes Antonides (Jean-Antonide, Johannes Antonides) van der Linden was the compiler of the most complete bibliography of medicine published up to his time. Born at Enkhuizen, Holland, on the shore of the Zuider Zee in 1609, the son of a well-known physician, theologian, litterateur, and rector of the University, Linden studied at Enkhuizen and at Leiden, from which place he received

his medical degree in 1629.[2] After practicing medicine with his father in Amsterdam for a few years, Linden accepted the position of professor of medicine at Franeker, where it is said he reorganized the botanical gardens and the medical library.[3] Later he was offered posts at both the University of Utrecht and the University of Leiden; choosing the latter, he remained in Leiden until his death in 1664. While there, Linden published works on the circulation of the blood, plague, and human physiology, as well as preparing new editions of Celsus and Hippocrates.

Linden's bibliographic work, his *De scriptis medicis* (Amsterdam, Blaev, 1637), is a list of medical writings arranged alphabetically by the first name of the author, with indexes of surnames and subjects. The work passed through several editions while Linden was still alive,[4] and it was reissued in an enlarged form by Georg Abraham Mercklin[5] after Linden's death in a revision which corrected some of the errors of the earlier editions and added biographical sketches of a few of the authors listed. An innovation found in Mercklin's revision is the listing of a

[2] Hirsch, following G. C. B. Suringer (Het geneeskundig Onderwijs van Albert Kyper en Johannes Antonides van der Linden. Bijdragen tot de Geschiednis van het geneeskundig Onderwijs aan de Leidsche Hoogeschool, no. 6, Amsterdam, 1863), gives the date as 1630. See Hirsch, August, ed. Biographisches Lexikon der hervorragenden Ärzte aller Zeiten und Völker. 2. Aufl. Berlin, Urban, 1931, v. 3: 790.

[3] Michaud, L. G., ed. Biographie Universelle, Ancienne et Moderne . . . Paris, Desplaces, 1819, v. 24: 509–511.

[4] The three common editions are those of 1637, 1651, and 1662.

[5] Mercklin, Georg Abraham. Lindenius renovatus, sive . . . De scriptis medicis . . . Nuremberg, Endterus, 1686.

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ber. In quo etiam affinium morborum ſelecta remedia extant. E germanica in latinam linguam converſus à *Iacobo Satero Paſſavienſi*. Paſſaviæ, apud Matthæum Nemmingerum, 1595, in 8.

BALTHASARIS EISLINGERI

De Peſte curanda liber. in 4. loco & tempore impreſſionis non expreſſis.

BALTHASARIS FABRICII

Opuſculum Phyſiologum & Medicum, libriſque tribus diſtinctum; tractans accurate primo corporis humani temperamenta, deinde compendioſe ſex res non naturales, Medicis ita dictas. Cui ob materiæ cognationem acceſſit appendicis loco Tractatiuncula de literatorum tuenda, & reſtituenda valetudine. Amſtelodami, apud Paul. Arn. à Raveſteyn, 1629, in 8.

BALTHASARIS HAN

Epiſtola ad Dan. Sennertum, miram veneficii hiſtoriam exhibens. Extat cum lib. VI Practicæ Medicinæ ejuſdem Sennerti.

BALTHASARIS ab HERDEN

Epiſtolæ quædam Medicæ extant cum Ciſta Medica Ioannis Hornungi. Noribergæ, apud Simonem Halbmayerum, 1625, in 4.

BALTHASARIS du HVVAL

De Peſtis curatione liber. Pariſiis, apud Claud. de Monroeil, 1583, in 8.

BALTHASARIS PISANELLI

De Eſculentorum potulentorumque facultatibus liber unus, Italice ſcriptus, & latine converſus ab *Arnoldo Freitagio*. Herbornæ, apud Chriſtoph. Corvinum, 1593, in 8. Genevæ, apud Phil. Alberti, in 16.

BALTHASARIS KLEIN

Epiſtola de ligno in Armenium lapidem converſo, habetur lib. III Epiſtol. Matthioli, pag. 406.

BALTHASARIS SCHEIDERI

Conſilia & Epiſtola inſignis Medica extant eo in opere quod Laurentius Scholzius edidit Francof. apud Andr. Wecheli hæredes, 1598, in fol.

BALTHASARIS SCHVLTII

Conſilium Medicum, pro curanda valetudine. Witebergæ, apud Clementem Bergerum, 1606, in 12.

BALTHASARIS SIMONIS, *Smalcaldiani*

De Ογκολογία φθισικῆς Diſputatio. Extat Decade VI Diſputat. quas collegit & edidit Baſileæ, Ioa. Iac. Genathius, 1622, in 4.

BAPTISTÆ CODRONCHII, *Imolenſis*

De Chriſtiana & tuta medendi ratione libri duo, varia doctrina referti. Cum tractatu de Baccis Orientalibus, & Antimonio. Ferrariæ, 1591, in 4. Bononiæ, apud Clementem Ferronium, 1629, in 4.

De

Fig. 3. Linden, J. A. van der. De Scriptis Medicis. 1637.

few articles from the publications of learned societies. Manget also included some of Linden's text in his work.[6]

In spite of the large number of references contained in this work, it has been criticised for what it omitted.[7] It is, moreover, the first medical bibliography which resembles a modern work of similar content (see Figure 3). Authors' names are placed on a line separate from the rest of the citation and are printed in capitals with spaces between the letters. Both the given names and the surnames appear in the genitive case of the Latinized form, although occasionally a surname like Klein will defy any attempt to make a genitive of it. Where this occurs, the author has wisely allowed the original form of the name to remain. In this Linden is in advance of his times, for even later bibliographies resorted to Latinizing vernacular names as, for example, Lipenius, who lists Jacob Vogel as Jacobus Aviensis.

For each book Linden gives the full title, the place of publication, the publisher, the date of publication, and the size of the volume. In cases where there are different editions of the same work, the imprint of each is listed. The names of editors, translators, commentators, and the like are noted in italics in the body of the citation. Cross references are made from forms of names not used to forms that are used, and non-Roman alphabets (especially the

[6] Manget, Johann Jacob. Bibliotheca scriptorum medicorum, veterum et recentiorum . . . Geneva, Perachon, 1731. 2v.

[7] "C'est une bibliographie médicale très-incomplète, même pour le temps où elle a paru, et qui n'est point exempte d'erreurs. Mais elle n'en a pas moins été fort utile à ceux qui ont travaillé depuis sur le même sujet." Weiss. (In: Michaud. *Op. cit.*, 24: 551–552.)

Greek alphabet) are printed in the original form, not transliterated. Altogether, the *De scriptis medicis* shows a new grasp of the potentialities of the printing press not found in earlier bibliographies. This is especially noticeable in its methods for setting off important matter from the less important, by the use of different type faces, by leading between lines and spacing between letters, and by variations in form of type (bold-face and italics, for example). Because Linden considered important many of the things which we consider important today, the work has a decidedly modern look about it.

In purely bibliographic details, also, Linden's bibliography resembles modern ones. Linden was faced with the problem of indicating several things in one volume; especially 1) who was the author of a work, 2) what variations existed of an author's name, 3) what works had been published on a particular subject, and 4) all the information necessary to identify fully the particular title. He solved this problem in a way which bibliographers have been using ever since: he listed the titles in his bibliography under the name of the author (typographically the author's name is the most prominent feature of the *De scriptis medicis*), he provided an index of references from forms of names not used to forms that were used, he gave a second index of subjects covered, and he placed the imprint (place of publication, name of publisher, and date of publication) as a final unit.

In general this is the scheme still used today; the one major change is in the use of surnames instead of given names for alphabetization. This change is due, of course,

to the fact that Christian names have almost disappeared as identifying marks in our culture, as family names have become more stabilized. The problem of how to list authors is important in any bibliographic work and the method of entering authors in a list has changed from time to time with changes in the customs of naming people.

The use of family names became common in different parts of Europe at different times. Originally Roman names were made of three parts—the praenomen, the gens name (or nomen), and the cognomen—which might be compared loosely to the given name, the family name, and the designatory name. Sometimes an agnomen, or descriptive name of the individual, was also added. Examples of this are Fabius who was known as Cunctator, the Delayer, because of his tactics in the Second Punic War; or Scipio, whose agnomen, Africanus, celebrated his deeds in Africa. In more northerly, barbaric lands the usual form of the name was merely the given name. At a later date names designating descent (Johnson, the son of John), or place of origin (John of Gaddesden), or profession (Taylor, Smith), or personal attribute (Longfellow) were added to the given name to differentiate individuals with the same given name. The whole matter of names is further complicated by the practice of the Christian church of bestowing another name upon a person at baptism.

We are told that surnames were introduced into England by the Normans after the invasion, and this implies that they must have been known and used in Normandy before 1066. In England surnames became a distinguishing mark of the nobility and those attached to the conquerors,

from whom they were gradually taken over by the conquered.[8] Isaac Taylor notes[9] that surnames were common in the south of England in the twelfth century but were not in general use in some parts of Wales and Scotland until the nineteenth century. Although introduced 300 years earlier, it was not until the fourteenth century that surnames became family names handed down from father to son.[10]

Although presumably family names were used in Normandy before the time of the conquest of England and were common in England by the end of the fourteenth century (cf. Geoffrey Chaucer, Roger Bacon, Robert Grosseteste), they were not widespread or standardized; as a result, bibliographies up to the seventeenth century listed authors by given names. It is interesting to compare lists of names made at that time for other purposes—for example, lists of citizens for jury duty, taxable persons, army, navy, or church registers. Many of these lists probably were arranged geographically or chronologically because of their intricate nature,[11] but a certain percentage

[8] Niel Steensen (Niel, the son of Steen Nielsen) in seventeenth century Denmark, for example, was not aristocratic enough to have a surname; he signed his works by the Latinized form of his name—Nicholaus Stenonis—from which he is now known as Steno.

[9] Notes and Queries, 103: 98, 1901.

[10] *Ibid.* 7: 489, 1853. A good discussion of this development appears, surprisingly enough, in the book by T. W. Peck and K. D. Wilkinson, William Withering of Birmingham. Bristol, Wright, 1950, p. 19–24.

[11] For example, the Doomsday book, which is arranged geographically by hundreds, and church registers which are usually arranged chronologically.

must have had no such logic and they must have been listed by an artificial system, perhaps alphabetic. It seems reasonable to conjecture that the use of surnames for listing individuals probably spread gradually many years after the family names themselves had become an integral part of the name, since for a long period of time surnames for the same individual varied greatly,[12] and the Latin form of the Christian name was probably the only stable factor.

In the field of medical bibliography, the change to surnames occurred during the seventeenth century; the first bibliography of the century listed authors by Christian names with a separate index of surnames, while the later lists of the century arranged the authors alphabetically by family name, even though the names themselves were still printed with the given name first.[13]

[12] Compare, for example, Paracelsus (or Hohenheim), Schwarzerd (or Melanchthon), Estienne (or Stephanus), Sylvius (or Wood or Bosch).

[13] See, however, A. Maunsell, who in his First Part of the Catalogue of English Printed Bookes . . . (London, Maunsell, 1595), speaks slightingly of Gesner and Bale for alphabetizing according to the author's Christian name instead of his surname. Also compare Sir Thomas Bodley's injunction to James, his first librarian, "I did alwaies wishe that in the setting downe of an autor's title, you would place his surname first." The first catalog of the Bodleian library (1605), however, did not adopt this radical procedure, and it was not until the publication of the second catalog of that library in 1620 that any general library catalog was arranged in alphabetical order of the authors' surnames. A discussion of this point is found in D. M. Norris, A History of Cataloging and Cataloging Methods, 1100–1850 . . . London, Grafton, 1939.

Martinus Lipenius

(1630–1692)

The first large, well-printed bibliography of medicine appeared in the seventeenth century with Martinus Lipenius (Martin Lipen) of Germany as compiler. Lipenius, like Linden, Brunfels, and Spach was a part of the academic world; like the other bibliographers—Spach, Gesner, and Beughem—he compiled a number of bibliographies on a wide range of subjects.

Lipenius was born in Wittemberg on November 11, 1630, and studied theology at the university there, becoming professor at an early age. He is said to have refused other posts with the statement that he preferred the academic atmosphere and a life of study, but in 1659 he was finally persuaded to leave the University of Wittemberg to become co-rector of the Gymnasium at Halle. Here he remained for another thirteen years before leaving Halle to take up his position as professor and rector at the Gymnasium at Stettin. A few years before his death, which occurred on November 6, 1692, he resigned from his duties at Stettin to go to Lubeck as co-rector. There he suffered a nervous breakdown and had to be confined to a hospital for some years.[14]

Lipenius' medical work *Bibliotheca realis medica*[15] was

[14] Michaud. *Op. cit.*, 24: 584–585. Also, Poggendorff, Johann Christian. Poggendorff's Biographisch-literarisches Handwörterbuch zur Geschichte der exacten Wissenschaften. Leipzig, Barth, 1863. 6. Bd.

[15] Lipenius, Martinus. Bibliotheca realis medica ... Frankfurt am Main, Friederic, 1679.

APO APP

APOSTEMATA PESTIFERA, vid. Bubo peſtil.

APOTHECARIA, vid. Pharmacopœa.

Heßiſche Apothecker-Ordnung. Gieſſen f. 1670.

Quirin. de Auguſtis edidit Minus Lumen Apothecariorum, quod recognitum *Nic. Mutonus* unà cum Majori & Theſauro Aromatariorum divulgavit. *Venet. f.* 1556.

Nic. *Præpoſiti* Diſpenſatorium ad Aromatarios, f. Introductiones in artem Apothecariatus. *Pariſ.* 4. 1582.

APPARATUS MEDICUS.

Ioa. Bapt. Donatii Apparatus Medicus. *Lugd.* 8. 1566.

APPARATUS MEDICAMENTORUM.

Ioa. Lud. Bertaldi Apparatus Medicamentorum. *Taurini* 4. 1611. 1614.

Io. Georg. Macaſii Promptuarium Materiæ Medicæ f. Apparatus ad Praxin. *Francof.* 8. 1654. *Vlm.* 1676.

APPARATUS PLANTARIUS.

Pet. *Laurembergii*, *Roſtochienſ.* Apparatus Plantarius in 11. Lib. tributus. *Francof.* 4. 1632. 1654.

APPETITUS.

Ioh. *Bohn* de Appetitu, Reſp. *Ioan. Auguſt. Hermanno. Lipſ.* 4. 1668.

Iac. *Iſraelis* de Appetitu ejusq; variè affecti Speciebus, Reſp. *Io. Conr. Stettero. Heidelb.* 4. 1668.

APPETITIVA FACULTAS.

Caſ. *Cremonini, Centenſ. Itali* Tract. III. 1. de Senſibus externis, 2. internis, 3. Facultate Appetitiva. *Venet.* 4. 1644.

APPETENTIA CANINA.

Mart. *Hoffi* Diſp. de Appetentiâ caninâ. Extat Decade 2. Diſpp. collect. & edit. à *Io. Iac. Genathio. Baſil.* 4. 1619.

APP AQU

APPROBATIO MEDICORUM, vid. Medicor. Approb.

AQUA.

Moſes Alatinus Interpretatus eſt Galeni Comment. in Hippocr. & Aere Aquis &c.

Adr. *Alemani* Liber Hippocratis de Aëre Aquis & Locis, Commentariis 4. illuſtratus. *Pariſ.* 8. 1557.

Excerpta de Aquis & Balneis ex Problematibus Ariſtotelis extant *pag. 470. Operis Vineti de Balneis.*

Buccii *Baldinit* Commentaria in Librum Hippocratis de Aquis, Aëre & Locis. *Florent.* 4. 1586.

Gaſp. *Bartholini* de Aquis Libb. II. *Roſtoch.* 12. 1618.

Vinc. *Bellovacenſis* de Aquæ Proprietatibus, Differentiis, Notis, extat T. I. Spec. Natur. *Duaci f.* 1624.

Robert. *Boyle* Paradoxa Hydroſtatica novis Experimentis evicta. *Oxon.* 12. 1669. *Rotegod.* 12. 1670. Ext. in Opp. *Genev.* 4. 1677.

Hieron. *Cardani* in Hippocr. de Aëre, Aquis & locis Commentarii. *Baſil. f.* 1570.

Car. *Claromontii* de Aëre locis & Aquis tertiæ Angl. *Londin.* 12. 1672.

H. rm. *Conringii* de Aquis, Reſp. *Hermanno Conterdingio. Helmeſt.* 4. 1639.

'oh. *Coſteri* de Aqua fontana ext. in Diſſertat. Miſcel. *Patav.* 12. 1658.

Pet. Ioh. Fabri Hydrographiia Spagyrica. *Toloſæ* 8. 1639.

Camilli *Flevii* Paraphraſis in Hippocratis Librum de Aëre, Aquis & Locis. *Venet.* 4. 1596.

Hier. *Gardinii* in Hippocratis Opus de Aëre, Aquis & Locis Commentarii. *Baſil. f.* 1570.

Ioa. Bapt. Helmontii Tr. de Aqua ext. in Phyſic. Inst. Inaud. *Lugd. Gall. f.* 1667.

P. m-

Fig. 4. Lipenius, Martinus. Bibliotheca Realis Medica . . . 1679.

one of a large series of bibliographies which he compiled on various subjects; together they formed the *Bibliotheca realis universalis omnium materiarum, rerum et titulorum, in theologia, jurisprudentia, medicina, et philosophia*, which appeared from 1679 to 1685. It is arranged by subjects with authors listed alphabetically by surname under the subjects, although printed with given names first. (See Figure 4.) There is an index of all the authors, commentators, interpreters, compilers, and disputants cited in the book. Occasionally Lipenius identified an author by birthplace or by including his position after his name (e.g., "Pisan Prof . . ."), and now and then he furnished cross references from forms of names not used to forms which were used (e.g., "Sylvius cf Franç. de la Boe"). In addition, there were comparatively large numbers of cross references from subject headings not used to those under which the topic was dealt with (e.g., "Abdominis Paracentesis, vid. Paracentesis."). Altogether about eight thousand subjects and about twenty thousand authors were listed.

The problems with which Lipenius had to deal were: 1) how to include as much literature as possible, 2) how to list the literature so that the bibliography could be easily used, 3) how to keep costs down without sacrificing utility or ease. On the first point Lipenius was more successful than Linden; as a result he was able to include approximately twice as many authors as his predecessor. He was still not comprehensive in his coverage, however; although he analyzed some composite *Opera omnia* (e.g., "Mart. Rulandus in Hydriatrica, Sectione I. Dillingae 8. 1568"), he had not grasped the importance of the serial

publications of the learned societies springing up around him. This is not surprising in view of the fact that these publications were just coming into being,[16] but Lipenius' omission of them helps to point up the alertness of Merck-lin who only seven years later saw the value of society transactions and included them in his revision of Linden's bibliography.

On the second point, the arrangement of his material, Lipenius went far beyond his predecessors. He used large quarto pages which he divided into two columns, he placed letter guides at the head of each column to show what was included in each column (e.g., APO–APP), he printed the subjects in the middle of the column in upper case type, and he set off the authors' names from the rest of the citation by the use of italics. Typographically this is a rich looking, perhaps paper-wasting, but very easily used bibliography.

In addition to the ease of use due to the typography, Lipenius' *Bibliotheca realis medica* is also easy to use because of its numerous cross references from names and terms likely to be sought after vainly to those under which the names and terms usually appear. The "copious index of authors," about which he was so proud that he noted it on the title page, also makes for ease of consultation of the main bibliography.

As the first medical bibliography to use cross references

[16] Sprat, Thomas. History of the Royal-Society of London. London, Martyn, 1667. See also McKie, Douglas. Scientific Societies to the End of the Eighteenth Century. Phil. Mag., July 1948, p. 133–143, and also Ornstein, Martha. Role of the Scientific Societies in the Seventeenth Century. Chicago, University of Chicago Press, 1938.

extensively, Lipenius' work is an advance over that of earlier bibliographers. The fact that it was more complete in its coverage of the medical literature of the time than any previous work made it important as a bibliography when it was published; this wide coverage also makes it necessary for it to be consulted occasionally even today. This attempt to include as much of the literature in the bibliography as was possible was not a new idea. Spach and Gesner attempted the same thing and if they had been able to tap the resources of their field with Lipenius' ease, they probably would have compiled just as comprehensive works as he did. The difference in the ease of compilation was a result of the extra hundred years of printing available to Lipenius. By his time a large percentage of the medical writers (represented by manuscripts in Gesner's time) had been printed and were available in public and private libraries; in addition, most new works were now printed instead of being circulated in manuscript form. And finally, general and national bibliographies, coming into being during this hundred years, provided easier ways of learning of new publications than had been available in Spach's time.

In order to determine how well Lipenius covered the medical monographic literature published from the beginning of printing to approximately the date of his work, it would be necessary to learn, if possible, the total number of medical works published during that period. With this figure in mind, it would then be possible to compare the twenty thousand authors listed in Lipenius with the possible total number of authors to whom he might have referred.

This is not so simple as it would seem at first glance. As pointed out in a previous chapter, there have been many estimates of the number of printed volumes issued at different periods, the most frequently used method being that of Peignot[17] which is taken over in theory by Iwinski.[18] Peignot, who did not claim to have worked out the method himself, used the actual counts of incunabula (1436–1536) made by students of the subject up to his time.[19] For the period 1736–1822 he used catalogs of large libraries, national bibliographies, lists in literary journals, and the like. The figures for the intervening centuries were arrived at by use of an arithmetical progression by quarter centuries, with allowances for any political, economic, or social events which might have changed the normal progression. By the use of this certainly inexact method, it has been estimated that approximately 40,000 editions of incunabula were printed,[20] and that at least 617,000 editions were printed from the end of the incunabula period to 1636.

If we consider that we have determined the total output

[17] Peignot. *Op. cit.*, p. vi ff, and his Manuel du Bibliophile . . . Dijon, Lagier, 1823, v. 1: 2 ff.

[18] Iwinski. *Op. cit.*, but see also the earliest such calculations: de la Sarna Santander. Dictionnaire Bibliographique Choisi du Quinziéme Siècle . . . Brussels, Farte, 1805, as well as the spurt of publications on the subject of which Paul Otlet's work (La Statistique Internationale des Imprimés. Bull. Inst. Internat. Bibliog. 1: 300–319, 1896) is a representative sample.

[19] Peignot preferred to consider 1536, rather than the usual 1501, as the end of the incunabula period. This is immaterial here.

[20] Von Rath, E. (In: Gesamtkatalog der Wiegendrucke. Leipzig, Hiersemann, 1925–1940; v. 7: v, 1938.)

of the printing press to Lipenius' time in a rough way, the next problem is, of course, to determine how much of the total output was in the field of medicine.[21] The best and most complete discussion of this subject appears to be that of Wilson,[22] who has brought together much of the scattered literature of the subject; his conclusions are that probably 2 per cent of all manuscripts were on medicine; somewhere between 2.15 per cent and 2.5 per cent of the fifteenth century books were devoted to medicine; and anywhere from 3 to 5 per cent of the sixteenth century publications were medical. If his figures are correct, then 966 incunabula and 24,750 editions printed from 1501 to 1636 were medical in nature, making a total of 25,716 possible volumes to be listed by Lipenius.[23]

It may be assumed, therefore, that there were 25,000 medical books to which Lipenius could have referred. He actually listed 20,000 authors. It would be pleasant to be able to say that Lipenius therefore referred to 80 per cent of the available literature for this would be an enormously successful bibliography, and a feat for which Lipenius

[21] Iwinski. *Op. cit.*, p. 38–55, gives figures for the number of books published in certain subject fields in a few countries, but unfortunately only for the years 1868–1906.

[22] Wilson, W. J. A Plan for a Comprehensive Medico-historical Library. Wash., Army Medical Library, 1949. [mimeo.]

[23] While the number of medical incunabula calculated here is in fairly close agreement with the figures of Klebs in Osiris, 4: 2–359, 1938, and Steele in Library, n.s., 16: 337–354, 1903, and Russell in Bull. Hist. Med., 21: 922–958, 1947, the number of sixteenth century medical works calculated seems high. For the purposes of this argument, however, erring on the side of giving too many is better than erring on the side of not giving a large enough count.

would deserve the greatest credit and admiration. As a matter of fact, however, we have no data on which to base any guess as to the number of authors represented in these 25,000 volumes; they may have represented any number of authors, and the 20,000 authors cited in Lipenius might just as logically have been in any number of works. It would seem reasonable, however, to assume that 25,000 volumes contained the works of at least 50,000 authors (considering as well that many authors were prolific writers, that some works were collections of shorter pieces —as for example, collections of theses—and that many titles were published in more than one edition).

If we accept this assumption—and it is put forth only tentatively for want of any better method of arriving at the facts—then Lipenius, referring to 20,000 authors out of a possible 50,000, cited approximately 40 per cent of the total literature. This is a far more comprehensive coverage of the literature than had ever appeared before this date, and it explains in part the high esteem with which this work was held in its day and ever since.

Cornelius à Beughem

(1678–1710)

The third group of bibliographies of medicine published in the seventeenth century, which had an influence on the development of medical bibliography, were those of Cornelius à Beughem (Cornelius van Beughem, Corneille de Beughem). Beughem was librarian of Emmerich in Germany, on the border of the Low Countries, and in this

profession he distinguished himself for the many bibliographies he compiled[24] and for his introduction of the term "incunabula," which he invented for use with his *Incunabula typographiae*, the first bibliography of fifteenth century publications.[25]

The two medical bibliographies by Beughem were the *Bibliographia medica et physica novissima* . . . (Amsterdam, Jansson-Waesberg, 1681) and the *Syllabus recens exploratorum in re medica, physica, et chymica in miscellaneis medico-physicis naturae curiosorum Germaniae, Galliae, Daniae et Belgii* . . . (Amsterdam, Jansson-Waesberg, 1696). The first list is an author catalog of medical books published from 1651 to 1681; the second is an index to the articles published in the journals of the various learned societies which were just then becoming important.

The *Bibliographia*, although containing only works published from 1651 to 1681, lists many of the older writers, since a fair number of the ancients were being reprinted during this period. It is arranged alphabetically by the last name of the author, with appendices (like those of Paschalis Gallus) which present the authors by language. A trend toward the vernacular can be observed in the number of publications in French, Dutch, German, Italian, Spanish, and English. The subjects being considered by physicians of the seventeenth century as reflected in

[24] "Plein du goût et de zèle pour sa profession, il a publié sur la bibliographie de nombreux ouvrages dont on fait peu de cas aujourd'hui." Michaud. *Op. cit.*, v. 4: 236.

[25] Beughem, Cornelius à. Incunabula typographiae . . . Amsterdam, Walters, 1688.

Beughem's list have been analyzed by Thorndike.[26] This is the first medical bibliography we have encountered which is limited by a specified time span (the thirty years prior to its publication). It shows that the medical literature pouring off the printing presses was becoming so voluminous that some limitation in the field to be listed had to be made. Beughem probably chose to limit his bibliography according to the demands made upon him as a librarian—in other words, to produce a list of the most recent works which would bring an earlier bibliography (that of Moronus[27]) up to date. Although the Beughem bibliography has been criticized by Jourdan as a "production très médiocre, fort incomplète, et remplie d'erreurs,"[28] it is probably as complete (about 2,000 writers) and as accurate as was possible at that time. Its main importance is that it is the first work to break down the overwhelmingly large production of medical works into easily digested portions by a time span.

On the other hand, Beughem's other work, his *Syllabus recens exploratorum in re medica . . .*,[29] is valuable because

[26] Thorndike, Lynn. Another Glimpse of Medicine in the Seventeenth Century: Beughem's Bibliography. Ann. Med. Hist., n.s., 6: 219–223, 1934.

[27] Moronus, Matthias. Directorium medico-practicum; sive Praeternaturalium affectuum . . . Lyons, Huguetan, 1647. This is a list of medical writers, emphasizing contemporaries, arranged by subjects and preceded by a list of authors and their publications. It was meant for practitioners and students of medicine who wished to keep up with the current literature.

[28] Jourdan, A. J. L., ed. Biographie Médicale. Paris, Panckoucke, 1820, v. 2: 222.

[29] Beughem, Cornelius à. Syllabus recens exploratorum in re medica,

it is the first substantial indication of the importance for medicine of periodical literature, especially the transactions of learned societies. Societies of scientists and "natural philosophers" had existed in Europe as early as the middle of the sixteenth century when the Academia Secretorum Naturae was established in Naples; but this particular society was short-lived, and it was not until 1603, with the foundation of the Accademia dei Lincei in Rome, that a viable European scientific society was formed.[30] The first scientific society founded by a physician was the Collegium Naturae Curiosorum, established in 1652, which received official protection and recognition from the Emperor Leopold in 1672, and in honor of that event changed its title to the Academia Caesareo-Leopoldina Naturae Curiosorum. This society was founded by Johann Lorenz Bausch, town physician of Schweinfurt,[31]

physica et chymica . . . Amsterdam, Jansson-Waesberg, 1696. It is interesting to compare this work with Reuss' Repertorium . . . of a century later. (Repertorium commentationum a societatibus litterarii editarum . . . (Reuss) Göttingen, Dieterich, 1801–1821. 16v). The latter work is a list of the papers submitted to the various learned societies, arranged in subject-classified groups. Each volume contains an author index, and for each citation Reuss prints the author's name (with the given name first), the title of the article, the name of the periodical in which it was published, the year, and the first page of the article. Although Beughem's work is not as complete as Reuss' six medical volumes, it was, nevertheless, far in advance of its times; indeed, Reuss may be said to be a direct descendant of Beughem, bibliographically speaking.

[30] Thornton. *Op. cit.*, p. 131–144. See also Ornstein. *Op. cit.* and McKie, Douglas. Scientific Societies to the End of the Eighteenth Century. *Op. cit.*

[31] *Ibid.*

with the avowed purpose of investigating the scientific basis of medicine.

The increase in the number of individuals concerned with the new scientific experimentation at this time had made inadequate the older method of communicating new scientific information. That method had been the personal communication of the newest intelligence in the field of "natural philosophy" from one interested party to another; it usually took the form of long detailed letters, with answering comments, questions, and debates. In some instances collections of such correspondence have been published, presenting a picture of scientific interchange of the period.[32] In addition, diaries of men prominent in the seventeenth and eighteenth centuries are useful indications of the state of science at a time when the differentiation between amateurs and professionals in the sciences had not yet appeared. Such personal methods of communication, however, are ill-suited to the advance of a subject which changes as rapidly as physics, chemistry, and medicine were changing in the seventeenth century. Too much time was needed to learn of experiments done in remote parts of Europe; and, as McKie has pointed out,[33] "Men write to their friends, and not always, or not so often, to those who dispute their facts and reject their theories."

Under these circumstances it is not surprising that a new method of communication was worked out; this took

[32] See for example, Tannery, Mme. Paul, Waard, Cornelius de, and Pintard, René, eds. Correspondence du P. Marin Mersenne. Paris, Beauchesne, 1933–1937. 2 v.

[33] McKie, Douglas. The Scientific Periodical from 1665 to 1798. Phil. Mag., July 1948, p. 122–131.

the form of a publication appearing periodically which went at the same time to a number of interested individuals. Almost simultaneously, in 1665, two such periodicals appeared: the *Journal des sçavans* and the *Philosophical Transactions of the Royal Society*. These two periodicals, representing differing groups and differing purposes, are the ancestors of two of the three principal types of scientific journals still being published today.

The *Journal des sçavans* was a weekly publication which appeared for the first time in Paris on Monday, January 5, 1665 under the editorship of Denis de Sallo, a lawyer, a dilettante "natural philosopher," and a friend of many influential politicians and courtiers. Ill health had caused de Sallo to retire from much of his normal work, and in his enforced leisure he interested himself in abstracting and compiling extracts from new works which later became the basis of the *Journal*.

In the prospectus for the *Journal des sçavans*, which appeared in the first number, a list of some of the topics to be dealt with in the ensuing issues was given. Not only were articles on the new developments in physics, chemistry, technology, mathematics, astronomy, medicine, and anatomy to be included, but also legal and ecclesiastical judgments, and indeed, anything that would interest "gens de lettres." This statement is an indication of both the state of science at that time and the people who were interested in scientific developments. Specialization was virtually unknown in science and a worker in the field of astronomy one day might on the next work in mathematics or architecture. Nor did a person necessarily devote his

whole attention to science; he might be interested in it merely as a matter differing from his normal routine—the law, the church, or managing his estates.

The *Journal* continued to be published for some months when it became involved in a controversy with the Jesuits; as a result, it was suspended on March 30, 1665, and did not resume publication until January 4, 1666, when it appeared with a new editor, the Abbé Gallois. It was then published without any legal or ecclesiastical information, and in this format it continued until 1792, when it was again suspended, this time because of the French Revolution.

As the first scientific periodical to be published in Europe, the *Journal des sçavans* had wide influence. It was reprinted in Paris and in Amsterdam, and was imitated in Italy (*Giornale de'letterati*), Holland (*Nouvelles de la république des lettres*), France (*Nouvelles descouvertes sur toutes les parties de la médecine*), and in other countries. Together with the *Philosophical Transactions of the Royal Society*, discussed below, it set the pace for periodical literature in the sciences.

The *Journal des sçavans* was aimed primarily at the amateur "if the . . . term may be applied to the productions of an age when the professional scientist had not yet appeared on the scene."[34] It soon became apparent that there existed also a need for a means of communication between practising scientists, as well as a journal of interesting and curious knowledge. After some discussion regarding the form and contents which such a publication

[34] *Ibid.*, p. 124.

should have, the Royal Society decided upon the publication of its *Philosophical Transactions*.[35] This journal, the first issue of which appeared on March 6, 1665, was to have no account of ecclesiastical or judicial affairs, but instead was to stress the experimental work done by its own members. The main difference from the earlier *Journal* was that it was meant for the publication of original work and new discoveries; unlike the *Journal* it published the work of the scientist as written by the scientist himself. In addition to the main articles, the *Philosophical Transactions* also printed book reviews and letters to the editor on the work undertaken by members of the Society. As an official organ of the Society it was published by the Society's secretary, the first editor being Henry Oldenburg; curiously enough, however, it was Oldenburg's private financial venture.

Just as the *Journal des sçavans*, publishing material of interest to all learned men, had many imitators, so the *Philosophical Transactions of the Royal Society* was followed by the publication of many other periodicals intended for scientists exclusively. Of these the Leipzig publication, the *Acta eruditorum*, the French *Comptes rendus de l'Académie des Sciences*, and, in succeeding centuries, the *Verhandelingen* of the Akademie van Wetenschappen and the *Transactions* of the American Philosophical Society are some of the better-known. Later on, as individual sciences split off from the main body of scientific learning, "spe-

[35] Brown, Harcourt. Scientific Organizations in Seventeenth Century France. Baltimore, Williams, 1934, p. 201; Thomson, T. History of the Royal Society. 3rd ed. London, Baldwin, 1812; Stimson, D. Scientists and Amateurs. N. Y., Schuman, 1949.

cialty" journals began to be published, each one limited to only one subject. As these specialized periodicals multiplied, it began to be difficult for a scientist to learn of all the publications pertinent to his work; for this reason, there grew up a group of indexing or abstracting journals, the purpose of which was to bring together periodically the articles printed in the many "Transactions" of learned societies and in the many general and specialized periodicals. This development will be discussed in more detail in a later chapter.

The establishment of scientific periodicals changed the picture of medical publication, and, as a result, the bibliography of medicine. Where earlier it had been necessary to publish only monographs, now shorter publications could be made available to interested workers. It seems reasonable to assume that scientists, faced with the necessity of publishing a whole book in order to present a new observation, would hesitate, would wait until further evidence had been discovered, or would even have their manuscripts returned to them by publishers for lengthening.[36] With the

[36] "Before the advent of periodicals in the 17th century scientific work was of necessity published either as an essay (*exercitatio*), or separate treatise (*tractatus*), despite the fact that the material contained therein might have consisted of a few pages only. For example, Harvey's *Exercitatio anatomica de motu cordis*, published in book form in 1628, might well have appeared as an article in a modern periodical, but lacking these vehicles for the propagation of research, separate publication was necessary. It is probable that much valuable material remained unpublished, the author not being able to find a publisher, or being unwilling to pay the cost of printing his own works, for in the early days of printing publishers must of necessity have carefully studied the material to be issued from their presses." Thornton, *Op. cit.*, p. 145.

appearance of scientific periodicals, however, it was possible for shorter communications to be published; and as a result preliminary observations, tentative conclusions, and individual discoveries not yet integrated into the framework of the entire science began to appear. This considerably increased the number of authors and individual publications. In addition, the practice of publication by national scientific societies tended to split up knowledge geographically more than the older methods of publication had done. This tendency, added to that of publication in the vernacular instead of in Latin, made it more difficult for the physician from the last half of the seventeenth century on to be aware of all the published advances in his field than for his predecessors. A full realization of this problem did not come, however, until the eighteenth century; and in the next chapter the work of Ploucquet will be discussed from this point of view.

Conclusions

The seventeenth century saw the culmination of medical bibliography predicated on the publication of medical works in monographic form and the first appearance of bibliographies taking into account publication of advances in medicine in periodicals. The problems which the medical bibliographers of the seventeenth century had to meet were:

1. The increase in the amount of publication. This was met by Lipenius by increasing the number of references included, and by Beughem by limiting his list to the works published within a certain period of time.

2. Methods of citing authors. In the seventeenth century the surname became standardized; as a result the practice of alphabetizing by Christian name was dropped and was never re-introduced. A Latinized form of the author's name continued to be used; however, this form was not followed so completely as had been the case earlier. Because of variations in names a more abundant use of cross references (from one form of a name to another) was used in this century.

3. Aids to the reader. As the material listed became greater, it was necessary to provide guides for the user of the bibliography. One such has just been mentioned: cross references from variant forms of names. Another aid was the use of large numbers of cross references from subjects not listed under certain terms to the terms under which they were listed. Alphabetical indexes to classified subject arrangements and details, such as the use of running heads to orient the reader, were also introduced.

4. Denoting exactly the titles listed. With the spread of printed works, it became necessary to give more complete citations than had been provided previously. We find that in the seventeenth century for the first time the imprint was given regularly and in the same form as we are accustomed to seeing it in bibliographies today: the place of publication, the publisher, and the date. Where several editions existed, each was noted separately.

Added to these problems, there appeared toward the end of the century the new problem of the periodical article. While not of great moment in the seventeenth century, this problem tended to overshadow and intensify

the others in the next centuries, as will be shown in the other chapters of this work. Only with the coming of the near-print publication of limited circulation, especially the government research report, does an entirely new problem arise in medical bibliography.[37]

[37] The problem of the government research report has been discussed at a number of meetings and symposia in the past few years. See, for example, the two-day Institute devoted to the subject at the 1952 meeting of the Special Libraries Association, and the week-long workshop convened in April, 1953 at Catholic University, D. C. That this problem has two sides to it, however, is shown by a Short Communication to the Editor (Cobb, Mary M. Publication of Medical Research Reports in Scientific Journals. Bull. M. Library A., 41: 154–155, 1953), on the one hand and Dwight E. Gray's article, Is the Technical Report an Information Tomb? in Physics Today, 5: 4, Dec., 1952.

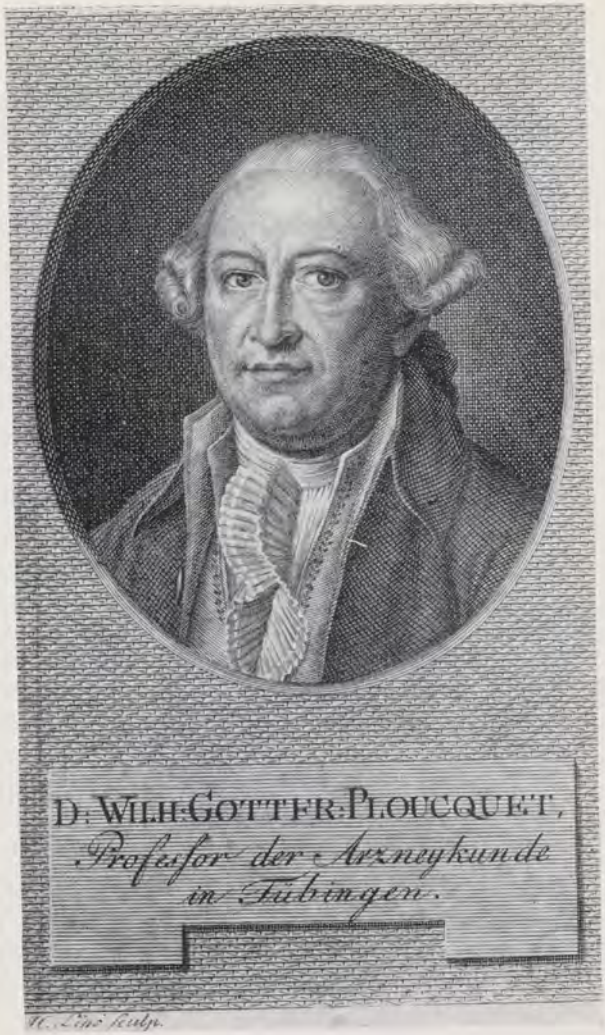
CHAPTER III

Golden Age of Individual Bibliographers

With the advent of the eighteenth century, many of the problems that beset modern medical bibliography came into prominence. An attempt will be made in this chapter to show through the examples of the work of the greatest medical bibliographers of their age, Albrecht von Haller and Wilhelm Gottfried Ploucquet, that methods were devised for the solution of these problems which were essentially the methods of modern medical bibliography.

Perhaps the greatest of the problems confronting medical bibliographers in the eighteenth century was that of coping with the enormous growth of medical literature. This growth is attested on all sides.[1] The "endless flood of the medical literature," about which Ploucquet com-

[1] See, for example, W. G. Ploucquet's Literatura medica digesta . . . Tübingen, Cotta, 1808, v. 1: [iii]: "Cum autem flumen perenne Literaturae Medicae urgeret, factum est, ut ad finem anni 1806 iterum insignis copia noviter inserendorum, numerum 40,000 circiter aequans . . .," or the words of Römer and Usteri, who comment that even with the best intentions in the world, physicians cannot get through all the new medical literature—or even the classic works. J. J. Römer and P. Usteri. Des Herren von Haller's Tagebuch der medizinischen Literatur der Jahre 1745 bis 1774 . . . Bern, Haller, 1789, v. 1: vi–vii.


D. WILH. GOTTFR. PLOUCQUET,
Professor der Arzneykunde
in Tübingen.
H. Lips sculp.

plains, was probably due not to a single cause, but to several causes working simultaneously. Perhaps one of the most important of these was the change in medical education occurring at the time: this change fostered a demand for a new literature, which the recently founded scientific periodical was able to fill.

Medical education in the seventeenth and eighteenth centuries underwent some fundamental changes. Before this time the didactic lecture from an approved text with some commentaries by the professor had been, for the most part, the established method of educating physicians,[2] as shown in many illustrations of the time.[3]

By the end of the eighteenth century, many of the more important medical schools had replaced these theoretical lectures with clinical and laboratory teaching, and

[2] "Medical teaching consisted chiefly of theoretical discourses. The medical writings of the ancients and their Arabian and Italian commentators formed the foundation of these. The teacher added technical explanations and remarks on his own practice to the reading of these books." Theodor Puschmann. A History of Medical Education from the Most Remote to the Most Recent Times. London, Lewis, 1891, p. 239. See also p. 396.

[3] For example, Johannes de Ketham's Fasciculus medicinae, *op. cit.*, or Mundinus, *op. cit.*, which show the professor on a raised dais expounding to the students below from an open book before him. In the case of Ketham, the books to be expounded are labelled by the artist and include the classic writers, Galen, Hippocrates, Avicenna, Rhazes, and others. Other such representations can be found reproduced in Ludwig Geiger's Renaissance und Humanismus in Italien und Deutschland. Berlin, Grote, 1882.

had enlarged the number of their faculty to such an extent that each professor taught only one subject.[4]

Perhaps nowhere on the Continent was this change more apparent than at the University of Leiden. Here under the aegis of Boerhaave, a new emphasis was given to medical studies with a return to the Hippocratic principle of observing the patient and of fitting theory to observed fact, rather than fact to preconceived theory. This led to far-reaching results.[5] As far back as 1637 the University of Leiden had attempted to present its medical students with some practical training.[6]

[4] "Instead of two or three professors whose teaching was limited to a few theoretical lectures and only occasionally concerned itself with practical training in anatomy, materia medica and the healing art proper, now, at least at the greater universities, boards of teachers were formed, the members of which represented the various branches of medicine and had anatomical schools, laboratories and clinical establishments at their disposal." Puschmann. *Op. cit.*, p. 433.

[5] How different this spirit was from the medieval medical school (excluding Salerno) can perhaps best be illustrated by comparing it with the statements of Arnold of Villanova in his commentary on the first aphorism of Hippocrates. (Opera omnia. Lyons, 1504, f. 336 recto and f. 337) Even when experience seems to contradict the writings of authorities, Arnold points out, we are not at liberty to condemn them; they may be talking of things which have changed since their time, for surely such great masters could not be entirely wrong. This rather common-sense view was sometimes carried to extremes, as, for example, in the case of Sylvius who (according to a perhaps apocryphal story) is said to have replied to a demonstration of errors in Galenic anatomy that man must have changed since Galen's time.

[6] Suringer, G. C. B. Stichting der School voor klinisch Onderwijs te Leiden onder Heurnius en Screvelius in het Jaar 1637 . . . Nederl. tijdschr. geneesk., 6:515–552, 1862.

Unfortunately this attempt lasted only a few years, and had to be re-introduced by Boerhaave in the eighteenth century.[7]

Hermann Boerhaave

(1668–1738)

Hermann Boerhaave, the moving spirit of this reform in medical education, was born in Voorhout, near Leiden, in 1668. He studied medicine at the University of Leiden, where he was chosen professor of theoretical medicine at the age of 33. His inaugural address on this occasion, *De commendando studio Hippocratico*, was a statement of

[7] "Waar het in dit verband op aan komt, is dat sedert 1636 twee hoogleeraren der Leidsche faculteit de opdracht hadden in het Caeciliagasthuis, waarin tot dat doel door de Universiteit 12 bedden gereserveerd waren, meermalen per week lessen aan het ziekbed te geven. Tot hulp dezer hoogleeraren werden bovendien twee stadsdoctoren en een chirurgijn aangewezen, terwijl bovendien in genoemd gasthuis een afzonderlijk vertrek voor het verrichten der lijkopeningen was gereserveerd . . . De studenten kregen zoodoende gelegenheid regelmatig patiënten te zien, deze zelf te onderzoeken en het beloop der ziekten te volgen. De hoogleeraren vonden in het onderwijs aan het ziekbed aanleiding meer methodisch over de ziekten en haar behandeling na te denken, terwijl in de combinatie van clinische waarneming en lijkopening de zoo noodzakelijke contrôle op de gevormde voorstellingen gewaarborgd was . . ." J. A. J. Barge. Het geneeskundig Onderwijs aan de Leidsche Universiteit in de 18e Eeuw. Nederl. tijdschr. geneesk. 78:53, 1934. The twelve beds set aside for the teaching of medical students at the Cecilia Hospital represented a fairly high ratio of patients to students. A description of clinical "rounds" is given by John Ray in his: Observations Topographical, Moral, and Physiological; Made in a Journey through Part of the Low-Countries . . . London, Martyn, 1672.

his principles in the field of medical practice. In this discourse Boerhaave emphasized the need for following the principles of Hippocrates in the observation and treatment of patients, a point he stressed throughout his subsequent career. The aim of medicine, he contended, was to cure the patient. Like a number of scientists from Renaissance times on, Boerhaave felt that only from observation could one reach theoretical considerations and hypotheses. In those cases where there is an equal possibility of several explanations for observed facts, then the simplest explanation should be chosen. ("Simplex sigillum veri.")

In order to bring the medical student into contact with the patient, Boerhaave re-introduced the medical "rounds" first conducted by Sylvius in 1663,[8] during which a student would examine a patient, make a tentative diagnosis, and prescribe treatment, stating his reasons; then Boerhaave would discuss the case and make any necessary corrections in the student's work. This innovation did not meet with unqualified approval by the students, who disliked having their ignorance exposed to fellow students, but the advantages of such a system of bedside teaching over purely theoretical study were so obvious that the method was soon taken over by other medical schools in Europe and later in America.

Boerhaave's influence spread far because of his personal fame,[9] because of the influence of his writings, which ex-

[8] See Osler. *Op. cit.*, no. 969.

[9] It is said by William Burton in his: Account of the Life and Writings of Herman Boerhaave. . . . London, Lintot, 1743, that a letter addressed "A M. Boerhaave, Médecin en Europe" was delivered to him with no difficulty.

pounded his theories of patient-centered medicine and simplicity of treatment, and because of the pre-eminence of his students who left Leiden to found medical schools in other countries.[10] Among the more eminent students of Leiden were Albrecht von Haller, John Pringle, Anton de Haen, Benjamin Waterhouse, Gerard van Swieten, and John Rutherford, many of whom were founders of other medical schools.[11]

The importance of this group to American medical education has been clearly brought out by Waite, who traced the influence of Boerhaave's clinical instruction on the medical schools of the Ohio valley area.[12] A similar line of descent can be traced through the University of

[10] In 1709 Boerhaave had approximately 300 students. Puschmann. *Op. cit.*, p. 412. See also Van Leersum, E. C. Two of Boerhaave's Lecture Lists. Proc. Roy. Soc. Med. (Sect. Hist. Med.), 11:11–20, 1917.

[11] "The University of Leiden . . . was the center from which, inspired by Boerhaave, numerous medical scholars set out to establish similar centers at Vienna (van Swieten and Albrecht von Haller), Edinburgh (Rutherford), Pavia, Prague, and Rome." Tercentenary of Clinical Instruction at the University of Leyden. J. A. M. A., 110:1686, 1938.

[12] "Some of the early teachers of medicine in America were graduates of Leyden. Of these one of the best known was Benjamin Waterhouse (1753–1846) M.D. Leyden, 1780, the first Professor of Physic in Harvard from 1782 to 1812. Among Waterhouse's early students was Nathan Smith (1762–1829) M.D. Harvard, 1790, who became Professor of Physic at Dartmouth and later founder of the Yale Medical Institution. . . . Among Nathan Smith's earliest students was Jared Potter Kirtland (1793–1877) M.D. Yale, 1812, who was Professor of Medicine in Cleveland Medical College from 1843 to 1867 . . ." F. C. Waite. Early Medical Schools: Leyden. Bull. Acad. M., Cleveland, 13:8, 1929.

Edinburgh medical school, founded by John Rutherford, a pupil of Boerhaave, whose American students—Samuel Bard, Benjamin Rush, John Morgan, and William Shippen, Jr.—were instrumental in the establishment of the University of Pennsylvania Medical School and the medical school attached to King's College in New York (Columbia University). Still another line of descent can be traced through Daniel Drake, who was a student at the medical school in Philadelphia, and then founded no less than seven medical schools in the "middle interior valley" of America.[13]

The change from dependence upon the writings of one or more classical authorities to a comparison of different authorities with the actual state of the patient had important repercussions on medical literature. One of the difficulties of clinical teaching is that it presents the inexperienced student with perhaps one, or at the most, a small number of isolated cases of a given disease. Because of his lack of experience the student is unable to tell whether the particular case under investigation is typical of the general run of such cases. To get around this, the clinical professor comments on the case, points out how it agrees or disagrees with other cases, and rehearses alternative diagnoses, prognoses, and treatments. This time-consuming method can be both bettered and shortened if the student has access to the records of other similar cases; in addition, the return to the original records of other

[13] Norwood, William F. Medical Education in the United States Before the Civil War. Philadelphia, University of Pennsylvania Press, 1944, and Smith, R. W. Innes. English-speaking Students of Medicine at the University of Leyden. Edinburgh, Oliver, 1932.

cases acts as a check on the perpetuation of errors by dogmatic clinical teachers. The importance of the case study, therefore, increases with the use of the bedside method of medical teaching.

Case records can perhaps be conveniently divided into the published and the unpublished records. They may be individual cases, the cases of a particular physician or hospital, or collections of cases of a particular disease drawn from several sources. From the end of the sixteenth century right through the eighteenth century a series of case reports of important physicians, anatomists, and pathologists were issued. Probably the most famous is Giovanni Battista Morgagni's *De sedibus et causis morborum per anatomen indigatis libri quinque* (Venice, Remondiniana, 1761, 2v.), but many works called *Consilia*, *Epistolae*, or *Adversaria* were collections of case histories.[14]

In addition to this method of publishing collections of case histories, the rise of the medical periodical made possible the publication of individual case histories. A large number of the early journals carried reports of individual cases which, when taken in conjunction with the cases reported in the *Consilia*, *Opuscula*, *Miscellanea*, *Recensiones*, and other collections, presented a new problem to the bibliographer: namely, the indexing of parts of a collected work. The first person who met this problem in extenso was Ploucquet, and he solved it in the way in which medical indexers have been solving it ever since: he indexed each case and each part as a separate entity. An immediate effect of the use of this method was to

[14] See the Preface to Ploucquet's Literatura medica digesta . . . which lists more than six lines of names of such case histories.

increase the size of the resultant bibliography. In comparison to Lipenius' 20,000 author references, Ploucquet prints more than 200,000 citations.[15] This increase in the size of medical bibliographies was not proportional to the increase in medical literature; in spite of the substantial growth of the medical literature, it seems unlikely that the total literature could have increased as much as tenfold in half a century.

Another effect of the "endless flood of the literature" resulting from the change in the method of teaching medicine was the appearance of digests and guides to the literature. As the amount of literature increased, it became impossible for any person to be acquainted with all of the writing.[16] In order to save the students' time and to lead the reader more easily to the important literature, there was now a growing tendency toward works which pointed out the best that had been written on a particular subject, or which abstracted or digested the literature. Examples of such works are Boerhaave's own *Methodus studii medici*, (Amsterdam, Wetstein, 1751, 2v); Haller's series of volumes under the title *Disputationes*,[17] as well as his *Bibliothecae*, which will be described in more detail below; and Thomas Young's *Introduction to Medical Literature* . . . (London, Underwood, 1813), which contains a list of the books important to a complete medical library, indicating by typographical symbols the most important titles for the

[15] *Ibid.*, p. xii.

[16] Römer and Usteri. *Op. cit.*

[17] Disputationes anatomicae selectae. Göttingen, Vandenhoeck, 1746–1752, 7v. and Disputationes chirugicae selectae. Lausanne, Bousquet, 1755–1758, 5v.

beginning student. How much labor these works entailed can perhaps be understood by examining the life of Haller.

Albrecht von Haller

(1708-1777)

Much has been written about Haller as a physician, as a physiologist, as a botanist, as a Swiss citizen, as a defender of religion; but very little appears in print on Haller as a bibliographer. Occasionally a fellow-bibliographer, traversing the same ground, will comment on the amazing task which Haller set for himself,[18] but for the most part there is silence. When his bibliographies are mentioned, they are usually discussed as minor incidents in his life.[19] This is unfortunate because it gives a completely distorted view of the place of bibliography in Haller's life. As will be shown in the comments on his life and works, bibliography was not for him a thing set apart from the rest of his life, but a reflection of his everyday interests and a by-product of whatever work he was engaged in at the moment. Indeed, after a study of Haller's life, it is hard not to conclude that he could no more keep from producing bibliographies on subjects which interested him than could Gesner. For each of these men to know a subject was to know its literature, and to know its literature was to attempt to make it available to others.

[18] See Sir William Osler's statement in his Bibliotheca Osleriana, *Op. cit.*, p. 117, that "Haller is the greatest bibliographer in our ranks. . . . To learning and judgment he added that indispensable quality in a bibliographer, accuracy . . ."

[19] Cushing, Harvey. Haller and His Native Town. Amer. Medicine, 2: 542–544, 1901.

Albrecht von Haller was born in Bern in 1708 of well-to-do middle-class parents. His father was a lawyer who expected his son to follow in his footsteps or else to enter the church; and the son's education was therefore extensive and well-considered. Haller turned out to be a precocious child who at the age of eight lectured to the servants on religion, who had compiled a Hebrew-Chaldaic dictionary by the time he was ten, who in his early teens presented a thesis in Greek for admission to the university, and who preferred serious and moralistic volumes to comedies, and studies to play. Seen through the eyes of a generation of Victorian biographers, Haller appears to us to have been an intolerable prig with not the slightest touch of a sense of humor.[20]

After studying with private tutors in Switzerland, Haller decided that his interest lay neither in the law nor in the church, but in medicine. In December 1723, therefore, he left his country and went to study medicine at the University of Tübingen. Here he found the teaching of medicine at a low ebb; no human corpses were available for dissection, outmoded methods of treatment were taught, and the faculty—except for Camerarius—was inclined to pay little attention to the students.[21] After hearing Duvernoi read Boerhaave's *Institutiones medicae*

[20] See John Fulton's comments on Haller's "inhuman habits of living . . ." Haller and the Humanization of Bibliography. New England J. Med., 206: 323–328, 1932.

[21] Haller, Albrecht von. Tagebücher seiner Reisen nach Deutschland, Holland, und England, 1723–27; Tagebuch der studien Reise nach London, Paris, Strassburg und Basel, 1727 bis 1728. Bern, Haupt, 1942. Zimmermann, Johann Georg. Das Leben des Herrn von Haller. Zurich, Heidegger, 1755, p. 24ff.

to the class in the old tradition of didactic lectures on an authoritative book, Haller conceived the idea of going to Leiden and hearing Boerhaave at first hand; so in May, 1725, after only eighteen months at Tübingen, Haller left for Holland. In Leiden he found things more to his liking; students were intent on studying and professors on teaching and investigating. Each professor lectured on one subject only, and because he was not responsible to the students, he could insist upon higher standards than it was possible to have in Tübingen.[22] The anatomical theatre was well ordered and well supplied with bodies; there was a laboratory for chemical work, and even a library.[23]

It was at Leiden that Haller first began the systematic reading, abstracting, and weighing of medical literature which he continued to the end of his life, and the results of which were later used in the preparation of the four *Bibliothecae* he published, as well as all his other bibliographic writing.[24] According to Zimmermann, who was Haller's literary executor, the notes which Haller took of his reading were on uniform halfsheets of paper, and were in several series. These sheets were still in exist-

[22] *Ibid.*, p. 25.

[23] *Ibid.* p. 32.

[24] Römer and Usteri. *Op. cit.* See also his own description of his method: "Legi ab anno retro 1725 libros omnis generis, sed tamen, ut medicos soles in commentaries referrem, et utiliora rerum momenta in meas usus decorporem, schedulisque committerem. . . . Quam primum librum absolvi, ab ipse anno 1728 judicium meum de eo libro, cum enumeratione inventorum, eorumque quae peculiaria haberet, censu continuo in mea adversaria retuli. . . ." Albrecht von Haller, ed. Methodus studii medici. . . . ab H. Boerhaave. Amsterdam, Wetstein, 1751, v. 1 Praefatio, sig. ** 2 recto.

ence in 1901 and were seen by Harvey Cushing when he visited Bern.[25] That Haller continued this work during his entire lifetime is borne out both by the dates of his notes and by his rather touching words in the preface to his *Bibliotheca medicinae practicae. . . .*[26] How time consuming such work was is also attested by the fact that Haller made it a rule to read and take notes at all his meals and for some time before retiring each night.[27]

After graduation at Leiden and further study in medicine in London and in anatomy and mathematics in Paris, Haller returned to Switzerland to practice medicine. He was not very successful in building up his practice in his home community, although he began the custom there of keeping patients' records, and it was therefore natural for him to accept the post of professor of medicine at the newly founded University of Göttingen offered him by George II of England in 1736. Here Haller remained for the most fruitful period of his life, from 1736 to 1754, and here he sponsored most of the 13,000 writings to which his name is attached either as author, editor, commentator, or dissertation "praeses."[28]

It is not the purpose of this study to discuss the importance of Haller in any field but bibliography. It should merely be mentioned that in the field of physiology his

[25] Cushing. *Op. cit.*

[26] *Op. cit.*, 1: viii. "Senex, infirmus, non possum nisi insipienter spes jaculari longas, & cogor me omni cum studio contrahere, ut ne denique nihil dem, qui plura nimis dare cupivissem."

[27] Baldinger, E. G. Oratio in laudes meritorum Alberti de Haller. . . . Göttingen, Dieterich, 1778, p. 16.

[28] Thornton. *Op. cit.*, p. 162.

writings were a fountain head of information for generations. He is still remembered in botany by a plant which Linnaeus named after him as a token of friendship (in spite of the difference of opinion between the two men on the theory of botanical classification). He is considered by some to be one of the founders of German poetry.[29] His interest in and writings on religion continued throughout his lifetime. He was, perhaps, less important in his work as a public official than in any other work he undertook, but he founded an orphan asylum, directed the state salt works, prosecuted "natural healers" for the state, and oversaw a philological school. In the field of bibliography however, he is admittedly without a peer.

What were Haller's purposes in preparing his bibliographies? This man who "absorbed everything he read . . . and seemingly never forgot,"[30] was primarily concerned with saving the beginner in a field from the laborious task of reading and judging everything, as he himself had been forced to do in order to discover the important and worthwhile writings.[31] This reason for compiling exhaustive bibliographies should, perhaps, be compared with the statements given by John Shaw Billings a century later on his reasons for desiring to found the *Index-Catalogue* (see next chapter). In both cases the difficulties which they had encountered in searching for medical literature

[29] Most modern writers seem to consider Haller's poetry poor in quality, but Osler (*Op. cit.*, p. 117) felt that "as a poet Haller is in the first rank of medical poets."

[30] Cushing. *Op. cit.*

[31] Henry, Thomas. Memoirs of Albert de Haller, M.D. . . . Warrington, Johnson, 1783, p. 84–87.

for their own work had led to a desire to lessen the task for newcomers to the field. While Billings, however, was willing merely to list the literature (reasons for this will be discussed in later sections), Haller preferred to annotate his citations.

Haller's earliest large work of para-bibliography was his *Primae lineae physiologiae in usum praelectionum* (Göttingen, Vandenhoeck, 1747, 8v.), a work which was not meant primarily as a bibliography, but which was, because of its abundant references to the literature, a comprehensive bibliography of its subject. Since its subject was not medicine, as defined for this dissertation, it will be described only briefly here, as the basis for Haller's later work in bibliography.

The *Primae lineae physiologiae* appeared in eight volumes and contained not only the fruit of Haller's readings on the subject, but also many of his original observations. Magendie[32] once remarked that whenever he thought he had a new idea in physiology he looked in Haller's compendium and found it there already set forth. Each page of the *Primae lineae physiologiae* is divided in two, horizontally, about midway. On the upper portion of the page are the observations of Haller; below are listed the references to other writers, with Haller's comments and arguments.

Much the same form was employed also in his edition of Boerhaave's work, *Methodus studii medici*. In this work, the value of each writing, according to Haller's judgment,

[32] Quoted by Charles Bert Reed. Albrecht von Haller; a Physician—Not Without Honor. Bull. Soc. M. Hist., Chicago, no. 4, p. 40, 1916.

was indicated by a series of asterisks—the more asterisks, the better the contribution in Haller's opinion. Since many living authors were included, it is not surprising that a number of people were hurt.[33]

From the experience with these two works, and from his many years of reading and note-taking, Haller finally proceeded to the publishing of his great *Bibliothecae*: one on anatomy, one on surgery, one on medicine, and one on botany.[34]

The *Bibliotheca medicinae practicae* (Basel, Schweighauser, 1776–1788) consists of four quarto volumes dedicated to John Pringle of England, and contains 52,000

[33] "We may reasonably suppose that very few of these learned men were content with the number of their asterisks; though we cannot pretend to say how far this freedom of Haller increased the list of his enemies and critics . . . M. de Haller hazarded, at this time, his importance and his repose. He was sensible of the risk, but he did not hesitate. In delivering these opinions, his end was to determine what guides should be chosen by young men who design to enter into a profession in which the lives of their fellow creatures are intrusted to their care; and he esteemed this to be one of those circumstances, in which the resolution to expose ourselves to that hatred, which is often excited by the wounds given to self-love, may deserve to be considered as a virtue." Henry Thomas. *Op. cit.*, p. 87–89.

[34] In relation to the latter, it should perhaps be pointed out that "botany" then encompassed many things now considered to be materia medica and pharmacology. The importance of this subject in the medical curriculum of the time can be seen by the care with which the medical schools kept their botanical gardens and the standing of the professors under whom they were administered. A good example is the "Physick garden" of the College of Physicians and Surgeons, New York City, founded by David Hosack, and preserved by the College and by Columbia University for many years. It is now the site of Rockefeller Center.

references to books, pamphlets, and some journal articles. (See Figure 5.) The entire work is arranged by large subject groups, then chronologically under the subject. An alphabetical index of all the writers is also supplied. In each reference the author's name appears in upper case letters, Christian name first and in the genitive form of the Latin name. Frequently a biographical note or the identification of the author follows his name (for example, "medici Imperatorii"). The title of the work comes next and is set off from the rest of the citation by being printed in italics. The place of publication, the date of the first and subsequent editions, and the sizes of each edition are noted. Prices are occasionally listed. Important works are then abstracted and annotated critically at length; lesser works receive more summary treatment.[35]

Here for the first time in the history of medical bibliography we find a work which attempts to be both comprehensive and critical at the same time. It was a magnificent attempt, probably impossible of achievement by any lesser person or one less industrious than Haller.[36] It is a one-man tour de force whose magnitude staggers the

[35] "In *Bibliographia* non soli boni libri recenseri possunt, brevem in nucem certe correpturi: necesse est etiam deteriores libros & inanes indicare: Cur non minores libellos? vel eo fine, ut nota aliqua imposita lectores moneantur, ne vano immorentur legendi labore . . . De bonis libris, vera fruge plenissimis, solum gustum dabo, breve nempe compendium aliquot adnotationum, eo uberius ut auctor rarior fuerit minusque notus . . ." Albrecht von Haller. Bibliotheca medicinae practicae . . . *Op. cit.*, v. 1: vi. For a further discussion of the importance of including poor as well as good literature, see the introduction to Ploucquet's bibliography, described below.

[36] "Ces . . . ouvrages . . . contiennent beaucoup de choses, bien des erreurs sans doute, mais, en matière de bibliographie, il ne faut jamais

hernialis dicitur, peritonæum eſſe dilatatum oſtendit. Lienis tunicam duram vidit, cum viſcus ſanum eſſet. Lien ſcirrhoſus adeo magnus, ut totum abdomen repleret. A cauſo lien ruber & aridus. Calculi fellei aliquoties, & fellis veſicula ſcirrhoſa. Hydatides in omento. Scirrhi ventriculi, aliquoties. In femina cyſtis plena ſeboſa pinguedine; in ea quaſi maxillæ & dentes & capilli. Poſt duram alvum in coli anfractibus lapidea ſtercora. Volvulus a ſcirrho tunicæ coli officulis pleno. In alia, cum nephritis putaretur, ſcirrhus in ileo inteſtino. Pinguedo candeæ ſebaceæ ſimilis (polypus) in cordis ventriculo ſiniſtro. Pulmone dextro abſumto æger vitalis. Scirrhus, inde tuſſis. In iis, quibus cor palpitat, arteriæ magnæ tunicæ dilatantur.

NICOLAI BOCA ANGELINI medici Imperatorii, *de morbis malignis & peſtilentibus, de cauſis, præſagiis, medendi methodo, remediis* Madrit. 1600. 4. *. 1618. 4. CARRERE qui PETRUM vocat. Peſtis bubonibus & carbunculis comitata a. 1599. in Hiſpania graſſata eſt, contagioſa, ex veſtibus ex Flandria miſſis propagata. Salubres fuerunt glandulæ (bubones) & carbunculi, ægroſque vel ſervarunt, vel certe mortis periculum longius removerunt: ſi abeſſent, cita mors ſuperveniebat. Magis ſervabantur, quibus duo, etiam tres carbunculi prodibant: evaneſcentes mortem accerſebant: funeſti etiam erant, qui in pectore aut collo prorumpebant. Medicatio noſtri fiebat, per calida auxilia, motum ſudorem. Frigidæ potum Cæſarauguſtæ ſaluberrimum fuiſſe tamen fatetur: pueris theriacam obfuiſſe. Frigidam etiam in febre colliquativa utiliter dedit. In febre petechiali laudat cucurbitulas, terramque ex Italia adlatam. Variolarum ſecundam febrem non ignoravit, purgationem tamen rejecit.

Reperi citatas ejus *obſſ. de variolarum notis reliquiis ſine maculis & foveis.*

SIMONIS MAIOLI, non quidem medici, *dies caniculares, h. e. colloquia tria & viginti phyſica* Urſeil. 1620. 4 TR. Mogunt. 1607. 4. L. & *continuatio* ib. 1608. 4 L. Mogunt. 1610. 4. TR. Heteropoli 1610. 4. 2 vol. & tomus III. ib. 1612. 4. TR. Tomi VII. Frf. 1642. fol. TR. Offenbach 1691. fol. Medica etiam aliqua admiſcentur. Tres calculi inſignes in difficili partu per anum excreti.

JAYME FERRER *tratado de la peſte* Valencia 1600. 8. C. de V.

FRANCISCUS PUEZ CASCALES *de morbis puerorum* Madrit. 1600. 4. C. de V. Ej. *de affectibus mulierum, una de morbo vulgo garottillo & duabus quæſtionibus de gerentibus ultero & de faſcinatione* Madrit. 1666. 4. C. de V.

CAROLI GALLI *de febribus peſtilentialibus & malignis tractatus bipartitus* Ferrar. 1600. 4. TR.

PETRI VERDERII *de morborum & ſymptomatum occultis manifeſtatione cauſis diſſ.* Vicent. 1600. 4. RIV.

JUSTI BALBIANI *nova ratio praxeos medicæ* Venet. 1600. 8. L.

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Fig. 5. Haller, Albrecht von. Bibliotheca Medicinae Practicae . . . 1776–1788.

reader. "It is the 'Index medicus' from the early manuscripts till the middle of the eighteenth century," says Harvey Cushing.[37] "It was called by his contemporaries an 'abyssmus eruditions' [sic] and is still indispensable to the medical historian," says another.[38] That one man should have been able to compile it by himself seems incredible. Even though medical literature had not reached the bulk it was to reach later, for example in the time of Callisen or Billings, it was still a great flood.[39]

Just as Kekulé may, because of the advances in his field since his time, have been the last person who knew all of chemistry, so perhaps Haller can be considered the last person who was able to know the entire literature of medicine. Later medical bibliographers were to be faced with the necessity of limiting their work in one or more of

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se déconcerter . . ." Alexis Dureau. Contribution à l'Histoire de la Bibliographie Médicale. Bull. Soc. franç. hist. méd., 1: 170, 1902.

[37] *Op. cit.*, p. 544.

[38] Reed. *Op. cit.*, p. 44.

[39] Iwinski (see p. 8, 42) considers that 1,245,090 volumes were published from the invention of printing to 1700 and another 1,637,196 from 1700 to 1800, for a total of 2,882,286 volumes. Wilson (see p. 43) has estimated that 3 to 5 per cent of 16th century publications were medical. In 1950, 4.0 per cent of all published American books were medical, according to Publishers Weekly, 159: 241, 1951. Using this lack of progression in the ratio of medical to non-medical publications, we may hazard a guess that approximately 5 per cent of the 18th century works, or about 81,000, were medical. If we use the same methods, it would appear that somewhere around 305,000 volumes published in the 19th century were medical. It might be interesting to note here the rise in publication of periodicals in the same period. According to Iwinski, 68 periodicals had been published on all subjects by 1690, 910 by 1800, and 59,057 by 1901.

several alternative ways: by period covered, by language, by subdivision of subject, by country of origin, or by some other means; or else they were to be forced to assemble teams of assistants to aid them. No man was ever again to be able to know all there was of the medical literature.[40] Indeed, ground was so quickly lost that soon the attempt was not to know everything that had been written, but merely to keep up with the newest material being published.[41]

Wilhelm Gottfried Ploucquet

(1744–1814)

We have alluded in several previous places to the work of Wilhelm Gottfried Ploucquet. Although by no means as outstanding a personage as Haller, with little of the stature of Champier, Gesner, or Linden, Ploucquet still

[40] See the arguments of d'Irsay that Haller's bibliographic work was an outgrowth of the Age of Enlightenment. d'Irsay, Stephen. Albrecht von Haller. Eine Studie zur Geistesgeschichte der Aufklärung. Leipzig, Thieme, 1930, p. 70–74. It has been said of Gibbon that he could not have known everything about Rome if he had lived a little later, when the increase in literature had put such knowledge beyond any one man's control. Since the first volume of Gibbon's *Decline and Fall of the Roman Empire* appeared in the same year as Haller's *Bibliotheca medicinae practicae*, it would appear that the same increase in the volume of the literature was occurring in other subject fields as in medicine.

[41] In 1882 John Shaw Billings attempted to locate the catalog of Haller's private library, for which undertaking he enlisted the aid of Mr. D. J. Crane, then U. S. Consul at Milan, but neither Mr. Crane nor the Milanese book seller Hoepli were able to help him. The entire correspondence is in the files of the History of Medicine Division, Armed Forces Medical Library.

may be considered more important for the development of medical bibliography than his great predecessors. As I have tried to show, Haller was the last of the giants who could make all of medical literature his. With him the personal, exhaustive, critical bibliography on all aspects of medicine perforce came to an end. His choice of the methods for preparing complete bibliographies was unrealistic and sterile because, with the growing expansion of the literature, the method could not be continued.[42] With Ploucquet, on the other hand, there emerges a new form of medical bibliography—the cyclical, series bibliography—which foreshadows the most important publications of the nineteenth and twentieth centuries.

Wilhelm Gottfried Ploucquet was born in Württemberg on December 20, 1744, and died in Tübingen, January 12, 1814. He studied medicine at the University in Tübingen, receiving his degree from it in 1766 with a thesis *De vi corporum organisatorum assimilatrici*. Although not much is known of Ploucquet's personal life, it seems obvious that he must have continued at Tübingen for some time, perhaps even have been attached to the University, for in 1782 he was appointed Professor Ordinarius der Medizin there. He is especially known for his medico-legal writings, having been the first to note that expansion of the lungs occurs upon birth, and that proof a child was not stillborn could therefore be obtained from the presence of inflated lungs. His other writings cover a wide range of medical

[42] Although Haller's *Bibliothecae* may be said to be forerunners of abstract journals, they differed from them in that abstract journals edited by one man rarely attempt complete coverage of the literature.

and legal points; a list of them occupies four closely printed pages.[43]

Ploucquet published the first volume of his *Initia bibliothecae medico-practica et chirurgica. . .* in Tübingen in 1793 and continued publishing two volumes a year until eight volumes had appeared. By that time (1797) the literature which had accumulated since the publication of the first volumes was so great that he decided to publish a supplementary series. This continuation, which was entitled *Bibliotheca medico-practica et chirurgica*, required another five years for publication (Tübingen, Cotta, 1799–1803, 4v.). By then another 40,000 references to new literature had accumulated[44] and a third series seemed inevitable. At this juncture, Ploucquet was faced by a dilemma, as he himself points out in the Foreword to the *Literatura medica digesta*. He could either issue another series of volumes as a supplement to the two series already published, or he could attempt to integrate all the published citations with the new citations he had collected and issue them in one series. In the foreword to his *Literatura*

[43] Jourdan. *Op. cit.*, 6: 450–454, 1824. Further biographical information on Ploucquet can be found in Allgemeine deutsche Biographie. Leipzig, Duncker, 1888, v. 26: 320; Dezeimeris, J. E. and others. Dictionnaire Historique de la Médecine . . . Paris, Béchet, 1832, v. 3: 733–736; Hirsch, August, ed., Biographisches Lexikon der hervorragende Aertze... Berlin, Urban, 1932, v. 4: 636, and Poggendorff, *Op. cit.*, 2: 474–475, 1863. A particularly elusive reference to a funeral oration on Ploucquet by Münch (Rede nach der Beerdigung von Wilhelm Ploucquet . . . Tübingen, 1814) seems not to be present in any American library circularized by the Union Catalog of the Library of Congress.

[44] Literatura medica digesta, v. 1, p. III.

. . . he gives the arguments on both sides and explains why he has decided to re-issue the old interfiled with the new in one alphabetical listing. His arguments are self-evident: a fourteen volume set is expensive to purchase, the multiplication of alphabets slows down the user of the complete index, it is necessary to spend much space on repetitions in volumes published in a series, which space could be better employed for printing additional references. As a matter of fact, says Ploucquet, by printing the work in smaller type, by dividing the page into three columns, and by other printer's economies, it is possible to print the entire text of the original two series and the newly obtained 40,000 citations in four volumes, each smaller than the volumes in the original twelve volume set.

With the publication of the four volumes of the *Literatura...* Ploucquet was under no illusion that he had subdued the problem of keeping track of the medical literature;[45] and in 1813, just before his death, he issued one supplementary volume to the entire work. By this time, therefore, he saw and appreciated the wheel of expanding literature on which medical bibliographers were to be bound, for it is this serial nature of the attempts to control medical literature which is the sign of the bibliographers of the nineteenth and twentieth centuries.[46]

The various bibliographies published by Ploucquet are arranged by subject; indeed the entire work loses some of

[45] *Ibid.*, Introductio, XII.

[46] Thornton. *Op. cit.*, p. 163, says that all of Ploucquet's later volumes were issued as supplements to the first series published, the *Initia Bibliothecae* . . . This is an error, which an examination of the volumes themselves will uncover.

its usefulness by the fact that there is no author index. Preceding the main body of the work is a list of sources referred to with the abbreviations under which they are cited in the main body of the work. Not only are books, pamphlets, and dissertations recorded, but for the first time the great mass of journal articles is listed. In the Preface to the *Literatura...* Ploucquet discusses some of the problems with which he has had to deal. These include:

1. The tremendous growth of the literature. "The job would be simpler if the legacy were smaller, but the wealth of material overwhelms us, and we are blinded by too much light. . . To make matters worse, no day passes but someone throws another article upon this mountain of material. . . 'Our life is too short, and there are so many books; money is so scarce, and there is so little time.'"

2. It is impossible to tell the subject of a book or article from the title alone, and reading it takes time. "It is obviously insufficient to record only the titles. . . . Titles often promise more than they deliver, sometimes less, sometimes matter of which the title gives no inkling."

3. Many things important to medicine are found in non-medical works. "Valuable material. . . is often included in histories, travel diaries, and in various other genres, where it is least expected." Yet this expands the scope of the work enormously, and makes it more difficult to complete. "Many will say that priority should perhaps have been given to those who wrote about disease, since their work offers the most return for the least effort. . ."

4. Many of the writings indexed are worthless from a scientific point of view, yet they must be included. "A

compiler cannot afford to indulge in the arrogance of deciding what is beneath. . . notice. . . Besides, the profession's favor may change, and what has previously been condemned may later be approved. . . My object is after all not critical. It is the recording, as far as possible, of all that has been done, said, seen, observed by physicians and others, of all ages and nations—whether right or no."

5. It is impossible to see all the works to which references are made. "Many works. . . are known to me only by title, and although I have read many completely, judgment on those others could not be made." "It must be admitted that if I had at hand the originals of much of the material. . . or if I could have obtained the best editions, the work would have been the better for it. But it is doubtful that even the best of libraries could possess itself of such a treasure."

These are Ploucquet's problems. Since his time, perhaps only two new problems have come to plague the bibliographer. These are the problems of foreign languages, now that Latin has been discarded as a universal language, and the problem of difficult-to-obtain documents (whether the difficulty is due to restrictions caused by military secrecy or because of the confused state of the present day "out of trade" publications).

When the eighteenth century dawned, medical bibliography had solved the problems of the mechanics of its task. It had realized the importance of recording as exhaustive a collection of the literature as was possible, the value of the complete citation and the exact reference, and the utility of the varied approach to the literature (by author, by title, by subject, with cross references from

terms not used to terms that were used). Two problems which were to become the concern of the eighteenth and subsequent centuries were foreshadowed. These were the problem of coping with the enormous growth of the medical literature, and the rise of the periodical article.

Changes in the methods of teaching medicine in the eighteenth century led to the need of and demand for case histories. At the same time, the newly founded scientific periodicals were able to provide a means of gratifying that demand. The result was a large increase in the literature of medicine, and a heightening of the problems of medical bibliography.

By the end of the eighteenth century, medical bibliography had devised schemes which helped solve these problems partially. One form of the solution was the critical annotated bibliography, so successfully worked out by Haller; the other solution was the cyclical publication of indexes to the literature, each beginning where the last left off, as characterized by the work of Ploucquet. For the periodical article the method worked out for its indexing consisted essentially of treating each article as a separate entity. These solutions were taken over by the nineteenth and twentieth centuries, as will be shown in succeeding chapters.

Transitional Period

In the history of medical bibliography, the nineteenth century can conveniently be divided into two parts: the first fifty years when the great medical bibliographies were compiled in the tradition of the eighteenth and earlier centuries, and were, in general, the work of one man who

hoped thereby to subdue the literature of his field; and the second fifty years, which witnessed the introduction of group bibliographies produced by a bibliographic factory working to produce a company product. Such a change might be characterized, with some liberty of language, as the introduction of a part of the industrial revolution into bibliography. An example of the first type of list is Callisen's *Medicinisches Schriftsteller Lexicon*[47] while examples of the second type of list are the Royal Society of London's *Catalogue of Scientific Papers*[48] and the *Index-Catalogue*.[49] In this chapter we will discuss Callisen's work; in the next the bibliographies of the second part of the century.

Adolph Carl Peter Callisen

(1786–1866)

Comparatively little is known of the personal life of Callisen, who is usually overshadowed by the fame of his uncle, Heinrich Callisen, the leading Danish professor of surgery of his time. Adolph Callisen was born in Glückstadt, April 8, 1786, studied there and at Kiel, where he took his surgical examinations in 1808 and his doctor's degree in 1809. He then went to Copenhagen, where (under the patronage of his uncle) he obtained a commission as Reserve Officer with the Danish Army (1809–1812)

[47] Callisen, Adolph Carl Peter. Medicinisches Schriftsteller Lexicon der jetzt lebenden Aerzte, Wundärzte, Geburtshelfer, Apotheker, und Naturforscher aller gebildeten Völker. Copenhagen, Callisen, 1830–1845. 33v.

[48] Royal Society of London. Catalogue of Scientific Papers. 1800–1900. London, Royal Society, 1867–1925. 21v.

[49] *Op. cit.*

and was appointed Adjunct at the Kirurgisk Akademi (1813), later becoming Assistant Professor, Extraordinary Professor, and Full Professor. He was also Surgeon to the Frederiks Hospital (1810–1814); and finally in 1842–1843, when the surgical academy was united with the University of Copenhagen, he became professor of surgical pathology. Some time during this period, moreover, he spent three years travelling in Germany, Switzerland, Italy, France, and Holland.[50] After holding his professorship at the combined university for one year, Callisen retired to Holstein, from which place he prepared his great work for the printers. There he died at the age of eighty. Callisen appears to have been a quiet, reserved man, an anatomist and pathologist of note, but not much of a clinician.[51] His

[50] Fairly lengthy accounts of Callisen's life can be found in the following sources: Bricka, C. F. (In: Dansk biografisk Leksikon. Copenhagen, Schultz, 1889, v. 3: 339–341, and 1934, v. 4: 482–483); Erslew, Thomas Hansen. Almindeligt Forfatter-Lexikon for Kongeriget Danmark med til hørende Bilande, fra 1814 til 1840 . . . Copenhagen, Forlagsforeningens Forlag, 1843, v. 1: 274–275; Hospitalstid., 9: 52–53, 1866; Ugesk. for laeger, 3d rd, s. A., 22: 416, 1876 (Djørup), Norrie, G. Af Medicinsk Facultets Historie. Copenhagen, Munksgaard, 1939, v. 3: 61–62; and Norrie, G. Kirurgisk Akademis Historie. Copenhagen, Levin, 1920.

[51] ". . . hvis Interesse udelukkende optages af theoretisk boglig systen. Laegens praktiske Virksomhed yndede han ikke, og som Regimentskirurg, hvor han var nødt til at forestaaen Afdeling paa Garrisonhospitalet; indskaenked han sig til ved smaa Hastvaerksbesøg med Handsken paa at føle Pulsen paa enkelte Patienter medens, han overlod alt det øvrige til sine Underlaeger." C. F. Bricka. *Op. cit.* This story of his using gloves while taking the pulse of his soldier-patients is derived from the obituary in Hospitalstid., *Op. cit.*, but is obviously written by a contemporary of Callisen's who knew him and the situation in Copenhagen well.

great interest was theory as opposed to practice,[52] and although he never cared enough to master Danish and thus be able to speak to his patients directly, he did learn to read Greek, Hebrew, and Latin, as well as French and his native German, that he might study the theories of other writers.

As a lecturer, Callisen was poised, clear, somewhat slow and stiff, but interesting.[53] He talked in a mixture of German, Danish, and Latin; a mixture, which, because of the composition of his class—Germans and Danes educated in Denmark and abroad, and educated to several different levels—had become a kind of *lingua franca* of the University. Although he taught anatomy, practical surgery, bandaging, pathology, and venereal diseases at various times,[54] his great love was surgery, which he always expounded on a historical and theoretical basis. According to one contemporary[55] his great fault was his tendency to spin out theories to fine points without coming to any conclusion. This can be seen today in his commentaries on his uncle's great treatise, *Systema chirurgiae hodiernae*.[56] Callisen made so little impression upon either the medical or lay group in Copenhagen that the author of his obituary

[52] "Callisen var en meget belaest Teoretiker, men egnede sig ikke til praktisk kirurgisk Virksomhed." Erslew. *Op. cit.*, p. 275.

[53] Hospitalstid. *Op. cit.*, p. 52.

[54] ". . . dels som reservekirurg dels som adjunkt, over anatomi, praktisk kirurgi, bandagelaere, patologi og de veneriske sygdomme . . ." Gordon Norrie. Af Medicinsk Facultets Historie. *Op. cit.*, v. 3: 62.

[55] Hospitalstid. *Op. cit.*, p. 53.

[56] System der neueren Chirurgie zum Öffentlichen- und Privatgebrauche . . . aus dem Lateinischen übersetzt und mit Commentär, nebst vielen Zusätzen versehen von Adolph Carl Peter Callisen. Copenhagen, Beim, 1822–1824. 2v.

in *Hospitalstidende* begins with an apology for writing about this "half-forgotten teacher," continues with a remark about the unlikelihood of his ever having finished his "not very attractive work," the *Medicinisches Schriftsteller Lexicon*, and ends with a statement about the good character of the man, in spite of the puzzling life.[57]

The *Medicinisches Schriftsteller Lexicon* is an author list of books and journal articles written by the medical writers contemporary with Callisen (that is, from approximately 1750 to 1830). It is in thirty-three small duodecimo volumes, of which the first twenty-one volumes are lists of works of single authors published before 1830–1835. Two volumes, v. 22–23, contain publications of anonymous authors, listed by title of the work, and two volumes, v. 24–25, contain works of joint authors and collected works. The last eight volumes, v. 26–33, are made up of additions to the titles listed earlier and works of people who had died since 1830. Special lists, such as outstanding medical journals with abbreviations of titles, are also given.

For each author Callisen lists an identifying biographical note, frequently a place name (e.g., "Schierlitz, Friedrich August, zu Mücheln in Querfurther Kreise") or a distinguishing remark (e.g., "Schmid, Jacob (2). . . Wahrscheinlich Jam. Smith"), obituaries and portraits, then a chronological, numbered list of the writings, noting translations, new editions, variants and reviews of the work in the same and in other languages. All this wealth of information, unfortunately, is confusing to use because of

[57] Hospitalstid. *Op. cit.*, p. 53. "We appreciate him both as a teacher and a man of great learning, but with regard to freemasonry he will meet with no understanding. . . . In spite of this we have wanted to do what we could to honor his memory."

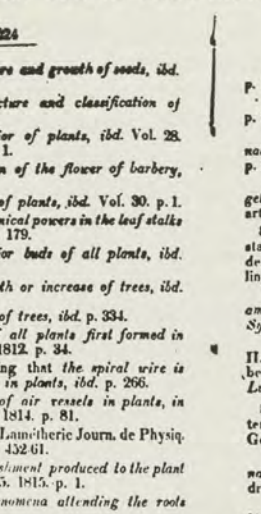
the poor typography in the first series. (See Figure 6.) The later series are easier to use, for they contain bold face type, large numerals, running heads, and clear print. Only one caution must be noted in the use of Callisen's information. Because he came from a milieu where doctoral dissertations were always printed, he assumed that all the theses listed in the commencement programs of American medical schools had also been printed. Occasionally, therefore, he sets up a bibliographic "ghost."

For the most part, however, Callisen's bibliography is a mine of very useful information. As Dr. Viets has pointed out, "Ploucquet and Callisen, one a subject and the other an author index-catalogue, supplemented one another until the whole, and much more, was packed into the *Index-Catalogue* by Billings."[58]

Callisen's work contains information almost impossible to locate elsewhere; yet it fell short of the needs of its time, and can only be of antiquarian and historical aid today. This is true because it is only an author list and because it made no provision for continuance after the original compiler had died.

Medical literature is used in two ways. Physicians and other scientists working in the field of medicine go to the literature in order to learn what other people have thought and done in situations similar to the one in which they find themselves at the moment. On the other hand, an occasional scientist searches the literature of medicine to see what an individual or group of men has contributed to the body of scientific knowledge, but this use of medical litera-

[58] Viets. *Op. cit.*, p. 115.



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2672. On *the structure and growth of seeds, ibd.* Vol. 27. 1810. p. 1.

2673. On *the structure and classification of seeds, ibd.* p. 174.

2674. On *the interior of plants, ibd.* Vol. 28. 1811. p. 254, Vol. 29. p. 1.

2675. On *the motion of the flower of barbery, ibd.* p. 213, p. 295.

2676. On *the hairs of plants, ibd.* Vol. 30. p. 1.

2677. Of *the mechanical powers in the leaf stalks of various plants, ibd.* p. 179.

2678. On *the interior buds of all plants, ibd.* Vol. 38. p. 1.

2679. On *the growth or increase of trees, ibd.* p. 16.

2680. On *the roots of trees, ibd.* p. 334.

2681. *The seeds of all plants first formed in the roots, ibd.* Vol. 36. 1812. p. 34.

2682. Letter, shewing that *the spiral wire is the cause of all motions in plants, ibd.* p. 266.

2683*. On *the use of air vessels in plants, in Philos. Magaz.* Vol. 43. 1814. p. 81.

2683*. *Französisch:* Laméthérie Journ. de Physiq. T. 35. (T. 78). 1814. p. 452-61.

2684. On *the nourishment produced to the plant by its leaves, ibd.* Vol. 45. 1815. p. 1.

2685. On *the phaenomena attending the roots of plants, ibd.* p. 177.

2686. A paper, proving that *the embryo of the seeds are formed in the root alone, ibd.* p. 183.

2687. On *the phaenomena of vegetation, ibd.* p. 321.

2688. Experiments, introductory to an attempt to exhibit the *comparative anatomy of animals and vegetables, ibd.* Vol. 46. 1815. p. 46. p. 81.

2689. *On the anatomy of vegetables*, intended to substitute many *important truths in phytology. ibd.* Vol. 48. 1816. p. 96.

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2690. *On the physiology of vegetables, ibd.* p. 173, p. 401, Vol. 49. 1817. p. 125, Vol. 50. p. 341.

2691. A *new view of vegetable life, ibd.* Vol. 48. p. 278.

2692. On the *death of plants, in Thomson Annals of Philos.* Vol. 11. 1818. No. 64. Apr. art. 2. p. 252-62.

2693. On *actions of lime upon animal and vegetable substances, ibd.* Vol. 14. 1819. No. 80. Aug. art. 7. p. 125-29.

847. Iberer (Franz Anton), zu Wiener-Neustadt, Med. Dr., Arzt und Geburtshelfer. Mitglied der medic. Facultät zu Wien; practicirte 1800 zu Mödling unweit Wien.

2694. Geschichte eines *Typhus puerperalis cum amentia, in Carl Werner Apologie des Brown'schen Systems* Bd. 2. 1800. art. 13. S. 191-206.

2695. *Entbindungsgeschichte* der Frau Magdalena H. in B—dorf; eingesandt und *mit einem Urtheile* begleitet *von* Professor *Borr*, zu Wien. *in Siebold Lucina* Bd. 2. St. 2. 1805. art. 6. S. 81-91.

848. Iberti (Don Jose), zu Madrid? pensionirter Arzt Sr. kathol. Majestät, Mitglied vieler gel. Gesellschaften; er reisete 1793 auf Kgl. Kosten

2696. *Metodo artificial da criar a los recien naridos y darles una buena educacion fisica.* Madrid, 1790. 8. 2 Bde.

2697. *Plan d'étude de la médecine*, proposé à l'Université *de Louvain.* Louvain, chez Michel 1793. 8. 45 S. nebst 1 Kpfr.

Rec. Medic. chir. Zeit. 1795. Bd. 4. No. 81. S. 96.

849. Ibrelisle (Joseph Maximilian), zu... Med. Dr. Argent. 1810.

2698. Diss. inaug. *du froid* et de son action *sur l'économie animale*; le 11 Septbr. Strabourg. 1810. 4.

850. Ideler (August Ferdinand), zu... Med. et Chir. Dr. Berol. 1823. Er ist geb. zu De-

Fig. 6. Callisen, Adolph Carl Peter. Medicinisches Schriftsteller Lexicon. 1830–1845.

ture is extremely small as compared with the other use.[59] Generally speaking, in medicine, the subject and not the

[59] See unpublished interviews on the use of medical literature gathered by the Army Medical Library's Research Project at Welch Medical Library, Johns Hopkins University and also see Royal Society's Scientific Information Conference. Reports and Papers Submitted. London, Royal Society, 1948, p. 589–610, and unpublished paper on

person who propounded the theory is of supreme importance. This is, of course, even more true in the case of the physical sciences than in the medical sciences, for in the former there is less impact of the observer on the facts than there is in the latter. Wherever objective judgment is the goal, the fact is important and the observer of secondary importance; where the fact changes, or appears to change, because of the presence of a particular observer, then the person who observes the facts takes on added significance. The purely subjective fields of art, music, and literature thus belong to the category of observer-important fields, while mathematics, physics, and geology belong to the category of object-important fields. Medicine lies between the two groups, but is much closer to the latter than to the former.

This does not imply, of course, the unimportance of the observer in science. First of all, the scientist must be able to observe the facts as they are. For example, a color-blind person describing the spread of gangrene through a limb would not be able to report the same facts as would a person who is not color-blind. Second, the observer must be able to record his information so that some one else can find it and perhaps reproduce it. Crawford Long, for example, probably observed accurately enough the effect of etherization on his surgical patients, but, because he did not record it for some time after anesthesia had already been discovered by others, his observations came to nothing. Third, the observer must be honest in his recording of

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the information gathering habits of scientists by Saul Herner, read at Symposium at Welch Medical Library March 3, 1953.

facts. A scientist who listed all the facts which supported his theory, but none of the ones which refuted it, would hardly be worth studying. It is not necessary that the observer of the facts draw the correct conclusions from his facts, unless his conclusions are to be used; indeed, science is full of instances where the facts were accurately collected and described although the conclusions drawn from them were untrue. This may be because of the lack of intermediary information (as, for example, the lack of knowledge of the transmission of plague by *Pasteurella pestis*, at the same time that excellent clinical descriptions of the disease were being written), or because the phenomenon observed had little or no bearing on the central question (for example, the compilation of information on comets in a discourse on causes of the plague).[60]

For all these reasons, the author of a scientific work is important. But he is important more as a check on the reliability of his data than on the data themselves. For that reason, the first use of scientific literature—and therefore indexes to it—is by the subject, not the person.

This is precisely where Callisen's work falls down, for he gives no approach to the subject matter in his great work, which can, therefore, be used only to determine the writings of a particular author. Since this approach is a biographical or historical one, it is clear that Callisen's work is more valuable to his successors, to us today, than it was to his contemporaries, who found the work of Ploucquet, although older, better. It is, perhaps, the reason

[60] See, for example, Thucydides' discussion in his work on the Peloponnesian War. Bk. 2, Chap. 7, Plague in Athens.

for the remark of the writer of Callisen's obituary about the unattractiveness of the work; and it also explains in part why copies of Ploucquet are more difficult to find today than copies of Callisen and more expensive to purchase when found.

We might well ask ourselves, therefore, why it was that Callisen decided to bring out an author, instead of a subject list. There seem to be no records on the matter extant, but some conclusions can be drawn from the personality of the man himself, as recorded by his contemporaries.

In all the biographical sketches we are told that Callisen was more of a theorist and more of a literary physician than either a clinician or an experimenter. His erudition is praised highly, especially his knowledge of the writers of earlier centuries.[61] As an antiquarian himself, as a person who looked up to the classical writers, it is probable that Callisen's first interest was to learn who had said something; it was only his secondary interest to learn what was said. Callisen was thus the Miniver Cheevy of his time, and was just as remote from the interests of his colleagues as was that misplaced medievalist; as a result his great work was of comparatively little help in solving the problems of medical bibliography of his day.

[61] Hospitalstid. *Op. cit.*; Erslew, *Op. cit.*; Norrie. Af Medicinsk Facultets Historie, *Op. cit.*

Joseph Henry

CHAPTER IV

Development of Cooperative Bibliography

WITH Callisen the age of the great one-man bibliography of medicine may be said to have come to an end. After his time the bibliographies which embraced all of medicine and covered any large-scale span of time were compiled by groups of workers toiling under the general editorship of an executive, using the books and journals owned by some institution, and published as a group project. This I have characterized as the industrial revolution in bibliography, and I propose to discuss this theory in more detail in the following pages. Because it is not the purpose of this work to go into the problems of the industrial revolution as an economic force in other fields or even to discuss when the industrial revolution occurred, no attempt will be made to cite more than the most obvious literature, which is used merely as background for the discussion.

The industrial revolution can be characterized by the change from the hand work and home system of the production of goods to the machine system and the factory production of these same goods.[1] The industrial revolution

[1] "Machinery was substituted for hand tools . . . A second result was the destruction of the domestic system of house work . . . and the substitution therefor of the factory system." E. L. Bogart. Industrial Revolution,

not only saw the substitution of the factory for home work and the machine for the hand tool, but it also brought about a need for greater capital. As a result of the introduction of factory methods, standardized parts were produced in place of the variable ones obtained by other methods, total productivity increased, greater means of communication and transportation were devised, and a class of worker formed which did not own what it had produced. In the case of medical bibliographies, we can see some of this occurring in the publication of the *Index-Catalogue* and, to a lesser degree, in the *Catalogue of Scientific Papers* of the Royal Society. In each case the bibliographies were prepared by paid workers who worked together in a single institution (here a library rather than a factory), who did not own the raw materials or the tools with which they worked (the books and journals, the cards, reference works, paper, ink, typewriters, etc.), who received from someone else (John Shaw Billings or the Committee of the Royal Society) the orders on how to work for turning out a standardized product, who produced more than other single groups because of the division of labor, who did not own the results of their labors (the *Index-Catalogue* or the *Catalogue of Scientific Papers*), and who depended upon the increased means of transportation to make their work available to a large

(In: Encyclopedia Americana, 1925, v. 15: 96–98.) See also Karl Marx's own words on this: "A great number of labourers working together at the same time in one place (or, if you will, in the same field of labour), in order to produce the same sort of commodity, constitutes both historically and logically the starting point of capitalist production." Karl Marx. Capital. N. Y., Modern Library [c1952] p. 63.

audience. In this case, perhaps it was the use of interlibrary loans. This certainly was true in the case of Billings, who devised the system of interlibrary loans especially to supplement the usefulness of his catalog, as will be shown later. And because these workers, except for the top executives and scientists, did not do any of the planning of their work, they were like the other laborers in the industrial revolution in that they were deprived of the "intellectual potencies" of their work. The one thing lacking was the substitution of the machine for the hand work of previous bibliographers. Not even today has a machine been devised into which published literature can be fed, to be processed automatically and reappear as a bibliography; though, as will be shown in the next chapter, machines have been devised which can do automatically some of the non-intellectual portions of bibliographic work.

Royal Society Catalogue of Scientific Papers

The first suggestion that a group undertake an index to the scientific literature appears to have been made by Joseph Henry, the first secretary of the Smithsonian Institution in Washington, and a theoretical physicist of considerable note.

Joseph Henry was born in 1797 in Albany, New York, of poor parents and was educated in Galway, New York, and at the Albany Academy, for entrance to which place he studied privately while teaching school, tutoring, and doing odd jobs. After graduation from the Academy, Henry acted as surveyor for a while and began to study privately to fit himself to enter medical school. He was

permanently shifted from this pursuit, however, by his appointment as professor of mathematics and natural philosophy at the Albany Academy in 1826, a post he held until 1832 when he was appointed to a similar position at the College of New Jersey, Princeton. During this period Henry did some of his finest work on electromagnets, both for motors and for telegraphy; indeed, in recognition of his work, the unit of conduction has been named the Henry. Later, in Princeton, after a few years of scientific inactivity devoted entirely to teaching and the preparation for teaching, Henry began experimenting in the fields of solar radiation and capillarity of liquids, at the same time continuing with his work on electromagnetism.

When the Smithsonian Institution was founded in Washington, Henry was unanimously chosen by its regents to be its first secretary. He took on this job reluctantly, but with a sense that duty to his country required it, feeling (as was later proved to be correct) that his administrative duties would occupy so much of his time he would not be able to continue his scientific work. Moreover, because of the vagueness of the terms of Smithson's will, the direction which the Smithsonian Institution should take was difficult to determine, and it is undoubtedly true that Joseph Henry's concept of Smithson's intentions molded the Institution in its formative years and determined many of its present policies.

In addition to his work as the operating official of the new foundation, Henry was also one of the organizers of the American Association for the Advancement of Science and its president in 1849; founder of the Philosophic Society of Washington, of which he was president from

1871 to his death in 1878; and head of the National Academy of Sciences from 1868 to 1878. In several of these groups he had John Shaw Billings as one of his assistants, and it is interesting to speculate on the effect each might have had on the other. Unfortunately no published material known to this writer contains any mention of the relationship of the two men.[2]

As a practical scientist, Henry appears to have felt the need to know what had appeared previously in the literature of his field. This may have been due, in part, to his anticipation of much of Faraday's work on the electromagnet; but whatever the reason, Henry attempted to interest the regents of the Smithsonian in doing something about the matter.[3] In this report Henry sets forth his reasons for desiring an index to the scientific literature:

> It is estimated that about twenty thousand volumes; including pamphlets, purporting to be additions to the sum of human knowledge, are published annually; and unless this mass be

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[2] There have been many biographies of Joseph Henry published. Of these the best long ones are: Crowther, James Gerald. Famous American Men of Science. N. Y., Norton [c1937]; Coulson, Thomas. Joseph Henry, His Life and Work. Princeton, Princeton University Press, 1950; and Taylor, William B. Scientific Work of Joseph Henry. Wash., Govt. Print. Off., 1880. The best short work on Henry is probably the article by William F. Magie (In: Dictionary of American Biography. N. Y., Scribner, 1932, v. 8: 550–553).

[3] See especially the Annual report of the Smithsonian for 1851. Generous quotations from this report are found in Katherine G. Murra's article, History of Some Attempts to Organize Bibliography Internationally. (In: Shera, J. H. and Egan, M. E., eds. Bibliographic Organization . . . Chicago, University of Chicago Press [c1951] p. 25–53).

> properly arranged, and the means furnished by which its contents may be ascertained, literature and science will be overwhelmed by their own unwieldy bulk. . . . One of the most important means of facilitating the use of libraries, particularly with reference to science, is well-digested indexes of subjects, not merely referring to volumes or books, but to memoirs, papers, and parts of scientific transactions and systematic works.[4]

It was soon apparent, however, that the regents of the Smithsonian would not be willing to underwrite so large a task.[5] In 1855, therefore, Henry proposed to the British Association for the Advancement of Science, meeting in Glasgow, that the various national scientific institutions agree to index the literature of their own countries, with some one group—presumably the British Association—arranging for its publication.[6]

The committee of the British Association to which the project was referred reported favorably on the suggestion, though it proposed some minor changes in the plan, mostly in the direction of greater inclusiveness both as to

[4] Annual Report of the Smithsonian Institution for 1851, p. 22.

[5] ". . . the hopelessness of attempting a work . . . which would require the united labors of a large corps of well-trained and educated assistants for many years, and the subsequent devotion of the whole available income for many years following, to complete its publication, was fully realized . . . and in 1854, Henry conceived the plan of taking up the more limited department of *American* scientific bibliography and by the persevering application of a fixed portion of the income annually for a succession of years, of finally producing a thorough subject-matter index, as well as an index of authors for the entire range of American contributions to science from their earliest date." William B. Taylor. *Op. cit.*, p. 296.

[6] Royal Society of London. Catalogue of Scientific Papers. *Op. cit.*, v. 1, Preface: [3].

subjects listed and forms of publications included. During the next year (1857), the Royal Society became interested in the project and offered its cooperation to the British Association, whereupon a joint committee was appointed to go into the matter more thoroughly, especially as to costs.[7] This joint committee presented its preliminary report in June, 1857, recommending that the index omit monographic works entirely, confine itself to serials exclusively, and that both an author list and a subject index be prepared.

In spite of the favorable report of the joint committee, little or no action was taken on the matter for some months, so that finally the Royal Society decided to act independently. In 1858, therefore, after further study, the Royal Society made the decision to prepare a catalog of the natural sciences for its own use.[8]

This catalog was prepared under the direction of the Library Committee of the Royal Society, which arranged that four copies of the reference to each article be made; one remained in the Royal Society Library as a serials record and the other three were reserved for possible publication, should funds be provided for that purpose by the government. These three were to provide for an author list, a subject list, and a reserve set. By 1864, sixty-two manuscript volumes had been compiled, totalling

[7] *Ibid.*, p. iv.

[8] It should be stressed here that no thought of publication by the Royal Society was present at this time. "In resolving on this undertaking the Council did not propose to task the Society with more than the preparation of a Manuscript Catalogue for use in their own library . . ." *Ibid.*, p. v.

184,000 titles from approximately 1400 serials, and representing the years from 1800 to 1863. The total cost to the Society to reach this point had been about 1400 pounds, and the contemplated cost of preparing a subject index was 400 pounds more.[9] With the aid of a government subsidy the entire index was printed in six large quarto volumes; but because of financial difficulties, the Franco-Prussian War, and other impediments, the subject index was slow in being compiled. In the meantime other periodical articles continued to come off the presses, and a second cycle of author entries was prepared and printed, again with governmental aid. A decennial index for 1864–1873 appeared, then one for 1874–1883, and much later indexes to finish the nineteenth century. During all this period costs continued to rise, and therefore governmental subsidies grew to be more necessary, until finally neither the government nor the Society could undertake the work. The clamor for the subject indexes also continued, and eventually it was possible to prepare and distribute four volumes of indexes to the mathematical and physics articles contained in the *Catalogue*.

Make-up of the Royal Society Catalogue

As described above, the Royal Society *Catalogue* is an author list, in four series, of the articles published from 1800–1899 in the transactions of the learned societies and in the scholarly journals.[10] As had every bibliographer

[9] Royal Society of London. Proceedings, 1866, p. 271, quoted in Murra. *Op. cit.*, p. 30.

[10] "The . . . Catalogue is intended to contain the Title of every Scientific Memoir which appears in the various Transactions and Pro-

before them, the Library Committee found it necessary to make some exceptions to their all-inclusive rule, and then to make some exceptions to their exceptions:

> As the Transactions of many learned Societies contain both scientific and non-scientific matter, it was necessary to make a selection, and to exclude such papers as were merely literary, technical, or professional; and a similar course has been pursued with regard to Scientific Journals. It has not always been possible, or even advisable, to adhere strictly to this rule, which has been construed so as to admit rather than exclude any matter as to which there might be any doubt. Thus many Medical and Surgical Papers have been included on account of their containing Anatomical or Physiological matter.[11]

For each author there was given a list of all his articles in the titles indexed by the group, arranged chronologically in two arrays, first for those titles in which the man was the sole author and second for those in which he was joint author. The usual problems arose as to anonymous works, pseudonymous works, works of individuals who had changed their names, names in different languages, and the like. We can also detect a note of weariness in the statement in the Introduction that no pains have been spared to assign the right works to the right authors, but in spite of it the Committee is sure there are many errors.

The overwhelming majority of the articles were seen by the compilers for the Royal Society, using the facilities

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ceedings of Scientific Societies, and in the Scientific Journals published in the time that it comprehends; with the Reference, the Date, the Author's name, and the number of pages in the Memoir." Royal Society Catalogue. *Op. cit.*, Introduction, p. vii.

[11] *Ibid.*

of that library, the British Museum Library, libraries of special subjects in London and neighboring cities (for example, in medicine, the libraries of the Royal Medical and Chirurgical Society and the Royal College of Surgeons), and some university libraries. Where the articles were not actually seen by the compilers, this was noted by an asterisk or an obelus.[12] Throughout the four series of the *Catalogue*, foreign titles were given in the original language, except in the case of the Russian, Polish, and Hungarian, which were presented in translations in square brackets after the printing of enough of the original title to identify the work. A list of the 1400 periodicals indexed preceded the entire *Catalogue*, and individuals who possessed items marked as gaps in this list were requested to forward them to the Royal Society for inclusion in subsequent series.

The Subject Index for the greatest portion of the *Catalogue* never appeared, it is true; but plans were made for its compilation and publication, and it is instructive to examine them. The Subject Index was to be prepared after the compilation of the author list, and thus from the titles only, since any other system would have required a second handling of the pieces. What was proposed was "an alphabetical Index of the subjects of the Papers so far as they appear in the titles."[13] This method of preparing a subject index was being debated all the way down to 1897.[14] Richard Garnett, Keeper of Printed Books at the British Museum, in 1897 read a paper on the problem

[12] *Ibid.*

[13] *Ibid.*, p. vi.

[14] See also the discussion on Ploucquet in a previous chapter.

at a meeting of the Library Association, and he subsequently printed the paper in *Nature*, October 9, 1897, and in his *Essays in Librarianship and Bibliography*.[15] In this speech, entitled "Subject-Indexes to Transactions of Learned Societies," but which is almost entirely devoted to the *Catalogue* of the Royal Society, Garnett holds that the difficulty of making subject indexes to scientific periodicals has been greatly exaggerated.

> I hope to point out, however, that so far as concerns the scientific papers . . . the difficulty has been over-estimated. . . As regards scientific papers, it appears to me that the only considerable impediment is the financial. . .[16]

According to Garnett, all that needed to be done was to transfer the entries from the *Catalogue* onto cards which would provide each entry "in a movable form instead of an immovable." Then some person need only write on the card the broad scientific division to which the title refers—say astronomy or geology or medicine—and file the card in a box or tray containing only that subject. A second subdivision would be necessary in most cases, but Garnett felt that the Royal Society could easily provide enough scientific men as volunteers so that each could be given his specialty to subdivide further. The technique of the second "cut" would be exactly the same as the first, and as many subdivisions as are necessary could be made. Of course, said Garnett,

> Some preliminary concert among the scientific editors would, no doubt, be necessary, and finally revision in conformity wth settled rules.

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[15] London, Allen, 1899, p. 225–233.

[16] *Ibid.*, p. 226.

CHART I

Growth of Periodicals
1800–1908

Date	Number of periodicals	Number added since previous record
1800	910	
1826	3,179	2,269
1866	14,240	11,061
1872	20,882	6,642
1880	25,901	5,019
1882	35,296	9,395
1901	59,057	23,761
1904	67,319	8,262
1908	71,248	3,929

But these are minor matters to Garnett, who was sure that they could be handled with little difficulty. It would be interesting to know why the Royal Society rejected these naive suggestions, but a search in *Nature* for 1898 does not bring any reply to Garnett's proposal.

The Royal Society *Catalogue* failed to continue into the twentieth century on its original plan and failed to publish subject indexes to the nineteenth century lists primarily because of the costs involved. One of the main costs, of course, was due to the increase in the periodical literature.[17] Chart I shows an exponential increase of over 1000 per cent in fifty-six years or 348 per cent in forty years. Both the chart and the logarithmic curve (Chart II) show that

[17] According to Iwinski (see p. 74) the total number of all periodicals published jumped from 910 in 1800 to 3179 in 1826 to 14,240 in 1866, to 20,882 in 1872, to 25,901 in 1880 to 35,296 in 1882, to 59,057 in 1901. (See Charts I and II.)

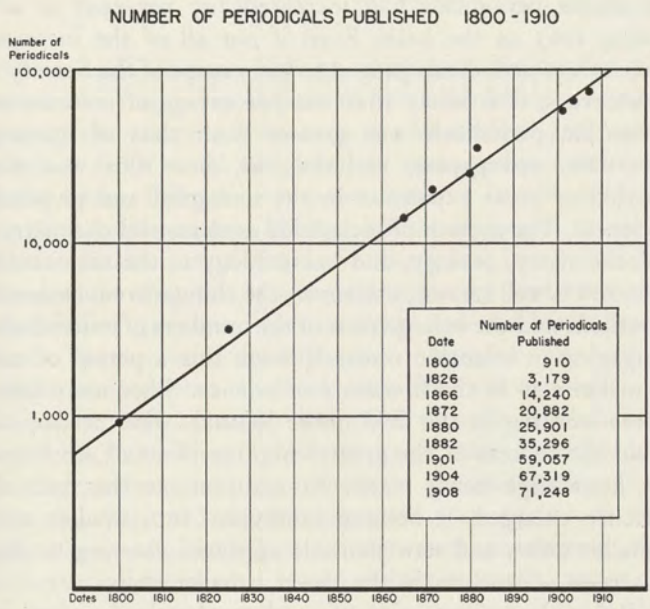

CHART II

the number of periodicals increased by a power of the original number, instead of by a simple arithmetical or geometric progression. Thus, if *a* number of journals were published in 1800, a^n journals were published in 1860, and a^{n2} journals were published by the next period of time (1920). Such an enormous increase in the literature would naturally bring large problems in its wake. Between the 1860's, when the first series of the *Catalogue* was being prepared, and 1883, the date of the third series, the number of

available periodicals had increased 147 per cent or a^{n^3} using 1863 as the base. Even if not all of the increase represents periodicals judged to be in scope of the Society's endeavors, it is likely that the percentage of increase of scientific periodicals was greater than that of literary journals, newspapers, and the like, since this was the period of great expansion in the biological and physical sciences. The growth of such fields as industrial chemistry, biochemistry, geology, and bacteriology in the nineteenth century is well known; moreover, the change in educational methods and the enlargement of the numbers of individuals engaging in scientific research made this a period of expansion also in the literature of science. Since more men were working in the field, more journals were needed to hold the reports of the greater number of small advances in knowledge being made. In addition, as the field of science enlarged, it became subdivided into smaller and smaller units, and new journals appeared catering to the interests of workers in the newer, smaller units.

But a larger quantity of work to be done, when it reaches a certain point, brings with it a need for a qualitative change as well. The Royal Society was groping toward this way, in its indexing of a field by a group of relatively low-skilled workers working together in one place under the direction of a committee which used the resultant index for its own devices. As an interim step to the full program, worked out by Billings, it has significance. It showed the direction in which the new indexing must go, and by its very failure to achieve its goals, it made evident some procedures which needed to be followed.

John Shaw Billings
(1838–1913)

The man who was able to work out the method by which the staggering amount of literature being produced during the nineteenth century in the medical and paramedical fields could be placed in manageable units was John Shaw Billings. By many workers in the field of medical bibliography, Billings has been judged entirely by his production of the *Index-Catalogue*; but it will be shown here that this is a one-sided picture and that the *Index-Catalogue*, the *Index medicus*, and the Interlibrary Loan System were, in Billings' concept, all parts of a single, unified plan. In brief, this plan was to provide a conspectus of the earlier literature through monumental catalogs and bibliographies, to keep these catalogs and bibliographies up to date through the publication of a monthly list, and to provide some way by which the physician, who had located the work containing the information he needed, could obtain it easily, expeditiously, and inexpensively. For this purpose Billings devised 1) the *Index-Catalogue* as the monumental work and arranged it partly by authors as well as by subjects; 2) the *Index medicus*, which he thought of as the quickly appearing work which would bring the *Index-Catalogue* up to date and which was to be arranged primarily by subjects; and 3) the system of personal and interlibrary loans, now so widespread in the United States. So long as both of the published indexes were prepared at the Surgeon-General's Office Library, this system worked out well; when the conditions changed so that the *Index*

medicus ceased to be prepared at the same place as the *Index-Catalogue*, the entire system began to break down. Since that time, no really unified plan has been presented to the world, and attempts at tinkering with the older method have been disappointing on the whole.

John Shaw Billings was born in Indiana, April 12, 1838 of poor parents. He studied at local schools and prepared himself for college by reading with a local clergyman. In spite of severe financial difficulties, he managed to receive his A.B. from Miami University at Oxford, Ohio, in 1857, and his medical degree from the Medical College of Ohio in 1860. An account of some of this life was published by Billings many years after the event, and gives us a picture of his living on eggs and milk for long periods of time in order to remain within the financial limit of 75 cents a week.[18] After his graduation from medical school, Billings was appointed demonstrator of anatomy, but when the Civil War broke out, he decided to enter the regular army. He therefore took the examinations for the army in 1861, passing at the top of the list. As a result he soon received his commission and saw field service. Later, orders were issued putting him in charge of a hospital near Washington. He did so well in this post that he was soon named Executive Officer of an army hospital near Philadelphia caring for thousands of sick and wounded. His administration of this hospital was characterized by the same efficiency and lack of fuss that he was to show in all the jobs he undertook to do.

[18] Billings, John Shaw. How Tom Kept Bachelor's Hall. Youth's Companion, Nov. 10, 1892, p. 598–599.

Soon after this, when the Surgeon-General wished to appoint an inspector of army hospitals maintained by the Army of the Potomac, Billings was chosen for the task. In this position he took part in many of the battles of 1864 and 1865, finally, in the summer of the latter year, being invalided back to Washington, where he was assigned to the Office of the Surgeon-General. Here he remained until 1895 when he retired from the Army.

During the first few years of Billings' appointment to the Surgeon-General's staff, he was busied with accounts pertaining to volunteer surgeons, veterans' affairs, and the like. Later he began to do research in fungi and unicellular organisms, and this interest in microscopy continued throughout his life. He also continued with work on statistical methods of studying diseases, and made several important reports, with suggestions on the collection of statistics, of various military medical matters. One of these, on sanitation in army barracks and hospitals, foreshadowed his later interest in the erection of efficient and healthful hospital buildings. Billings was actively engaged in planning for the tenth and eleventh censuses of the United States (1880–1890), in the course of which he proposed to Mr. Hollerith, of the Bureau of the Census, the punching of coded cards and the sorting of them electrically, which the latter took up and developed for census data and for other uses.[19] (In connection with this, it would be interesting to determine if Billings ever con-

[19] Pearl, Raymond. Some Notes on Contribution of Dr. John Shaw Billings to Development of Vital Statistics. Bull. Inst. Hist. Med., 6: 387–393, 1938.

sidered the use of these punched cards for coding bibliographic data, and if he did, why he decided against the scheme.)

While attached to the Office of the Surgeon-General, Billings was detailed to the Marine Hospital Service (now the Public Health Service) to make a survey of the hospitals maintained by that section of the government. His recommendations on this subject, as well as on the sanitary conditions in Memphis, where he made a survey during the cholera epidemic of 1879, were gladly accepted by the administering bodies and were immediately put into effect. In 1875, moreover, with the approval of the Surgeon-General, Billings presented plans for the erection of the Johns Hopkins Hospital; these plans were adjudged the best of all the ones submitted, and he was put in charge of translating them into actuality. He was also instrumental in having Sir William Osler and Dr. William H. Welch appointed to the faculty of the new Johns Hopkins Medical School. His minor successes would make a respectable list in themselves—he was Vice-President of the short-lived National Board of Health, President of the American Public Health Association, President of the American Library Association, on the Board of Directors and Vice-President of the Carnegie Institution, on the governing body of the National Academy of Sciences, and in many other organizations.

After retirement from the Army in 1895, Billings became Director of the University of Pennsylvania's University Hospital, and within a year, Director of the New York Public Library, in which position he died on March

11, 1913, of complications following an operation for cancer of the lip.

All the biographers of Billings who knew him personally speak of his coldness, his imperiousness, and his impatience with those who quibbled over details. Yet all of them—Garrison, Lydenberg, Wilcox—come away with an admiration, even a love for the man. As Wilcox puts it:[20]

> Billings was high-spirited and imperious in temper, and in later years the recurrent physical pain of which he never spoke added at times an edge to his words. His absorption in matters of large moment interfered with his enduring fools gladly; his army training developed an innate self-reliance and domination which to some were repellent; his achievements were not such as to split the ears of the groundlings; and his humor, at times somewhat grim, was not always understood by little men.

Garrison, for example, reports that he visited Billings' home only once in the many years during which the two worked together.[21] Yet, Lydenberg, who worked with Billings daily in his later years spoke of him as "the essence of all that was lovable in the man, engagingly affectionate, fatherly, brotherly, even sweet, if such a word can be applied to a man so emphatically virile and masculine."[22] It was this impression which Billings left

[20] Wilcox, W. F. [John Shaw Billings] (In: Dictionary of American Biography. N. Y., Scribner, 1929, v. 2: 269.)

[21] Johns Hopkins Historical Club. Special Meeting in Honor of John Shaw Billings. Bull. Johns Hopkins Hosp., 25: 244–253, 1914, especially p. 248.

[22] Lydenberg, Harry Miller. John Shaw Billings, Creator of the National Medical Library and Its Catalogue; First Director of the New York Public Library. Chicago, American Library Association, 1924, p. 78.

with the men who extolled him at the memorial meetings held in his honor at the New York Public Library, the Johns Hopkins Hospital, and the National Academy of Sciences. Librarians often take exception to Billings' obvious scorn for them as bibliographical workers (see, for example, his speech at the American Library Association meeting in 1878[23]), but it should be pointed out that Billings was talking before the specialty of medical librarianship had been instituted; indeed, before any professional librarianship with its emphasis on bibliographic knowledge had become firmly established. Certainly the impression Billings made on the people he wished to please—the physician, the large man of business, the young, impressionable disciple working under him, and the servant who would carry out his orders unquestioningly—was very great. Nothing about his personality, however, can detract from his credit in working out the scheme for making a large proportion of the medical literature published up to his time available to all.

We have shown in the case of Haller and Ploucquet what were the forces compelling them to prepare their bibliographies. Haller was interested in sparing others the great task of winnowing the grain from the enormous mountain of chaff in medical literature, a task which he had been obliged to do for himself. Ploucquet started out to make for his own use an index of the few facts he thought he would especially need to have handy. When this index had reached large proportions, he decided to share it with the workers who would be coming after him, and thus

[23] Billings, John Shaw. National Catalogue of Medical Literature. Lib. J., 3: 107–108, 1878.

save them the necessity of retracing his steps. Joseph Henry, on the other hand, was interested in indexes to the literature because he was unable to find what he wished to know in the publications then descending upon the scientific world. In the case of John Shaw Billings, a combination of the feelings of Henry on the one hand and Haller and Ploucquet on the other appears to have motivated him. As he himself noted:

> In [my graduating] thesis . . . it was desirable to give the statistics of the results obtained from certain surgical operations as applied to the treatment of epilepsy. To find these data in their original and authentic form required the consulting of many books, and to get at these books I not only ransacked all the libraries, public and private, to which I could get access in Cincinnati, but for those volumes not found there (and these were the greater portion), search was made in Philadelphia, New York, and elsewhere, to ascertain if they were in any accessible libraries in this country.
>
> After about six months of this sort of work and correspondence I became convinced of three things. The first was, that it involves a great deal of time and labour to search through a thousand volumes of medical books and journals for items on a particular subject, and that the indexes of such books and journals cannot always be relied on as a guide to their contents. The second was, that there are in existence somewhere, over 100,000 volumes of such medical books and journals, not counting pamphlets and reprints.[24] And the third was, that while

[24] Iwinski [*op. cit.*] gives a total of 3,444,586 volumes on all subjects printed to 1828 and 7,299,807 volumes printed to 1887. If 5 per cent of these were medical, about 175,000 volumes of medicine were printed before 1828 and about 365,000 volumes before 1887. To this figure must be added the periodicals published—25,901 in 1880. Five per cent of this figure is 1,280 volumes. Even though, relatively speaking, Billings was very wrong in his estimate of the size of the medical litera-

> there was nowhere in the world, a library which contained all medical literature, there was not in the United States any fairly good library, one in which the student might hope to find a large part of the literature relating to any medical subject, and that if one wished to do good bibliographical work to verify the references given by European medical writers, or to make reasonably sure that one had before him all that had been done or seen by previous observers or experimenters on a given subject, he must go to Europe and visit, not merely one, but several of the great capital cities in order to accomplish his desire.
>
> It was this experience which led me when a favourable opportunity offered at the close of the war, to try to establish, for the use of American physicians, a fairly complete medical library, and in connection with this to prepare a comprehensive catalogue and index which should spare medical teachers and writers the drudgery of consulting ten thousand or more different indexes, or of turning over the leaves of as many volumes to find the dozen or so references of which they might be in search.[25]

It was this desire to do once, for the benefit of all, what would otherwise have to be done by each person for himself, which motivated Billings and most of the previous bibliographers. For Billings, a desire to know, for his own uses, the literature of his field, was a secondary motivating force. However, the great difference between Billings and the other bibliographers is that he conceived a way of using the work of the fairly abundant non-

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ture, the absolute values were small. Either 175,000 or 365,000 volumes are still manageable quantities.

[25] Billings, John Shaw. The Medical College of Ohio Before the War. Cincinnati Lancet-Clinic, n.s., 20: 297–305, 1888; Quoted in: Garrison, Fielding H., John Shaw Billings, a Memoir. N. Y., Putnam, 1915, p. 15–16.

medically trained labor force for accomplishing his purpose, thus making his program independent of the individual scholar. Finally, Billings had the extra motivating force of desiring to make the actual work available to medical men. Since he realized the uselessness of providing a guide to the literature and then forcing the potential reader to seek out the copies of the desired works where he could, Billings included in his plan a method for distributing the works indexed in his bibliography throughout the country.

There had been three catalogs of the Library of the Surgeon-General's Office published before Billings developed his plan. A manuscript catalog of 1840 listed 135 titles in 228 volumes; in 1864 a printed catalog was issued, which listed 1365 volumes; still another catalog appeared in 1865, showing that the library had grown to a total of 2253 volumes. At this point, an old Civil War Hospital Fund was turned over to the library, and from that time to 1871 the library expanded to 13,330 volumes.[26] The first catalog prepared under the direction of Billings is dated 1873. It is in three volumes, and is arranged by subjects, form of publication (e.g., lists of serials), and authors; in it the library is stated to contain 25,000 volumes and 15,000 pamphlets. The 1873 catalog was still a catalog of books and not an index to parts of works, but the seeds of the concept of an index-catalog must have been germinating at about that time. With the aid of his principal assistant, Dr. Robert Fletcher, Billings was working out a scheme for compiling and publishing a

[26] *Ibid.*, p. 213–214.

catalog which would list not only authors but also subjects; not only books but journals, pamphlets, serials, portraits, and so forth; giving for each the individual parts as well as the entire work.

Sometime around 1873 this scheme had been worked out sufficiently to begin to put it into execution.

> In a majority of cases what [the physicians] want are the statistics of a given disease, operation, or remedy. The data for these statistics are for the most part contained in journals and transactions of societies. To make these available, a card catalogue of all important papers in such journals and transactions has been prepared.[27]

A specimen (called a "Specimen Fasciculus") of the suggested form for publication of this card catalog was printed and distributed in 1876 to physicians and librarians, who were asked to comment on the proposed form. It is a little difficult to determine what the physicians' comments were, since Billings' letter books for this period seem to have disappeared from the Armed Forces Medical Library, although some remarks are noted in published medical literature,[28] but the reactions of the librarians are available in the bibliographic publications of the time.[29] In general, the librarians praised the dictionary arrangement, though a few preferred classed

[27] Billings, John Shaw. National Catalogue of Medical Literature. *Op. cit.*

[28] For example, the note in Amer. J. M. Sc., n.s. 22: 220–221, 1876 and n.s. 82: 243–245, 1881.

[29] See, for example, Lib. J., 1: 121–122, 1876–1877, which contains a discussion of the Specimen Fasciculus by Cutter, Winsor, and Whitney, among others.

catalogs. All agreed that the subject headings chosen were adequate, so far as a layman could tell, and all complained about the size of the type, while admitting that the tucking of entries into small space by running the references together in paragraph form was bold but extremely valuable.[30]

Whatever was the reaction of the ultimate consumer of the work, Billings evidently felt sure enough of himself to make few changes in the arrangement of the volume when it finally appeared in 1880.

Plan of the Index-Catalogue

The *Index-Catalogue* is a list of the monographs, pamphlets, and theses contained in the Library of the Surgeon-General's Office (later the Army Medical Library, and now the Armed Forces Medical Library) as well as the journal articles found in its periodicals. As has been pointed out by Garrison:[31]

> It has been a common error to suppose that the Index Catalogue [!] contains, in addition to medical books and pamphlets, all the articles contained in the medical periodicals in the Library—now the largest collections [sic] of this kind in the world. This is, and has been wide of actual fact. In the period of inception (1865–1879), Billings personally checked all the periodicals in the library for indexing, a colossal undertaking, done at his

[30] This is, of course, merely a regression to the printing style of the first bibliographies of medicine, where the space between entries was kept to a minimum. See the illustrations to Chapter I of this work.

[31] Partially unpublished memorandum in the files of the History of Medicine Division, U. S. Armed Forces Medical Library, Cleveland, Ohio, dated August 5, 1929.

home into the small hours of the night. After the arrival of Fletcher, he continued to do this up to his retirement from active duty in 1895, with the assistance of Fletcher when he was absent on leave or otherwise. The two men undoubtedly checked all the articles in the purely scientific periodicals, such as Virchow's or Pflüger's Archiv, and all the important articles in weekly and provincial medical periodicals, such as the Lancet or the Lyon médical. But there are curious omissions here and there. A random examination of Volume I. of the Lancet for 1868, for instance, shows the omission of fairly important clinical cases (printed nowhere else) on pp. 314, 315, 376, 558, 588, 589, particularly a case of acute rheumatism with autopsy by Sir William Jenner on p. 750, and a compound fracture treated by the Lister method on p. 786. Some omissions, e.g. of trite public addresses or of verbose articles with no tendency, are quite judicious and well considered. For the medical journals of third, fourth, or fifth rate type Billings showed little consideration, passing them by as if on Osler's view of the medical journals of Australasia in 1897—that they contain little except records of hydatids and snake-bite... In selecting material for the Index Medicus, Fletcher tended to include more, on the ground that current articles of any kind are apt to be of current interest to current readers, some of whom may find in them just the stimulating or factual statement they are after. With the better sort of medical journals, his slogan was "Take everything"... The Index Medicus is, therefore, more complete as a record of this kind than the Index Catalogue, which Billings aimed to make a repository of the very best and most select material, but of no other... [During the European War] in the Index Catalogue, the same exclusions became imperative, by reason of the enormous amount of duplication and repetition, even in the worthwhile literature. Thus the bibliography of Tuberculosis in Vol. XVIII. of the second series, occupying 418 double-column pages, mostly in needlepoint type, represents only about a third of the indexed literature on the subject on hand in the Library at that time. The rejects actually occupied cubic space equivalent to that of a cord of wood or a ton of coal.

In spite of the great mass of omissions, the *Index-Catalogue* contains more works on any given subject than did any previous bibliography of medicine. Indeed, as has been pointed out by Dr. Claudius F. Mayer, now editor of the *Index-Catalogue*,[32] there is some question as to the accuracy of Garrison's statements on the coverage of the *Index medicus*.[33] Because of the excellence of the medical collection brought together by Billings and Fletcher, even a small proportion of its contents would reveal hitherto unknown treasures. Over and over again the reviews of the first volumes of the *Index-Catalogue* stress the surprise of the reviewer who opened the first volumes and found 66 pages of references to aneurysms. (Compared to this, Ploucquet's few pages on the same subject shrink into insignificance.) And with a scientist like Billings choosing which journal articles to list, more than a mere random sample is offered the reader.

The methods worked out for handling this mass of specialized literature with untrained help[34] were, perhaps,

[32] [Letter to the Editor.] Spec. Lib., 43: 224, 1952.

[33] While it is true that catalog cards were made for almost all the books and journal articles received in the Library, a selection was often made when the cards were published.

[34] "When Billings took charge of the Surgeon-General's Library, Government employees were not appointed by competitive civil service examination, but were simply pitchforked into the service through political preferment or as a recognition of their services in the Civil War. Most of the employees whom Billings selected for this work [the Index-Catalogue] came from this latter class, being old hospital stewards, one or two of whom had served with Billings in the field. With the exception of Mr. Edward Shaw, a Yale graduate, none of these men were educated beyond common schooling, but as old soldiers they had the dependability and reliability upon which Billings set the highest value. Given

the greatest contribution made by Billings to the technique of medical bibliography. After much controversy, Congress was persuaded in 1879 to appropriate the money for publication of the catalog. The project was successful largely because of the efforts of Dr. Abraham Jacobi of New York, who spent much of his time and money on the project. In 1880, therefore, volume one appeared, containing the portion of the alphabet from A through Berlinski.[35] Thereafter a new volume appeared approximately every twelve months until 1895, completing the alphabet. Books, pamphlets, theses, and titles of periodicals were listed in the *Catalogue* by author, by subject, and (in

reliability, he reasoned, and I can, by intensive training, convert it into efficiency... Like Emerson's cook who, by dint of cooking the same dinner over and over again, eventually obtained perfection, so these old employees, none of them linguists, soon learned the rudimentary technique of medical bibliography and by the publication of the first volume of the Catalogue, were already working at its details with reasonable proficiency. Apart from Dr. Fletcher and himself, the only linguists Billings had were a few industrious Germans of fair education." Garrison. John Shaw Billings. *Op. cit.*, p. 223.

[35] "We do all our work of catalogueing [sic] and indexing on cards and the catalogue is printed directly from these cards... We endeavor to secure all medical journals of any importance published in any country or in any language; the only exceptions being merely popular periodicals, of which we only secure a volume or so to serve as sample.

"The printing of each volume of the Index-Catalogue requires from eight to nine months' work, and at least three months' work are required to arrange and consolidate the cards forming the manuscript of a volume; it follows that we issue but one volume of the Index-Catalogue a year." Unpublished letter from John Shaw Billings to H. A. Webster, Librarian, University of Edinburgh, dated February 4, 1881. See also Garrison, Fielding H. Sketch of Library of the Surgeon-General's Office. Med. Lib. and Hist. J., 4: 211–216, 1906, especially p. 215.

the case of journals) by title; journal articles were listed by subjects and then alphabetically by author under the subjects. Unfortunately the articles were, for the most part, listed under only one subject heading, which cut down on the ease and perhaps usefulness of the entire work. As Garrison notes,[36] "In each case an attempt is made to find the true center of gravity of a given title, so that the card may be placed under the bibliographical heading to which it actually relates." Authors and subjects were interfiled alphabetically into one array. Special lists, such as lists of journals indexed, also appeared. In the early volumes special typographical devices were used to designate case histories or articles less than two pages long; throughout the entire work theses were noted by an asterisk before the author's name. Where possible, book authors' dates were also given.

With Billings' retirement from the Army in 1895 the work was kept up by Dr. Robert Fletcher, on whom fell the burden of the logical consequence of publishing an index to an ever-growing literature—the cyclical publication of supplements.[37] A new cycle of volumes was prepared, using the methods worked out by Billings, and although Billings originally estimated it would require only five volumes, it actually became twenty-one and

[36] *Ibid.*, p. 215.

[37] ". . . the work [the Index-Catalogue] will be one of immense service to all of us who profess to *study* as well as to *practice* our profession. The only possible drawback is one inseparable from the material, which will necessarily supersede, or at least render incomplete, the earlier vols. [sic] before the later ones are published." Unpublished letter from Dr. W. Gairdner of Glasgow, Scotland, to Billings, dated 12 October 1880. See also Ploucquet's remarks on this subject.

took until 1916 for completion. By the time the third series of volumes was half completed, it was apparent that it would not be possible to continue the publication on the scale set up for it formerly. The later volumes, therefore, omitted subject entries for some articles indexed in the *Quarterly Cumulative Index Medicus* (for details of this publication, see the next chapter);[38] and the avowed purpose was to end the work with the publication of the Z volume of the third series. Because of pressure put on the Library in the 1930's,[39] however, this decision was reconsidered and a fourth series begun on even wider principles than had been laid out for the *Index-Catalogue* by Billings. The tremendous growth of the literature soon bogged down the fourth series, which managed to publish ten volumes before a decision was again made to discontinue publication.[40] In each case one of the primary reasons for the proposed discontinuance of the *Index-Catalogue* was its cost. In 1876 Billings computed[41] that it would

[38] See Preface to Index-Catalogue, 3d series, v. 6 (1927). "Subject titles omitted from this publication can be found in the Index Medicus for 1926 and in the Quarterly Cumulative Index Medicus for subsequent years."

[39] See, for example, the resolution passed by the Medical Library Association in 1936. (Bull. M. Library A., 25: 12–13, 1936/37) and also the Preface to Index-Catalogue, 3d series, v. 10, 1932. "As stated in earlier volumes; it was at one time planned to close the Index-Catalogue with the third series, which was to include nothing appearing after 1926. In response to a very general demand by libraries and research institutions, that plan has been changed and work on the Fourth Series will be begun at once."

[40] Rogers, Frank B. and Adams, Scott. The Army Medical Library's Publication Program. Texas Rep. on Biol. & Med., 8: 271–300, 1950.

[41] Lib. J. *Op. cit.*

cost $12,500 to print 3000 copies of the *Index-Catalogue*, or $4.16 per volume; yet the price at the Office of the Superintendent of Documents was set at $2.00 per volume. The cost of preparing the later volumes (including printing) rose as high as $33.00 per volume, but the official price then was only $2.50 to $4.50 per volume.[42]

In the early days Billings himself marked with a soft pencil those articles he wished copied; the next day his copyists at the Library made the necessary cards. Then he and Fletcher pencilled in on the card the subjects under which the articles were to be placed. These headings were again considered when the articles were ready to go to the printer, but only for the purpose of making them consistent with each other, and not to determine if the wrong headings had been attached to the articles in the first place.[43] By this method Billings used the talents of all the team he had collected—the most skilled member chose the articles to be indexed, the unskilled worker manually copied the bibliographic entries from the articles and in-between someone with education and training not as good as one group and not as poor as the other worked at an intermediary level. This division of labor took from the skilled worker the drudgery hitherto associated with the compiling of bibliographies; moreover, it was so standardized that learning time was small for the majority of the workers. Because of the standardization, also, the work of any individual connected with the *Index-Catalogue* could be used interchangeably with the work of any other person. Nothing was left to the imagina-

[42] Index-Catalogue, s. 4, v. 1: V, 1936.

[43] Garrison. Sketch of Library . . . *Op. cit.*

tion of any of the workers except in the case of the top few who put the standardized parts together.[44] For the others there was no "intellectual potency" and no ownership of the finished product, only part of which they had produced.

One of the facts which is frequently overlooked in any discussion of the methods used by Billings, is that he provided a scheme whereby the standardized parts could be put together in varying ways for various purposes. It is true that the main purpose of his scheme was to put together the *Index-Catalogue*, but it is also true that part of his scheme was to prepare a monthly index—the *Index medicus*—using the materials already prefabricated for the other work.[45] Although the *Index medicus* was never a governmental venture, the same cards which were used to prepare the manuscript *Index-Catalogue* were used by Fletcher for the *Index medicus*, being copied

[44] See, for example, the unpublished rules laid down by Billings for his copyists, at the History of Medicine Division, Armed Forces Medical Library.

[45] "It has often been suggested that it is highly desirable that such a catalogue [the Index-Catalogue] should be supplemented by some current publication, which should show all recent works, together with articles in periodicals *arranged by subjects*, but until quite lately no proper means have been available for such an undertaking. Now, however, Mr. F. Leypoldt of N. Y., proposes to undertake the publication of such a current medical bibliographical serial, upon the condition that the manuscript for it be furnished of the requisite completeness and accuracy, and this last I have undertaken to supply, so far as the means of information at my command will permit . . ." Preface to Vol. 1 of Index medicus. New York, 1879.

a second time for this work.[46] Not all the references were identical, however; some articles not selected for the larger, more monumental work, were used for the monthly list while some citations used by the *Index-Catalogue* never found their way into the *Index medicus*. (It is this system, of course, which was attempted in the publication of the first few volumes of the *Current List of Medical Literature*; the difference lay in the fact that whereas the same man handled both the *Index-Catalogue* and the *Index medicus*, two different groups handled the raw material for the later *Index-Catalogue* and the *Current List*.)

Index Medicus

The *Index medicus* was a private, monthly publication under the editorship first of Billings and Fletcher, and then of Fletcher alone, from 1879 to 1898 and, under various editors from then to 1927. It indexed the contents of the journals, books, and pamphlets received by the Army Medical Library, arranged by subjects according to a modification of the system of nosology worked out by the Registrar-General's office in London.[47] No articles on chemistry, pharmacy, veterinary medicine, and dentistry *per se* were admitted, but articles in journals in these fields which were on pathology or therapeutics were selected. In addition to the monthly parts, which

[46] These cards were "farmed out" to the wives and families of the Library staff for copying. See Garrison's obituary of Billings in the 1913 volume of the Index Medicus.

[47] Index medicus, 1: 3, 1879.

contained no indexes, an annual author and subject index was sent to subscribers.

This periodical continued with increasing financial difficulties until 1898, when Fletcher felt constrained to give up his connection with it. Although the price had been raised from $3.00 to $25.00 per year, the cost of producing the volumes was too great for any publisher. For a while Fletcher had taken on the publishing as well as the editing of the work; but by the turn of the century he also had to admit defeat. For three years, therefore, the journal was suspended, while a French firm attempted to bring out a similar work.[48] Their results were even more disastrous than Fletcher's, but in 1903 the Carnegie Institution was persuaded by Billings, then on the Board of Directors, to come to the financial rescue of the journal. The third series, starting in 1921, was reconstituted on a quarterly basis, arranged alphabetically by subjects with an annual author index, and continued until 1926–1927, when it merged into the *Quarterly Cumulative Index*, published by the American Medical Association.[49]

[48] Bibliographia medica (Index medicus). Paris, v. 1–3, 1900–1902.

[49] "The fusion of the Index Medicus with the Cumulative Quarterly Index [sic] of the American Medical Association obtained for self same reasons, viz., the prospect of ultimate inadequacy or actual lack of funds and (more important still), the wearing down and dying out of the kind of personnel formerly available for carrying on this work. Preparation of such quarterly numbers as those in the final volume of the Index Medicus (1926–27), or of the author and subject index in the earlier series, was drudgery of the most devitalizing kind, ruinous to the eyesight, with consequent impact upon the nervous system, and wearying to the flesh. Some upstanding people 'slammed down their tools' and declined to go on with such work, on the ground that it was harder and

At least two reasons are given for the production of the *Index medicus*. Billings himself says in the Preface to the first volume of this work that he hopes for contributions from medical writers who wish to see their works indexed, and that these contributions, placed in the Library after indexing, will aid in building up that collection beyond what can be supplied from the "limited fund provided by the government for its support." In replies to letters asking for aid in locating literature, however, Billings frequently remarks that the earlier literature can be found listed in the *Index-Catalogue*, but that the *Index medicus* is aimed at bringing this up to date and furnishing the physician with the latest material on medical subjects.[50]

The third part of Billings' scheme for making the literature of medicine available to those who needed it was his interlibrary loan system. (Although not strictly medical bibliography, this subject must be discussed briefly here, to give a complete picture of Billings' concepts.) To know that the information desired is in a particular work and then not to be able to obtain that work was the original frustration which caused Billings to decide that he would collect a medical library for American medicine, if this

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less remunerative than a coal-heaver's (the financial compensation was niggardly). Moreover, as an eminent authority (Mr. Herbert Putnam, Librarian of Congress) observed to Col. Ashburn, enthusiastic workers of this kind are no longer to be found among the male sex. The obvious solution was the Chicago idea—a large and efficient female personnel." Garrison, Unpub. memo., *op. cit.*, p. 4.

[50] Unpublished letter books dated in the 1880's in the History of Medicine Division, Armed Forces Medical Library. Unfortunately only a few of these books appear to have been preserved.

were at all possible.[51] For this reason, Billings agreed to lend books and journals to physicians at a distance who would either 1) arrange for a neighboring library to consent by a vote of its governing body to be responsible for the work, or 2) who would deposit with the Library of the Surgeon-General's Office an amount of money equal to the value of the book, which deposit would be returned when the book was returned safely. Both the letter books of the library and the reviews of the *Index-Catalogue*[52] reveal that much use was made of this system.

It is constructive to compare the *Index-Catalogue* with the contemporary works available to the physicians. A characteristic attitude is expressed in a letter to the Editor of *Lancet* by Dr. John Chatto, Librarian of the Royal College of Surgeons.[53]

> How such an index will be valued and consulted can only be judged of by those who have observed the warm appreciation that has attended the publication of Neale's 'Medical Digest',

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[51] See p. 112 and also Washington Evening Star for May 5, 1883, which quotes Billings as follows: " '. . . in the Preface to the Catalogue of 1872,' replied the Doctor, '. . . the need of the United States for a large medical library was stated to be shown by the fact that were all the medical libraries of the United States put together, it would not be possible to verify from the original authorities the references given by standard English or German authorities. No complete collection of American medical literature was in existence, and the most complete was in private hands and not then accessible to the public . . .' "

[52] Collection of Notices, Reviews, etc., in Relation to the Index-Catalogue of the Library of the Surgeon General's Office, Washington, D. C., 1875–1889–1891, vol. 1, preserved in the History of Medicine Division, Armed Forces Medical Library.

[53] Lancet, 1: 970, 1881.

which yet embraces less than a dozen English periodicals. The periodical and serial publications of all times, and in all languages, which come within the grasp of the 'Index-Catalogue', are numbered not by hundreds, but by thousands. . .

Rise of Abstract Journals

Billings' bibliographies were not the only ones published in the nineteenth century, [54] and his method for controlling medical literature was not the only plan put forth. One other still important method for controlling scientific literature arose about this time: the abstract journal. This method accepted two facts: 1) that the literature had become so vast it was impossible for any scholar or any library to possess it all, or to scan it if available, and 2) that the literature on any portion of the entire field was likely to be so scattered a person had to examine the total literature to be sure that he was getting all pertinent information. The abstract journal aimed at bringing together from diverse sources a large portion of the literature on the subject it represented and it had the further aim of allowing the reader to learn the contents of the literature without reading the originals.[55]

[54] See the Bibliographical Appendix on p. 194–211.

[55] The most sweeping statement about this was made by the Springer Verlag, publisher of the largest group of such abstracting tools in medicine, in 1930. "The Zentralblatter [sic] are meant to make it superfluous, at least for German readers, to subscribe to foreign publications. Special efforts will be made to have the important foreign articles carefully abstracted in detail so that it will be generally unnecessary to look up the original articles." Purpose and Organization of the Medical Reference Journals Published by the Firm of Julius Springer in Berlin. Bull. M. Library A., 20: 173, 1930.

Probably the earliest abstracting journal in the sciences was the *Pharmaceutisches Centralblatt*, the predecessor of *Chemisches Zentralblatt*, which began publication in 1830. This so obviously filled a need that four years later, in 1834, Karl Christian Schmidt brought out the first volume of the famous *Schmidt's Jahrbücher der in- und ausländischen gesamten Medicin*, which published 336 volumes before it ceased its existence in 1922.[56] Following Schmidt's lead many such abstract journals were produced for the sciences, until the beginning of the first World War, when most had to be suspended. The more important ones resumed publication between the two world wars, but because of their high price, the increase in available literature resulting from the war, and the founding of many new medical libraries, and possibly because of the greater adequacy of the indexing tools, they never regained their former importance. For some years after World War II, most of the old abstracting journals which attempted to cover the medical literature comprehensively found it extremely difficult to exist, while the newly founded ones tended to run into financial difficulties.

The reasons for the decline of the earlier abstracting journals are varied. For one thing, English came in to

[56] Karl Christian Schmidt was born in Germany in 1792 and died June 13, 1855 in New York of osteomyelitis. He not only founded the first medical abstract journal, but he edited the Encyklopädie der gesammten Medicin (Leipzig, Wigand, 1841–1845, 10v.) and (with F. L. Meissner) the Encyclopädie der medicinischen Wissenschaften, nach dem Dictionnaire de Médecine frei Bearbeitet (Leipzig, Fest, 1830–1835, 13v.). Practically nothing else is known of him. See Hirsch, *op. cit.*, v. 5: 94, and Dechambre, *op. cit.*, 3 s., v. 7: 477.

supplant German as the language of science after World War II; for another, few English speaking physicians learned to read German with the ease with which earlier physicians had read it. Therefore, by the time the German abstracting journals resumed publication, much of the market of international subscribers had been lost to them. The English-language abstract journals, which had arisen during the period when the German Zentralblätter were *hors de combat*, were, for the most part, not as good in their coverage as the older ones. The best of these were probably *Excerpta medica* and *Abstracts of World Medicine*, but even these had serious weaknesses at first in coverage, method of abstracting, indexing, and speed of publication. (A further discussion of these journals will be found in the next chapter.)

Perhaps one of the factors which will determine whether this form of publication will again have its earlier importance is the change in medicine itself. At the end of the nineteenth century and the beginning of the twentieth, the trend in medicine was toward specialization and compartmentalization. In the middle of the twentieth century, on the other hand, there is a tendency for scientists from several specialties to work together on a research project as a team. In such a set-up, it is more difficult to define specialties and to provide abstracts of all pertinent publications; such research teams, moreover, require more wide-spread coverage of the literature than did the earlier clinician. At present it is impossible to say whether the abstract journal will ever again enjoy the popularity it had during the first quarter of the twentieth century; the

fact that so many attempts are made to publish abstract journals seems to indicate a demand, if not a need for them.

The typical German abstract journal-plan required three kinds of publications for its complete coverage. The first was a frequently appearing abstract journal, usually called Zentralblatt or Berichte, which provided signed informative abstracts of each article listed, and which had excellent author and subject indexes. It was usually arranged by some classification scheme. As an index to this publication, there usually appeared a yearly compilation, frequently called Jahresbericht or Jahrbuch, which annually listed the totality of the literature, some with semi-critical annotations, and some referring back to the original Zentralblatt or Berichte by key numbers. Finally there was a review journal, often called Ergebnisse, which contained reviews of a few important subjects in the field with extensive bibliographies.[57]

Although non-German literature contained examples of all these types of abstract journals, they were never tied together, in groups of three, as were the German publications. For example, although *Physiological Abstracts*, *Annual Review of Physiology*, and *Physiological Reviews* have all been bona fide publications, they were each published by a separate group and did not have internal tie-ins of citations. But the *Berichte über die gesamte Physiologie* and *Jahresbericht Physiologie* published the same material, and the *Ergebnisse der Physiologie* also

[57] Trelease, Sam. F. The Scientific Paper . . . 2nd ed. Baltimore, Williams, 1951, p. 10–22.

considered the same articles, though in a different form.[58] Finally because of the expense of purchasing the German tools, only libraries (and later, when the prices rose greatly, only the larger libraries) found they could afford these works. This further cut into the number of subscribers available to these publications after World War II.

Conclusions

Because of the growth of the medical literature in the nineteenth century, particularly because of the increase in numbers of periodicals produced, a system for bibliographic control had to be devised which would use the services of many individuals working at different tasks, but working under a master plan in a standardized way, so that the results could be combined variously. This system was able to give a conspectus of so much of the literature being produced in medicine at the time that it looked as if bibliographic control had finally been achieved in the field. What was not apparent at the time was that this literature was increasing at an exponential rate, so that any system devised would have to take into account an infinite number of periodicals and the production of an infinite number of building stones. Already at the end of the nineteenth century it was apparent that, economically speaking, if in no other way, the system had been outgrown by the explosive expansion of the literature.

[58] The nearest thing to this system in the English language literature appears to be the publications of the H. W. Wilson Co., which uses the same articles in several of its specialized indexes.

Two possibilities were inherent in such a situation if it were to be controlled. Either a system had to be devised which would admit of infinite expansion, or else the material being indexed must be broken up into smaller, more manageable units. This latter course would, of course, recapitulate the history of science and bibliography in general, for general science and general bibliography had also gone through a stage of growing large and dividing into smaller units. But such a solution would only be a temporary one, since presumably the same curve of growth would be observable in any portion of the whole as in the whole. In the late nineteenth century and the early twentieth century, however, this scheme of breaking up the field was the method used for controlling medical literature. Indexes to special subjects (e.g., the German Zentralblätter, Jahresberichte, and Ergebnisse, each devoted to a special subject) were published, or else selected portions of the entire literature were taken for complete indexing, as was done by the old *Quarterly Cumulative Index*. (This point will be discussed more fully in the next chapter.)

That this was less than perfect is shown by the fact that, beginning with the second third of the twentieth century, the emphasis switched from dividing up the field of medical (or chemical, physical, or other scientific) literature into smaller and smaller units for indexing to devising a system which would more nearly approach the ideal of handling an infinite amount of data. These systems generally made use of the newer punched-card techniques, electrical devices of one kind or another,

and photographic means of recording and scanning material. Such methods were generally based on the use of a machine, and in the next chapter an attempt will be made to describe some of the more common machines proposed for bibliographic control and to show in what respect they have not been successful in solving the problem.

CHAPTER V

The Present Situation

As has been pointed out previously, the *Index-Catalogue* and the *Index medicus* were superb tools because they presented so much of the medical literature to the reader of their day. It is a truism in medicine, however, that not all physicians need to have access to every scrap of published information and to have it as soon as it is published. For the general practitioner and the non-research clinician, with whom medicine still remains partly an art, all that is needed is what Matthew Arnold has called, in another connection, "the best that has been thought and said." Nor is it so important to him that he get these ideas promptly. Indeed, in most western countries the law takes cognizance of this by requiring that physicians use only the generally accepted methods of practice of their day, holding them responsible for malpractice only when they do not do so. On the other hand, the law considers them not legally responsible for the consequences of their acts, if these acts are in the generally accepted mode.[1] Thus, the natural cultural lag between

[1] "The legal duty requires that the physician . . . possess and exercise that reasonable and ordinary degree of learning, skill, and care commonly possessed and exercised by reputable physicians practicing in the same locality, or in similar localities, in the care of similar cases. . ." L. Regan. Doctor and Patient and the Law. 2nd ed. St. Louis, Mosby, 1949, p. 17.

". . . The physician is pledged automatically to . . . treat the patient

discovery and acceptance of a discovery is reinforced, rather than weakened, by legal safeguards. Medical research, on the other hand, requires immediate publication and immediate grasp of newly discovered facts and theories; as a result, periods of great increase in scientific information (for example, the times of Robert Boyle or of Pasteur) have also been periods when much attention was paid to the publication and indexing of new information. It should be pointed out, of course, that there are other reasons which bring about an emphasis on the publication and indexing of scientific advances; such economic facts as commercial rivalry and such social situations as wars have tended to increase the importance of knowing what has been discovered by others.

Not only is it true that the average general practitioner does not require the wealth, the detail, nor the speed of publication of the research worker; he may actually be bewildered by finding more than he has time or background to evaluate. For him, the indexing of a few books and journals in his native tongue is sufficient; and this fact explains the usefulness of such partial indexes to the literature as the *Quarterly Review of Medicine* and of sections devoted to "other literature" at the back of many general medical periodicals (for example, the *Journal of the American Medical Association*).

A number of attempts to publish indexes to only a few journals had appeared in the nineteenth century, the most

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with an ordinary or reasonable degree of skill, such as would be expected to exist in the community in which he is practicing." T. A. Gonzales, Morgan Vance, and Milton Helpern. Legal Medicine and Toxicology. N. Y., Appleton-Century [1940] p. 433.

important British one probably being Neale's,[2] published by the Sydenham Society, while the most important American one was perhaps Sajous' *Annual of the Universal Medical Sciences*.[3]

In 1916, the American Medical Association started a separate indexing journal, the *Quarterly Cumulative Index to Current Medical Literature* based partly on the "Guide to Medical Literature" section in its *Journal*, which was aimed specifically at the English speaking medical man who did not need to have the extensive coverage of the literature presented to him in the *Index-Catalogue*, and who did not wish to pay the $25.00 which the *Index medicus* cost to bring him more than he needed. As originally set up, the *Quarterly Cumulative Index* gave the contents of some 157 journals commonly found in American libraries, most of them of a general or clinical nature, and many of them in English. Of these journals, moreover, it indexed only the articles which the editors thought would be useful

[2] Richard Neale (1827–1900) compiled his Medical Digest for his own use, to record the articles available to him and save him the time otherwise needed for going over each issue of each journal. It is highly selecsive, indexing fewer than twenty journals, and is classified according to Neale's own needs. In its various editions, beginning with the first one in 1877, it covered the literature from 1850 to 1899; its usefulness is shown by the fact that it continued to be published, although for practically all of its existence the Index medicus was appearing at monthly intervals and covered infinitely more of the literature. For information on Neale, see Lancet, 2: 1617, 1900 and Brit. Med. J., 2: 1167–1168, 1900.

[3] For a list of other early American medical abstracting journals, see Myrl Ebert's paper, Rise and Development of the American Medical Periodical, 1779–1850. Bull. M. Library A., 40: 243–276, 1952.

to the clinician. Titles of articles in foreign languages were translated into English, and liberties were taken with all titles in order to bring out the main subject of the article.[4]

The *Quarterly Cumulative Index* appeared four times a year and was cumulated at first annually, then semi-annually. It contained, in addition to its main list of articles arranged by authors and by subjects in one long alphabetical array, a list of new medical books, a list of periodicals and their publishers, and a list of new government publications pertinent to the work of the physician.

Even this comparatively simple index became a financial burden, however,[5] and after ten years of publication, negotiations were begun for the amalgamation of this index with the *Index medicus*.

The main mover in this attempt at union was the Carnegie Institution of Washington, which had been underwriting the *Index medicus* since 1904. As pointed out in the previous chapter, the *Index medicus*, after twenty years of aid, was still not able to continue on its own; at the same time, the *Quarterly Cumulative Index* was also having financial difficulties. Since the *Index medicus* was already listing most, if not all, of the articles appearing in the American Medical Association's publication, it seemed logical to unite the two. On the other hand, the Chicago work

[4] Compare this with the German Stichwort and Schlagwort indexes.

[5] "The Chicago index is at present maintained at considerable financial loss per annum, but Dr. Fishbein estimated [sic] that the journal will be as well-nigh self-supporting by 1933 as additional subscriptions can make it. The original subscription list has increased eight-fold during 1927–28." F. H. Garrison. Unpublished memorandum, August 5, 1929.

employed a more up to date method, which actually produced the index on time and in an easily usable form. By the 1920's the backlog of unpublished citations meant to be placed in the *Index-Catalogue* eventually had grown very large; in an attempt to provide these references more promptly, General Noble, who was librarian of the Surgeon General's Office from 1919 to 1924, proposed the publication of an annual volume to keep the *Index-Catalogue* up to date.[6] The publication of a joint *Index medicus-Quarterly Cumulative Index* appeared to solve that problem.[7] Since an amalgamation seemed the obvious answer, the Carnegie Institution agreed to underwrite the new publication until the third series of the *Index-Catalogue* was completed and the matter of the future of this work could again come up.

The Preface to the first volume of the index under its new title (1927) tells the manner in which the editing was done:

> In the preparation of this number, some of the staff of the Army Medical Library have indexed and classified books, pamphlets, and articles in periodicals covering practically all the foreign medical literature, to which a condensed English

[6] Rogers and Adams. *Op. cit.*, and Report of the Surgeon General, U. S. Army, 1923, p. 178. This material is also in the unpublished memorandum in files of the Armed Forces Medical Library presented at the first meeting of Committee of Consultants for a Study of Indexes to Medical Literature Published by the Army Medical Library, 24 Sept., 1948, p. 4–5, which quotes a separate report attached to General Noble's Annual Report to the Surgeon General for the fiscal year 1921.

[7] "Ideally, the present Quarterly Cumulative Index Medicus ought to serve all the purposes of the Annual Year Book proposed as a successor to the Index-Catalogue, as a Surgeon General's Office publication." Garrison, Unpub. memo. *Op. cit.*

abstract of the actual content of each article (without reference to the title) has been added whenever necessary or desirable. The same personnel have indexed and classified titles in English and American periodicals not covered by the American Medical Association. These cards have been sent to the library of the American Medical Association, the cards covering the remaining English and American medical literature added to them, and this material edited and brought into uniform style by the library staff and the indexing service of the American Medical Association. The redaction, printing, proof-reading, and distribution are carried out by the various departments of the American Medical Association. The relation of the Army Medical Library staff to the redaction of the INDEX [sic] is advisory.[8]

This division into foreign and English language journals, with the Army Medical Library being responsible generally for the foreign material and the American Medical Association for the English language works, was to come up again, as we will see later, in the discussion on the *Current List of Medical Literature*.

With the cessation of the old *Index medicus*, the last large-scale general medical index in semi-classified form came to an end.[9] As an explanation of this trend away from classification schemes in bibliography, it might be pointed out that at first bibliography followed the lead of scientific thought which tends to go from the particular to the universal, in a more or less inductive fashion. Such thought has generally looked for relationships and patterns to ex-

[8] Quarterly Cumulative Index Medicus, Preface, 1: [3], 1927.

[9] Although the last series of the Index medicus printed its subjects in alphabetical order, authors still had to be sought for in a separate author index. More properly, therefore, these volumes were neither classed nor dictionary in form.

plain what might otherwise seem to be planless and chaotic.[10] Sciences which can easily find orderly relations, such as mathematics or astromony, have thus been prominent early in mankind's history; and it is probably no accident that the eighteenth century's Age of Reason should also have been an age of classifications, encyclopedias, and nosologies.[11]

Together with the interest in classification in science, there grew up an interest in classification of the derivatives of science, especially its literature. Unfortunately, however, the literature did not easily fit into any self-evident scheme, and almost as many classifications were developed as there were people developing them. As a

[10] "In the first place, there can be no living science unless there is a widespread instinctive conviction in the existence of an *Order of Things*, and, in particular, of an *Order of Nature*. . . Certainly from the classical Greek civilization onwards there have been men, and indeed groups of men, who have placed themselves beyond [the] acceptance of an ultimate irrationality. Such men have endeavoured to explain all phenomena as the outcome of an order of things which extends to every detail. Geniuses such as Aristotle, or Archimedes, or Roger Bacon, must have been endowed with the full scientific mentality, which instinctively holds that all things great and small are conceivable as exemplifications of general principles which reign throughout the natural order." Alfred North Whitehead. Science and the Modern World; Lowell Lectures, 1925. N. Y., Mentor Books [c1925] p. 4–5.

[11] "Classification is one method, probably the simplest method, of discovering order in the world. By noting similarities between numerous distinct individuals, and thinking of these individuals as forming one class or kind, the many are in a sense reduced to one, and to that extent simplicity and order are introduced into the bewildering multiplicity of Nature." A. Wolf. Classification. (In: Encyclopaedia Britannica, 14th ed. Chicago, Encyclopaedia Britannica [c1930] v. 5: 778)

result, a debate has raged for many years on the value of classification schemes for medical bibliographies as opposed to their arrangement by some non-logical sequence such as the alphabet. The earliest printed bibliographies were frequently arranged as the books listed in them had been shelved in the monastic libraries in which the compilers worked; they were thus often in broad subject groupings. Gesner chose to arrange his great work according to the divisions of higher education of his time, the trivium and the quadrivium. Later works used some other frame of reference clearly apparent to the bibliographer, if not always to the user of the work. Yet the simultaneous appearance of alphabetically arranged bibliographies of medicine, such as that of Ploucquet, showed that the non-logical arrangement sometimes appeared to have intrinsic advantages over classification schemes.

A fairly large portion of the history of the *Index medicus* was a struggle to find the best classification scheme to fit the literature appearing each month.[12] The scheme originally chosen was a modification by the Royal College of Physicians of the (British) Registrar General's Nomenclature for mortality and morbidity reports, which was also the classification of the medical department of the U. S. Army and Marine Hospital Service; but it was soon found necessary to modify the modifications. As Billings put it,[13] "Medical bibliography requires a more compre-

[12] Historical Outline of Indexing Publications in the Army Medical Library; Unpublished Memorandum to the Committee of Consultants for the Study of Indexes to Medical Literature Published by the Army Medical Library, 24 September, 1948, Part II, p. 4.

[13] Index medicus, v. 6, p. 1 (Preface), 1884.

hensive arrangement than is needed for returns of death and disease only." The original plan of the *Index medicus*, for example, had called for a copious annual subject index; this proved to be so difficult to construct that the annual indexes consistently appeared late. During the three-year period of the French publication of the *Bibliographia medica*, the Universal Decimal Classification was used, but this proved no more helpful than the original scheme. When the publication was again taken over by the Americans, an attempt was made for a time to have the numbers "index themselves" by subdividing the subjects in the main monthly lists, but after a while this was abandoned and the annual subject indexes reverted to. Later, as we have seen, under the aegis of the Carnegie Institution, the *Index medicus* in 1921 adopted an alphabetical arrangement of its subject headings in imitation of the *Quarterly Cumulative Index*, and provided only an annual author index.

Although Garrison, who was then editor of the *Index medicus*, said that the new arrangement was the preference of a majority of the subscribers to the journal, and that the classification used was obsolete and "little more than a scientific curiosity,"[14] there was enough protest about the innovation to cause him to make some concessions. By inverting and renaming headings, he tried to bring allied material into juxtaposition alphabetically, with the result that almost no one was satisfied.

In the *Quarterly Cumulative Index*, an index was pre-

[14] Unpublished Memorandum 1948. *Op. cit.*, Part II, p. 7. See also another discussion on the same subject: Seidell, A. Classified Index to the Current List of Medical Literature. Curr. List Med. Lit., 2: Preface to no. 27, June 30, 1942.

sented which did away with a logical classification entirely and arranged its entries by the alphabet only; at the same time it interfiled authors and subjects into one long alphabetical array. This system had also been used for *Reader's Guide*, the great general literary index, and other American bibliographies prepared in the Cutter-H. W. Wilson tradition. Although this method made necessary the reprinting of citations in several places—under author and under all subjects—the number of journals and consequently the number of articles handled by the *Quarterly Cumulative Index* was so small, it was an entirely feasible arrangement. Such an arrangement made unnecessary, also, the preparation of extra indexes, which naturally speeded up the appearance and use of the primary lists.

An index which does away with a classification scheme and replaces it with an alphabetical one finds that it has a new set of problems to solve in denoting the subjects it encompasses. Where a classification system is, in a way, partly independent of the name of subjects, the alphabetical system stands or falls on its choice of names. All classification systems are, by their very nature, based on some logical method of arrangement, and once that arrangement is understood by the user of the system, it is theoretically possible to find any subdivision of the subject without recourse to words. In actual practice, of course, an alphabetical subject index to the classification scheme has always proved to be desirable, but it is not a necessary condition to its use. An alphabetical subject arrangement, on the other hand, has the problems of determining what terms are to be used, how the user is to be led from terms

which are not used to similar terms which are used, and how the relationship of one subject to other subjects is to be indicated. These are the questions of subject headings, see references, and see also references.

Although we have noted how these problems were encountered from the 17th century on, when the size of the bibliographies began to demand such guides (see the discussions of Linden and Lipenius), it was not until modern times that they assumed the serious proportions they now have. Many factors were at work here; probably the most important were the substitution of vernacular languages for Latin at the same time that certain Latin terms were retained in medicine, the changes in medical theories beginning with the 17th century, the speed of change in terminology which came with increased research and progress in medicine, and the increase in numbers and types of users of medical indexes. These were not only physicians, but also laymen of various degrees of scientific training; where Billings could say that he was preparing the *Index-Catalogue* for the American physician, his successors in medical indexing could make no such claim.

The four most commonly-used lists of subject headings in the field of medicine in the past twenty-five years have been those of the Library of Congress, the *Quarterly Cumulative Index Medicus*, the *Index-Catalogue*, and the *Current List of Medical Literature*. The *Current List* headings, however, are based upon those of the *Quarterly Cumulative Index Medicus* and then modified.[15] A discussion of the

[15] Taine, Seymour I. Subject Heading Authority List of the *Current List of Medical Literature*. Bull. M. Library A., 41: 41–43, Jan. 1953.

other systems can be found in the report of the Symposium on Medical Subject Headings held in the Pentagon in December, 1947.[16] One of the problems has been to compile a list of subject headings which could be used for either books or journal articles; up to now the feeling has been that subject headings for books must be different from those for journal articles, in that the latter are written on more minute subjects than the former. Recently, however, papers by Lt. Col. F. B. Rogers and Dr. Mortimer Taube have recognized the point that one set of subject headings is adequate for both books and journals, since journal articles are on smaller topics than books only in the sense that they describe one thing as modified by one or more other things—for example, an article on treatment of fractures of the patella by streptomycin. The subjects *patella*, *fractures*, and *streptomycin* are all subjects of books and journal articles indiscriminately.[16a]

The publication of a medical bibliography which included authors and subjects in one alphabetical array and required no further index to use it, was hailed with joy by the medical community in the early twentieth century. Why should this innovation have been received so thankfully at this time? Had some new factor or factors entered into the picture of medical literature which would, as it were, demand this change? A study of the period does,

[16] Doe, Janet. Critical Review of Existing Medical Subject Heading Lists. Bull. M. Library A., 36: 86–93, 1948.

[16a] Rogers, Frank B. Applications and Limitations of Subject Headings; The Pure and Applied Sciences. (In: Tauber, Maurice, ed. Subject Analysis of Library Materials. N. Y., School of Library Service, Columbia University [c1953] p. 73–82.)

indeed, show changes in two particulars: the growth of the "public" medical library, that is, the medical library open to groups of readers as opposed to the medical library maintained by the physician for his own exclusive use, and the appearance of the non-medically trained librarian.

The history of public medical libraries in Europe has not yet been written. A few pages appear in the *Handbook of Medical Library Practice*[17] and in Thornton's work,[18] but on the whole there is little except a few articles on the history of individual medical libraries.[19] In Appendix 2 of Thornton's work, however,[20] there is a list of the larger medical libraries in the United States, England, and some continental countries arranged chronologically by the date of their founding. The earliest library listed there is the Bibliothèque Nationale, which began collecting medical literature in 1518; if the earliest entirely medical library is sought, it is found to be the Bibliothèque de l'Ecole Supérieure de Pharmacie, which was founded in 1570. Earlier medical collections also existed in monastic and other libraries, of course. From 1600 until 1900, the newly founded medical libraries take three and a half pages to list; from 1900 to 1941, when the list ceases, there are

[17] Doe. Handbook . . . *Op. cit.*, p. 1–6.

[18] Thornton. *Op. cit.*, Chapter 12: Medical libraries of today, p. 203–217.

[19] See, for example, André Hahn's work, La Bibliothèque de la Faculté de Médecine de Paris. Paris, Librarie le Françoise, 1929, p. 32, which shows that the books in that library were chained in 1519. Another non-monastic, sixteenth century medical library was connected with the Royal College of Physicians in London.

[20] Thornton. *Op. cit.*, p. 244–249.

enough medical libraries to fill two more pages. If this proportion is fairly accurate, it would appear that medical libraries grew much more rapidly in the twentieth century than at any previous time in history.

This growth of public medical libraries was probably due, in part, at least, to the growth of the medical literature itself. When few books and journals were published, it was possible for the physician to obtain them all personally; it was also possible for him to house them in his own home or office. And finally, a smaller literature made it possible for the physician to read a large portion of what was being issued as it appeared and to use his own memory to locate pertinent items later when wanted. Under such a system the indexes to the literature could cover fewer works; moreover they would appeal more to the user if they were arranged by some classification scheme which showed not only what was exactly pertinent to the question in hand, but what was closely related. Since the user of the index was also the scholar in the field, he knew the relationships between its parts and could locate peripheral material of value to his investigation.

As the literature became larger, however, the financial burden of obtaining and housing it became too great for the individual physician, who then proceeded to "club" together with other physicians in his neighborhood to obtain the material jointly. The growth of libraries of local societies and academies of medicine in the United States in the nineteenth century can easily be explained on these grounds. At first there was probably nothing more than a physical pooling of resources; as the number of volumes

in these academy libraries increased, it was found necessary to make better provision for their care and use. A reading of some of the early reports of these libraries shows that this provision was frequently in the person of one of the physicians, or of a retired or handicapped physician, who looked after the books physically, often made some kind of catalog of them, and, for the few hours the library was open, helped the other physicians in locating the material they wished to consult. Two things usually took place soon after the turn of the twentieth century which broke this cycle: either the physician who had acted as librarian died and it was found impossible to locate another one who would take on the task as a volunteer or at the meager salary offered by the local society; or else the collection got so large it was necessary to provide the librarian with one or more assistants. Sometimes, indeed, the two things took place at the same time in the same place.

The obvious answer to the inability to get a physician-librarian at the salary the local medical society would pay was to get a woman to do the work. This economic fact was strengthened by the emergence of schools of librarianship, the first of which was founded in 1887, whose graduates were able to bring more order and efficiency into the library than their predecessors had been able to do.[21] The

[21] The lack of interest of men in entering the indexing field was noted by many people. Garrison pointed out in his memorandum of August 5, 1929, that "as an eminent authority (Mr. Herbert Putnam, Librarian of Congress) observed to Col. Ashburn, enthusiastic workers of this kind are no longer to be found among the male sex. The obvious solution was the Chicago idea—a large and efficient female personnel." It should be pointed out, however, that he was referring to library indexers.

fact that these trained librarians did not know the field of medicine, however, had serious implications for medical indexes. As pointed out earlier, the literature of medicine had grown to the point where the average physician could not read it as it appeared. It had also become so voluminous that finding one's way around it was becoming a specialized undertaking hardly possible for the amateur. More and more the physician began to ask the librarian to "work up the literature." In delegating this responsibility to another, the physician was acknowledging that he would not or could not find what he needed to know. It is not surprising, therefore, that the user of the medical indexes gradually became not the physician but the librarian untrained in medicine. But it was difficult for a person untrained in medicine to make the most effective use of an index requiring a knowledge of the subdivisions of the subject and their relationships. Where it might be obvious to the physician that tumors of the jejunum could be found in works on diseases of the gastrointestinal tract, for example, it would not be *a priori* knowledge of the librarian without the medical background.

There have always been physicians who have found the alphabetical arrangement easier to use than the classified one, however, as Billings learned when he examined comments on the *Specimen fasciculus*; and it is generally true today in American medical libraries that the librarian can use a classified bibliography more expertly than the physician. Another fact which bears on this problem is that Americans have always seemed to prefer alphabetical indexes, while Europeans seem to prefer a classified arrange-

ment. As the publication of important medical bibliographies shifted from Europe to America, alphabetically arranged lists became more common, and because more common, more easily used. Perhaps a final reason for the preference of American physicians for the alphabetical arrangement in the second half of the nineteenth century was their experience in using the *Reader's Guide* and the *Annual Library Index*, both arranged alphabetically.

For these reasons then—that scientific literature did not lend itself easily to classification, that periodical literature had become too large for the physician to cope with it himself, that salaries in most medical libraries were too poor to attract medically trained librarians, and that Americans supplanted Europeans in the publication of important medical indexes—the value of classified medical bibliographies became less and the value of alphabetically arranged dictionary bibliographies greater. It seems to follow that as long as these conditions continue, the alphabetical arrangement will be preferred.

Because the form used by the *Quarterly Cumulative Index Medicus* made it easy to use, both for the physician and the non-medically trained librarian, it was an immediate success. Moreover, the Army Medical Library was relieved of its responsibilities for producing a current index and the American Medical Association was able to utilize much of the literature collected in the greater library in Washington without itself having to acquire it. Theoretically, therefore, the union was a symbiotic one; in actual practice it was soon found impossible to edit successfully in Chicago material to be seen only in Washington. In 1931, therefore, the agreement between the two

libraries came to an end, with the understanding that the American Medical Association would continue to publish the enlarged *Quarterly Cumulative Index Medicus*.

The new series of the *Quarterly Cumulative Index Medicus*, a series entirely under the aegis of the American Medical Association, started up in 1932 and continued without major alterations in style, format, or indeed fundamentals, until the outbreak of the second World War. At that point it became more and more difficult for the American Medical Association to publish its index on time. A printers' strike and other technical and personnel difficulties appeared from the 1940's on. At first the quarterly features of the work were dropped so that it appeared semiannually only. Even this schedule had to be abandoned after a year or two, however, until, at its worst (in 1950 and 1951), the *Quarterly Cumulative Index Medicus* was more than two years behind its publication date. In an effort to help, the Association decided to abandon its publication schedule, omit at least one volume entirely for the time being, and present the more modern materials first. The period January–June, 1949, has up to 1954 never been covered by the *Quarterly Cumulative Index Medicus*, and there is some question whether this bibliographic gap will ever be closed.

With the cessation, for all practical purposes, of the *Quarterly Cumulative Index Medicus* during the war years, the medical public had to look elsewhere for its indexes. Although some issues of the German *Berichte* and *Zentralblätter* were available in the United States through the Office of the Alien Property Custodian and its reprint program, American holdings were rather spotty, particularly

after 1944; the British and American indexing and abstracting tools, many of them begun at this period in an attempt to fill the vacuum left by the non-appearance of the usual German tools, compared unfavorably in scope, coverage, or tone with the earlier works. Again the bibliographic world turned to the Army Medical Library for aid.

In 1941, an enthusiastic research chemist and philanthropist, Dr. Atherton Seidell, who wished to popularize the use of microfilms by scholars at a distance from adequate libraries, presented some photoduplicating equipment to the Army Medical Library and paid much of the incidental expense for preparing free microfilms of articles in the collections of the Army Medical Library. This service was geared especially to the needs of medical officers outside continental United States, but it was also available to many others. It was soon realized, however, that in order to make the service popular, it was necessary to inform potential users of what could be obtained on microfilm. For that reason, as founder of a Friends of the Army Medical Library group, Dr. Seidell arranged to have some of the cards of the *Index-Catalogue* copied each evening after the Library was closed and published by photo-offset in a weekly list of the contents of some of the more useful journals received in the Library. This was called the *Current List of Medical Literature*. According to Dr. Seidell, it was purposely made small to fit into a man's pocket and flimsy so that readers would have no qualms about marking it up or discarding it when its usefulness had passed. The list had no author or subject index, although a rough grouping of the journals into fifty broad subjects was fol-

lowed. The plan on which the *Current List of Medical Literature* was based can be traced back as far as the eighteenth century.[22] Among others, two modern predecessors were the Japanese index, *Index universalis dissertationum originalium artis medicinae e libellis periodicis extractus* (*Igaku Gentyo Sakuin*) (Mukden, Manchurian Medical College, 1920) and the American journal, *Current Titles from Biological Journals* . . . volume 1, numbers 1–3 (May–July 1937). It appears, however, that Dr. Seidell was not aware at the time of these earlier indexes.

The *Current List of Medical Literature* continued on its way for several years without being of more than secondary interest to most librarians or to physicians with access to medical collections. In 1945 costs exceeded private means and the journal was taken over by the Army Medical Library as a government publication. When the *Quarterly Cumulative Index Medicus* ceased to appear regularly, however, a greater degree of interest was shown in this publication, especially since its coverage was probably greater than that of any other current medical index available for general distribution. As a result it was put to uses for which it had never been designed, and immediately its weakness in its role of ranking index to medical literature became apparent. The Army Medical Library considered that the publication of a periodical index was a responsibility of the national medical library; therefore, it at-

[22] See, for example, the Commentarien der neuern Arzneykunde. Tübingen, v. 1–6, 1793–1800; for modern counterparts, see also the Indice medico progressivo de la literatura Española. Barcelona, v. 1, 1945/46.

tempted to do away with the most glaring deficiencies. A monthly subject index (made from the cards originally prepared for the *Index-Catalogue*, and never from the articles themselves) was added in July 1945, a list of the journals indexed was placed on the back cover of the issues, and finally an author index was attached. However, it was clear that the fundamental structure of the work was wrong for the use to which it was being put, and the very necessary complete overhauling was finally made for the issue of July, 1950, which appeared almost simultaneously with the cessation of indexing for the *Index-Catalogue*.

The cessation of the *Index-Catalogue* at this time was brought about by several causes. Although the cost of publishing the *Index-Catalogue* was one reason for discontinuing it, a more important consideration was the fact that it was lagging further and further behind in presenting the medical literature to the medical community and it was felt that an entirely new system was needed to answer modern needs. For that reason, the Committee of Consultants for the Study of the Indexes to Medical Literature Published by the Army Medical Library (which is discussed in more detail later) appointed a Subcommittee to make recommendations on the *Index-Catalogue*. This Subcommittee consisted of Dr. Basil G. Bibby, Dr. Sanford V. Larkey, Dr. Mortimer Taube, and Dr. Eugene W. Scott as chairman. It met several times and on October 20, 1949, it made a report to the whole committee. The entire committee then drafted its recommendations and sent them to the Surgeon General of the Army through the Director of the Army Medical Library:

Recommendation No. 1

The *Index-Catalogue* should be stopped as soon as it is administratively possible to do so. This means that the Subcommittee feels that the publication of the present series should not be completed and that the volume now in preparation should be the last volume of the *Index-Catalogue*.

Recommendation No. 2

The Army Medical Library should continue to develop an indexing program of its current receipts of current material. Initially the publication from this indexing program could probably best follow the general pattern of the *Bibliography of Agriculture*, and might be developed from the *Current List*.

Recommendation No. 3

Consideration should be given to publication of a catalogue of selected monographic material from the backlog, including theses and dissertations in a dictionary arrangement by author and subject.

Recommendation No. 4

The present backlog of cards intended for use in future volumes of the *Index-Catalogue*, minus the cards for the monographic material already provided for, possesses values that should not be lost. Methods of utilizing these cards should be developed by the Army Medical Library.

Recommendation No. 5

> Selected non-current monographic material to be received in the future should be included either in the current index or in some other catalogue of monographic material. Non-current serial publications should be carefully recorded as to whether or not they have been analytically indexed.

After studying the recommendations of the Committee, and consulting with others, the Surgeon General approved the recommendations, and indexing for the *Index-Catalogue* stopped as of April 1950. Plans have been made for publishing one final volume (series 4, volume 11, MI-MZ), which is expected from the printers about June 1955, and for printing the lists of monographs, as suggested by the Committee. In addition, the unpublished portion of the *Index-Catalogue* is available to users through the Armed Forces Medical Library's photo-duplication service, which will make microfilm and photostat copies of the cards for a small fee; however, the estimate of the cost of reproducing the entire file has been so great it has not been possible to consider that.

In the light of the Committee's recommendations that a new current indexing scheme be developed by the Army Medical Library, the *Current List of Medical Literature* was expanded. Under the new set-up, it changed from a weekly to a monthly publication, and it was divided into two parts in each issue: the register, consisting of a list of the tables of contents of each journal, with the journals listed alphabetically without regard to their subject interest; and the index, containing the author and the sub-

ject entries. By the use of this arrangement, it is possible to locate articles by author, by subject, or by journal issue. Cumulations of the index portion were planned for: the first cumulation for the six-month period, July-December 1950, the second cumulation embracing the entire year 1951, with subsequent cumulations planned on a semi-yearly basis. Several changes have been made in the subject headings used, the most far-reaching of which appeared in the January 1952 issue. This group of changes was in the direction of a semi-classed index, and was based on the belief that users of a medical index must bring some knowledge of the subject to the work.[23]

In 1953, as in 1926, there were two American indexes to medical literature, each covering some of the same ground as the other. In 1953, the *Quarterly Cumulative Index Medicus* and the *Current List* between them indexed about 2000 journals. Of this total, approximately a third were covered in both indexes, while two thirds appeared in one or the other only. (In general, the *Current List* has had more Slavic publications and more in such fields as pharmacy and dentistry than has the *Quarterly Cumulative Index Medicus*.) Under these circumstances, it is not surprising that suggestions have once again been made for the amalgamation of the two tools, or for the division of the entire field between them so that less overlapping would occur. It is argued that the money spent in indexing a third of the journals twice could be better used for adding titles to the total indexed. For this reason two different solutions are usually offered: one that the two indexes jointly

[23] Taine. *Op. cit.*

prepare a single tool, and the other that certain journals be indexed by one of them and others by the other.

With the experiences of the earlier attempted amalgamation still vivid, it has seemed difficult, if not impossible, for one index to be prepared jointly, although this might be considered the logical course by all concerned. Another suggestion, that the American Medical Association turn over to the Army Medical Library its annual outlay for the *Quarterly Cumulative Index Medicus* and let Washington publish the one index in its own way, has understandably met with a cool reception.

The second suggestion has fallen on the barren ground of lack of clear-cut criteria for division of the field. If the *Current List* is to publish an index to one group of journals, which group should it be? Language, country of origin, and subdivision of the subject of medicine have been the three most often suggested break-downs. Any one of these, however, is likely to result in one index which contains the popular journals, thus making that index a success from the point of view of subscriptions; and another index with the less used magazines read by a comparative handful of people. For these reasons, consequently, although both the Armed Forces Medical Library and the American Medical Association agree that some form of cooperation should be worked out, no concrete plans have been approved as yet.

Other Tools

In order to fill in some of the background of medical indexing in the first half of the twentieth century, some mention should be made of 1) *Excerpta medica* and 2) the

efforts of UNESCO to bring about adequate but not overlapping indexing. *Excerpta medica* is an attempt to use the techniques worked out for the less voluminous literature of the nineteenth century (especially by the *Berichte* and *Zentralblätter*) in a twentieth century situation. UNESCO, which started with such enthusiasm and high hopes for the future, has not been in existence long enough to produce much that is tangible in the field of planning for medical indexing.

Excerpta medica is an abstracting journal published in Holland but in the English language. It is divided into sixteen subject sections, such as Anatomy and Physiology, Tuberculosis, or Radiology, each of which can be purchased separately if desired. Within these sections the articles, abstracted by specialists in the field, are arranged according to a broad classification scheme reminiscent of the German tools of which *Excerpta medica* can be said to be the descendant. An alphabetical author index appears with each issue; but there is no subject index until the appearance of the annual author and subject index for each section which is sent to all subscribers as much as one year late. Beginning in 1951, *Excerpta medica* appeared in photo-offset form to allow it to appear more quickly and more cheaply.

Although *Excerpta medica* was advertised to include *all* medical literature, its coverage only approaches that of the *Quarterly Cumulative Index Medicus*, or the *Current List*, as was shown by a recent study at the Armed Forces Medical Library. It is also more selective within these journals, but the fact that it presents English abstracts of articles in foreign languages has made it useful to the many American

physicians who read nothing but English. Many small libraries find *Excerpta medica* especially useful because it brings them knowledge of material which they can then obtain from larger libraries. Its coverage and methodology have grown noticeably better since its founding. Under the general guidance of UNESCO it has recently collaborated with other European indexing tools in joint publication of some of its abstracts; and as a by-product of its central work, it has attempted to sell its services to groups, such as the National Foundation for Infantile Paralysis, which are interested in specific subject bibliographies.[24]

Since it was felt after World War II had ended that the void left by the discontinuance of the German indexing and abstracting tools had to be filled, a number of attempts were made to launch new works, of which *Excerpta medica* was just one.[25] The large number of such publications made duplication of effort inevitable; yet none of these tools (nor indeed all of them put together) was able to present a comprehensive coverage of the world's medical literature. Under these circumstances the aid of UNESCO as a unifying force was sought, and a series of conferences of editors, librarians, and others interested in indexing

[24] Fishbein, Morris. Recent Developments in Medical Indexing. Bull. M. Library A., 40: 116–121, 1952.

[25] Bloch, Maxene Hubbard. New Abstracting Tools in the Field of Medicine. Bull. M. Library A., 36: 53–58, 1948, and International Federation for Documentation List of Current Specialized Abstracting and Indexing Services . . . (International Federation for Documentation. Publication No. 235, 1949). This list, however, contains many journals which are not really abstract journals, but which have abstracting sections.

and abstracting in the field of biology was held under UNESCO's auspices.[26] A meeting on a similar subject was also called by the Royal Society in London.[27] These conferences all came to the conclusions that 1) more information was needed about the use made of indexes and abstracts and 2) cooperation might do away with some of the overlapping of present services or even make it possible to extend the coverage of the world's literature. Although several minor schemes of cooperation have been worked out as a result of the meetings, no large-scale change in the methods of indexing medical literature has resulted from UNESCO's conferences on bibliography in the sciences. As a preliminary, an attempt has been made to learn the boundaries of the problem by determining how many medical periodicals exist to be indexed currently; a UNESCO publication *World Medical Periodicals*, a list of all medical periodicals known to the compiler, the Information Officer of the *British Medical Journal*,[28]

[26] Many reports of these meetings have been published. UNESCO. Co-ordinating Committee on Abstracting and Indexing in the Medical and Biological Sciences. Report. Paris, 1950. (Pub. no. 580) and International Conference on Science Abstracting, Convened in Paris by the UNESCO during June 20–25, 1949. Final Report. Paris, UNESCO, 1951. Cunningham, Eileen R. Report on United Nations Educational, Scientific, and Cultural Organization Conference on Coordination of Medical Abstracting Services. Bull. M. Library A., 36: 38–45, 1948; Medical and Science Abstracting: Conclusions and Recommendation from Two International Conferences. *Ibid.*, 38: 125–134, 1950, and *Ibid.*, 40: 474–478, 1952. Report of the Committee on Bibliography, Medical Library Association. *Ibid.*, 40: 462–464, 1952.

[27] Royal Society's Scientific Information Conference. *Op. cit.*

[28] Morton, Leslie T., comp. World Medical Periodicals. Paris, UNESCO, 1952.

was scheduled to appear in 1952, but was held up by legal difficulties and finally appeared in 1953.

Attempts at international cooperation in scientific bibliography have tended to go from a first enthusiastic response to a more cautious one and finally to be discarded with more or less fanfare. This has been the fate of the *International Catalogue of Scientific Papers*,[29] the Universal Decimal Classification, and the Brussels Institute's *Concilium bibliographicum*.[30] While it is too early to write of UNESCO's present ventures as another in a series of international failures in bibliography, it is unfortunately true that little has yet been done to maintain the high hopes of five years ago.[31]

There were probably a number of reasons contributing to the lack of success of UNESCO's efforts, but perhaps the most important was that those meeting under the sponsorship of UNESCO have not really concerned themselves with the fundamental problem of bibliography in the mid-twentieth century: which is that for a number of reasons the systems worked out for listing the smaller literature of the nineteenth century are now inadequate. For one thing, the literature has grown so large that

[29] See the reports of meetings on the subject in Science from 1898 to 1914. A good summary of the history of this tool is given in: Murra. *Op. cit.*, p. 24–53.

[30] See *ibid.*, and Richardson, Ernest C. The Brussels Institute Again! Lib. J., 52: 795-801, 1927.

[31] It must not be forgotten that the role of UNESCO is to act as a coordinator and to encourage groups working together toward the same goal. UNESCO itself is not organized to carry on projects of its own; even should it wish to do so, its funds would be inadequate for any such task.

methods requiring individual handling for coding and retrieving of the information take too long. For another thing, useful medical literature is now being published in places and in languages where previously it had been unknown; the task merely of learning about the existence of this literature has become enormous, to say nothing of the problems of obtaining or storing it. Third, science itself has shown a tendency to retreat from its most advanced international position to publish more national bibliographies.[32] And fourth, there has emerged on the medical scene the separately published report, such as the reports of government projects concerned with medical contracts, many of them restricted in circulation because of their bearing on military security. To none of these problems did the conferees seem to pay the same attention they did to the problem of joint international cooperation (especially through national bibliographies, which is UNESCO's recommended pattern). What is needed is not something to persuade the groups to work together, but some new plan on which they can all work with some chance of success.[33] What is needed are entirely new methods to handle the large group of items (books, journal articles,

[32] Adams, Scott. National Medical Indexes. Bull. M. Library A., 38: 238–245, 1950. UNESCO has also encouraged this tendency, as leading eventually to a universal bibliography.

[33] "The position had been reached where almost every scientist and technician agreed that something should be done but nobody could decide on the exact course of action or, if they agreed on the course of action, they could not put forth concrete proposals for implementing it." E. M. B. Ditmas. Co-ordination of Information: A Survey of Schemes Put Forward in the Last Fifty Years. J. Documentation, 3: 209–221, 1948, especially p. 220.

or near-printed reports) with ease and dispatch, and these no one so far has been able to determine, in spite of the large number of people in all fields working on the problem.

One problem, which has already been discussed in passing in this chapter, has begun to be studied in more detail, however: that of learning who uses the bibliographies and indexes to the medical literature and in what way they use them. The answers to these questions would obviously give some indication of the most useful form for medical bibliographies, and several attempts have been made to come to grips with the problem; unfortunately few investigations have yet emerged which could stand any examination of their methodology. On one hand, the universe in such a study is extremely large; on the other, the variables are not sufficiently well known to make sampling an accurate technique. As a result there have been several reports of answers obtained by questionnaires or interviews with limited groups of scientists and librarians, which leave many doubts as to the validity of their conclusions. Many have resorted to random samples; in some cases the questions have not been standardized; and in other cases the questions have actually been "stacked," whether consciously or unconsciously, so that answers have inevitable biases. Many of the findings have never been published.[34]

[34] For some of these see: Bernal, J. D. Preliminary Analysis of Pilot Questionnaire on the Use of Scientific Literature. (In: Royal Society's Scientific Information Conference, *op. cit.*, p. 589–637); Bray, Robert S. Physics Abstracting Study of the American Institute of Physics. Spec. Lib., 40: 248–250, 1949; Armed Forces Medical Library Research Project. Unpublished reports; Cunningham-Morgan-UNESCO—Personal communication, and Herner. *Op. cit.*

Since different groups use medical indexes in different ways and with different backgrounds, it is imperative to find the answer to this question. In 1876 this was easy; Billings remarked that he was preparing the *Index-Catalogue* for the English speaking physician. Today, however, so clear-cut an idea of the ultimate user of the indexes now being compiled is lacking.

Faced with "this appalling post-war bibliographic chaos"[35] those concerned with bibliographic problems in medicine have reacted in one of three ways: they have concluded that nothing can be done to better the situation and have given up trying, or they have retreated into the comfortable psychological position of saying that what is unindexed is unimportant,[36] or else they have looked to the development of a machine to do some of the work which has proved too great for the human population to undertake. Although over-enthusiasm and wishful thinking have caused some people to expect more from machines than any

[35] Murra. *Op. cit.*, p. 47.

[36] "Two universal characteristics of those in this group are that they rule out the great uncounted masses of material which they have not mastered (without having seen it, and thus without having any idea of what is in it) by indicating that it is probably sour stuff anyway, and by the fact that the material referred to is always written by someone writing in some ungodly tongue, or some ungodly style, or, as a least common denominator, by someone other than the one who happens at the moment to be decrying the low quality of the mass of material excoriated." Ralph R. Shaw. Machines and the Bibliographical Problems of the Twentieth Century. (In: Bibliography in an Age of Science; Windsor Lecture, Presented at the University of Illinois, March 1950. Urbana, University of Illinois Press, 1951.)

of them can perform,[37]: [38] they do represent the twentieth century's attempt to find a new solution for its new problem and as such are a hopeful sign of flexibility of mind.

Although there has been much discussion about machine methods in bibliography, all the machines suggested for this purpose appear to be of one or two basic types: they either store the material compactly or else they scan and sort the material very rapidly, with special emphasis on interrelationships between parts of subjects. The most advanced machines, indeed, appear to do both at once.[39]

Storing of information can again be broken down into two main divisions: either the original is stored photographically (as in microfilm, microprint, or memex) or information about the original is coded and the coded portion stored as a pointer to the original. (The marginally punched card, the Hollerith punched card, and the magnetized tape are examples of the latter method.) Sorting, whether of punched cards or of microfilm in the Rapid Selector, has generally consisted of matching a pattern

[37] "Machines do not now, nor will they in the foreseeable future, handle the intellectual aspects of bibliography." Ralph R. Shaw. Management, Machines, and the Bibliographic Problems of the Twentieth Century. (In: Shera and Egan. *Op. cit.*, p. 202.)

[38] "Nevertheless the central problem remains; no machine can by itself, make the initial record and classification . . ." Ditmas. *Op. cit.*, p. 220.

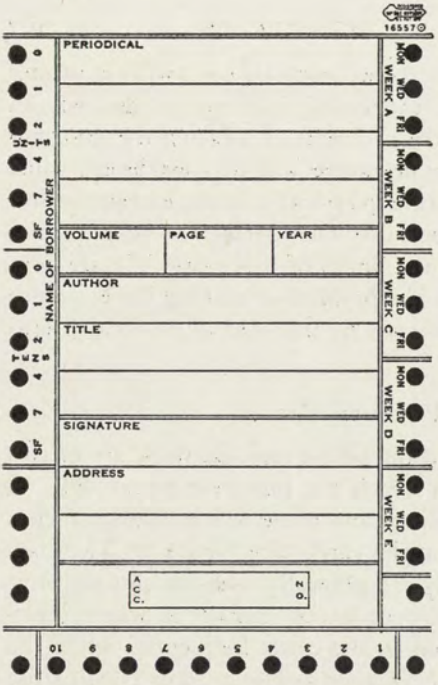
[39] According to Shaw, there are five main classes of machines used for bibliographic purposes: storage devices, mechanical sorters, mechanical sorting and addressing devices, electrical sorting and reproducing devices, and electronic sorting and reproducing devices. Shaw, R. R. Machines and the Bibliographical Problems of the Twentieth Century. *Op. cit.*, p. 45. See also his: The Future of the Serious Book. Stechert-Hafner Book News, 6: 68, January 1952.

of blank spaces, dots, holes, sounds, etc., with a master pattern representing the coded information desired. In this discussion only the problems of locating the information contained in the literature will be considered; while the storage of literature physically is an extremely important matter, especially considering its exponential growth, it is outside the limits of this work. We are concerned here only with the problem of making the existence of the information known to the user of medical literature.

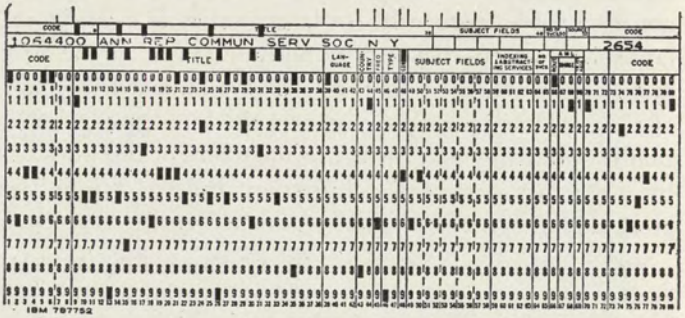
Punched Cards

Punched cards used for bibliographical work are of two main kinds: those in which the punches appear only on the periphery of the card, and those in which the punches appear at any point on the card. (See Figure 7.) The marginally punched cards are generally used for shorter compilations (usually not over 10,000 items)[40] or where information must be added to the cards frequently, while the interior-punched cards (known as Hollerith or IBM cards) are used more frequently for larger series and where relationships are particularly important. Since in the first system only the edges of the cards are punched, the rest of the card can be used to indicate the bibliographic citation by words, by an abstract or microfilm of the work, or by any other pertinent information. Indeed, this is the great advantage of marginally punched cards; that they

[40] Zeising, H. C., Jr., and Martin, P. T. Commercially Available Punched-Card Systems, Equipment, and Supplies. (In: Casey, Robert S. and Perry, James W., eds. Punched Cards; Their Application to Science and Industry. N. Y., Reinhold, 1951, p. 39–75.)



7a. Marginally Punched Card



7b. Interior Punched Card

Fig. 7. Punched Cards

can be read directly after they have been sorted, while the IBM cards must be run through a machine which "interprets" the pattern of punches.

Another difference between the two kinds of cards has been the detail which can be coded into the cards. Because the number of notches which can be cut into the marginally punched card is not so large as the number of holes which can be made in the IBM card, the fineness of subdivision of coding in the latter has usually been far greater than that in the former system. In general there are eight punches per inch in the peripherally punched card; in a card eight by ten inches there are thus 288 possible punches. In the standard IBM card, on the other hand, there are eighty vertical columns usually divided into twelve punching positions, for a total of 960 possible punches,[41] although new devices have raised this number greatly, and new methods of random punching have made this less important than previously.

A third major difference between the two methods of using punched cards is that the peripherally punched card can be entirely hand operated, while the IBM card is always dependent upon machines for coding, for sorting, and for decoding ("interpreting").

Since there has been much published in the last few years on punched cards,[42] it seems unnecessary to describe

[41] *Ibid.*

[42] See, for example, Casey, Robert S. and Perry, James W., eds. Punched Cards; Their Application to Science and Industry. N. Y., Reinhold, 1951, which contains a long bibliography and a review of previous work; and also Mooers, Calvin J. Zator Technical Bulletin, no. 30, 31, 51, 55, and 57 [mimeo.]

here the techniques of coding, punching, or sorting punched cards. What will be discussed instead is the impact of such methods upon bibliographic work in the medical sciences.

In using punched cards for medicine, the first thing that must be done is to determine the items to be coded and punched. Most commonly this is the subject or subjects treated in the work, especially the interrelationships between them. Occasionally the authors of the work, the publication in which the title appeared, or other factors may be punched. Up to this point the work has been no different from that of older methods of indexing medical literature, which is, indeed, the reason why punched cards have not solved the problems of medical bibliography. (A further discussion of this point is given below.) The advantages of the new system, on the other hand, are that more concepts can be coded than was economically feasible under the old system, and that no set verbal list of subjects (subject headings) need be used on the card itself. This coded information must, of course, be punched onto the card, checked for accuracy, and filed.

A further disadvantage in the use of these coded cards is that it is not possible to go to one section of the compilation and immediately pull out the desired information, as is true of the more conventional indexes and catalogs. It is said that one of the advantages of punched cards is that they can be kept in random order; but this advantage has the accompanying disadvantage of making it necessary to sort the entire collection of cards each time an item coded onto them is desired. Since in a collection of any size this is an important disadvantage, many punched

card systems have reverted to some system of filing the cards, which in itself is an added expense. The delay in use caused by the need to "interpret" IBM cards before use has already been mentioned.

Punched cards have not cut the cost of indexing medical literature because the most expensive part of this in the past has been the adding of a subject designation for each item to be listed (books, journal articles, reports, etc.) and this cost still remains. The reproduction of subject information, once determined by the indexer, has been standardized and made relatively inexpensive by such devices as the use of clerical help to type the main portion of the citation, or the distribution of information widely by means of photo-offset, micro-photography, and the like. The new method of bibliography by punched cards has not in any way done away with the main cost, the indexing of each item separately by a skilled worker; in addition the results are not so easy to use, the file cannot be used by several people at one time, the cards cannot be "published" in the normal sense of the word without much re-arrangement and editorial work. In addition, the interpolation of costly electrical devices and machines between the IBM punched cards and the user has raised the total cost of indexing by IBM cards to more than the cost of the older methods.

For all these reasons, punched cards have not been accepted for any large-scale indexing of the medical literature, which publishes more than 100,000 journal articles yearly,[43] although punched cards can certainly be used in

[43] The Current List of Medical Literature for 1953, for example.

this way. In general they have been employed for indexing smaller segments of the total literature, usually by one person for his own use.[44]

Army Medical Library—Johns Hopkins Project

An attempt to study bibliographic methods scientifically was made by the Army Medical Library in 1948. By this time it was apparent that there was no current index to a large segment of the medical literature, for the *Quarterly Cumulative Index Medicus* was suspended and the *Current List* had not yet changed to become the real index it was later to be; the British Medical Association's *Abstracts of World Medicine* and *Abstracts of World Surgery* were handling only small portions of the total literature, and the German indexes were largely unpublished from the war years on. Even the *Index-Catalogue*, which could only be of partial assistance for locating current literature, was unable to keep up its previous publishing schedule. As the group most intimately connected with publishing medical indexes over long periods of time and with receiving requests for bibliographic aid from those who had tried other sources unsuccessfully before approaching them, the Army Medical Library was naturally particularly concerned with the situation. At the suggestion of Colonel J. H. McNinch, then Director of the Library, the Surgeon General of the Army in 1948 appointed a Committee of Consultants for the Study of Indexes to Medical Literature Published by the Army Medical Li-

[44] For a list of some of these projects, see Casey and Perry. *Op. cit.*, p. 460–488, especially p. 471–473.

brary, and arranged for a Research Project at Johns Hopkins University to undertake fundamental investigations into the problems of medical indexing. The Committee originally consisted of: Drs. John F. Fulton, Morris Fishbein, Ebbe C. Hoff, Sanford V. Larkey, Chauncey D. Leake, William S. Middleton, Eugene W. Scott, Ralph R. Shaw, Lewis H. Weed, and Miss Janet Doe.[45] The Office Order which set up the Committee also authorized the Research Project "to study . . . problems, gather factual data, analyze such data and explore the possibility of using mechanical aids in the preparation of indexes." Results of these studies were to be made available to the Committee, which in spite of its name, was charged with examining "the indexing requirements of modern medical science" as well as the place of the Army Medical Library in the scheme of medical bibliographic control.

Soon after the Research Project was set up at Johns Hopkins University, its director, Dr. Sanford V. Larkey, presented three major aspects of the work to be undertaken.[46] These were: "1.—Evaluation and study of our present indexes. 2.—The detailed study of subject headings. 3.—Study of the possibility of using machine methods." Dr. Larkey also reported on the project at each annual meeting of the Honorary Consultants to the

[45] Bull. M. Library A., 37: 92–94, 1949, and Office Order No. 47, Office of the Surgeon General of the Army, 7 July 1948. See also the Committee's Final Summary Report, 1948–1952. Amer. Documentation, 3: 219–222, Fall 1952.

[46] Larkey, Sanford V. The Army Medical Library Research Project at the Welch Medical Library. Bull. M. Library A., 37: 121–124, 1949.

Army Medical Library from 1949 to 1952. Much preliminary work has been done by this Project and although it has not been possible so far to reach any very important conclusions, several useful by-products have come about through the efforts of this group: notably a categorization of subject headings used in the preparation of the 1950 and 1951 *Current List*, and an IBM punched card list of medical journal titles. With more time and money, more rigorous planning, a more stable research staff, and a more easily defined subject than was available to the Research Project, more might have been expected. It must not be forgotten, however, that this Project represents the first large-scale attempt to use the methods of experimental science in bibliographic problems; as such it can obviously be incomplete and inconclusive and still be the most important modern development in medical bibliography.

Present Status

Although the successful solution of the problems of medical bibliography appear to depend upon some system or method which will be worked out in the future, the need for a knowledge of what is being published is present at the moment, and a picture of how this problem is being met *at the moment* is needed to round out the story.

There appear to be at least three different approaches to the problem in use today. For the average physician, the literature is adequately enough covered by one or several indexing and abstracting tools which make no attempt to be exhaustive. Chief among these are the *Current List of Medical Literature*, *Quarterly Cumulative*

Index Medicus (late as it is in appearing), *Excerpta medica*, and specialty journals and abstracting tools (for example, *Cancer Current Literature*, *Psychological Abstracts*, or the *International Abstracts of Surgery*). For the research worker, there has also been a dependence upon indexes and bibliographies which are not purely medical in nature but which do include large sections of medical information; the title most used in this connection is *Chemical Abstracts*, with *Biological Abstracts* a runner-up. Since most journals of this nature exclude clinical material (with varying degrees of completeness), they are of little use to the clinician; however, their fairly prompt appearance and generally workmanlike contents may make them especially useful to those working in medical fields which are covered by these works. (For example, pharmacologists find *Chemical Abstracts* valuable, and those working in tropical diseases find the entomological sections of *Biological Abstracts* helpful.)

The third approach to modern literature is taken by those who are librarians, editors, bibliographic assistants, historians, and the like. These people must go to a large number of sources to obtain the material they are seeking; consequently they must be aware of many works in the field, know the advantages and shortcomings of each, and be prepared to use each in its most appropriate place. These are the people who must understand the law of the diminishing return in bibliographic work, who must realize that a large per cent of all the citations found on any subject can be obtained in a certain small number of indexes (varying, of course, with the subject), but that the culling

of the remainder may make it necessary to scan a large number of tools.[47] These are the people most aware of the shortcomings of modern medical bibliography, and most aware, too, of both the large number of tools which attempt to solve some of the problems and the theories and research being done now on new methods in the field. Both their training and their daily experience make them more aware of the gaps in the medical indexes than any other group.

The Future of Medical Bibliography

What of the future of medical bibliography? It would indeed be a rash person who would make any predictions about the future. As shown in the earlier pages of this work the schemes of the past have one by one been found to be inadequate to the present situation; at the same time medical bibliography has not yet discovered a new method which can handle the task it must perform if medicine is to continue to advance.

Indeed, it might be said that medical literature and the indexes to it have engaged in a never-ending game of leapfrog; each time medical bibliography has seemed to solve the problem of making available the information in the literature, that literature has grown in size or complexity or has developed new forms, which has again required new methods for its listing. Unfortunately, we have not

[47] Brodman, Estelle. Methods of Choosing Physiology Journals. Master's Essay. N. Y., Columbia University, 1943, and Lancaster-Jones, E. Evaluation of Scientific and Technical Periodicals. Rept. 15th Conference ASLIB, 1938; p. 72–81, 1939.

yet devised a system which will make the total literature published today available to those who need it; at the same time the earlier systems have not been able to absorb today's literature. The present, indeed, is like the condition described in Isaiah, a time between the times, when the old world has died and the new world has not the strength to be born.[48]

In such a situation there are only two possibilities: either the world of medicine must learn to be content with circumscribed goals and a return to a more haphazard knowledge of what has been reported in the total literature, or else an entirely new system of bibliographic control must be evolved, a system which is able to accept exponential growth of the literature without dislocation. For the latter there must be first a determined effort to decide what is necessary and desirable in medical bibliography, and second, long-term work of a rigidly scientific nature to examine and experiment with possible solutions of the problem. This work must be conceived in the same terms as similar work in industrial laboratories, as an investment for possible future rewards, critically reviewed for its methodology at intervals, and using "teams" of all the pertinent scientists to discover and test its proposed solutions. It must have money and the time to grow. But above all it must have the interest of really good thinkers and the cooperation of the physicians using the literature.

The great problems which have beset medical bibliography in the past have thus been the size of the literature, the inability to obtain all of it or information about

[48] Isaiah, 37: 3; II Kings, 19: 3.

it, the forms in which it has appeared, and the difficulty of classifying it. These problems still exist; only their quantity, not their quality, has changed. Just as in the past all the problems have never been solved at any one time, so it is questionable whether they ever will be solved entirely. Yet while the ideal solution is sought, which will bring at a moment's notice all the medical literature published anywhere and at any time, it is important to realize that not only must the present methods do for some time to come, but that they have not entirely broken down for everyday life. It is thus necessary to work pragmatically at keeping those methods going as well as possible. Like the philosopher who insists there is no world of reality but lives his everyday life as if there were, medical bibliography is now in the position of crying that lack of control of the literature is disastrous, yet continuing to make refinements in the obsolete system. Medical bibliography in a sense must work simultaneously on two tracks: the long-range ideal solution, and the present-day pragmatic answer.

APPENDIX I

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Whitehead, Alfred North. Science and the Modern World; Lowell Lectures, 1925. N. Y., Mentor Books [c1925]

Wilcox, W. F. [John Shaw Billings] (In: Dictionary of American Biography. N. Y., Scribner, 1929, v. 2: 269.)

Wilson, W. J. A Plan for a Comprehensive Medico-historical Library. Wash., Army Medical Library, 1949. [mimeo.]

Wolf, A. Classification. (In: Encyclopaedia Britannica. 14th ed. Chicago, Encyclopaedia Britannica [c1930] v. 5: 778.)

Zeising, H. C., Jr., and Martin, P. T. Commercially Available Punched-Card Systems, Equipment, and Supplies. (In: Casey,

Robert S. and Perry, James W., eds. Punched Cards: Their Application to Science and Industry. N. Y., Reinhold, 1951.)

Zimmermann, Johann Georg. Das Leben des Herrn von Haller. Zurich, Heidegger, 1755.

APPENDIX II

Medical Bibliographies Published Since 1500

Introduction

This list comprises all the printed bibliographies and indexes to the medical literature which I have been able to locate. Although it consists of almost three hundred titles, I am under no illusion that it is complete. I hope that readers will suggest additions; when a sufficiently large number of them have been collected, a supplement to the list will be printed in the *Bulletin of the Medical Library Association*. It should be noted, of course, that only "medical bibliographies," as those are defined in Chapter I of this work, are included.

The bibliographies are arranged by centuries, then within the centuries alphabetically by author, or title, if there is no author. Each item is numbered, and the author index refers back to the original citations by use of these numbers. Where it has not been possible for me to handle the bibliography, I have placed the source of my citation in parenthesis after the citation. A list of the sources searched follows this Introduction.

Principal Sources Searched for Medical Bibliographies

Adams, Scott. National Medical Indexes. Bull. M. Library A., 38: 238–245, 1950.

Besterman, Theodore, ed. Index bibliographicus . . . 3rd ed. completely rev. Paris, UNESCO, 1951.

———. A World Bibliography of Bibliographies and of Bibliographical Catalogues. . . . 2nd ed. London, Author, 1947–1949. 3v.

Cordasco, Francesco. Introduction to Eighteenth Century Medical Bibliography . . . Brooklyn, N. Y., Long Island University Press, 1950. (Eighteenth century bibliography pamphlets, No. 7)

Doe, Janet, ed. Handbook of Medical Library Practice. Chicago, American Library Association, 1943.

Dureau, A. Contribution à l'Histoire de la Bibliographie Médicale. Bull. Soc. franç. hist. méd., 1: 164–176, 1902.

Ersch, Johann Samuel. Literatur der Medicin . . . aus dessen Handbuch der deutschen Literatur besonders abgedruckt. Amsterdam, Kunst- und Industrie-Comptoir, 1812.

Garrison, Fielding H. Introduction to the History of Medicine . . . 4th ed. Philadelphia, Saunders, 1929.

Gregory, Winifred, ed. Union List of Serials in Libraries of the U. S. and Canada. 2nd ed. N. Y., Wilson, 1943.

Hahn, Lucien. Essai de Bibliographie Médicale. Paris, Steinheil, 1897.

John Crerar Library, Chicago. List of Bibliographies of Special Subjects. July 1902. Chicago, Printed by order of the Board of Directors, 1902.

Josephson, A. G. S. Bibliographies of Bibliographies. 2nd. ed. Chicago, Bibliographical Society of America, 1910–1913.

Klebs, Arnold C. Incunabula scientifica et medica. Short Title List. Bruges, St. Catherine Press, 1938. (Also in: Osiris, 4: 1–359, 1938.)

Meyer, Immanuel F. Repertorium der gesammten medizinischen Literatur. Berlin, Dornmann, 1809.

Paris. Bibliothèque Nationale. Département des Imprimés. Catalogue des Sciences Médicales. Paris, Didot, 1857–1889. 3v.

Pauly, Alphonse. Bibliographie des Sciences Médicales . . . Paris, Tross, 1874.

Petzholdt, Julius. Bibliotheca bibliographica; kritisches Verzeichniss der das Gesammtgebiet der Bibliographie betreffenden Litteratur des In- and Auslandes. Leipzig, Engelmann, 1866.

Sarton, George. Horus; a Guide to the History of Science. Waltham, Mass., Chronica Botanica, 1952.

Schneider, Georg. Handbuch der Bibliographie. 4. Aufl. Leipzig, Hiersemann, 1930.

Stein, Henri. Manuel de Bibliographie Générale; Bibliotheca bibliographica nova. Paris, Picard, 1897.

Thornton, John L. Medical Books, Libraries and Collectors . . . London, Grafton, 1949.

U. S. Armed Forces Medical Library. Index-Catalogue of the Library of the Surgeon-General's Office, U. S. Army (Army Medical Library). Wash., Govt. Print. Off., 1880– 57v.

U. S. Armed Forces Medical Library. Research Project at Welch Medical Library, Johns Hopkins University. Reports, 1948–1952.

Vallée, Léon. Bibliographie des Bibliographies. Paris, Terquem, 1883.

Viets, Henry R. Bibliography of Medicine. Bull. M. Library A., 27: 105–117, 1938–1939.

Whitney, James L. Catalogue of the Bibliographies of Special Subjects in the Boston Public Library . . . (Boston Public Library. Bulletin, 9, no. 1 (whole no. 80): 135–205, 1890.)

Medical Bibliographies Since 1500

Sixteenth Century

1. Brunfels, Otto. Catalogus illustrium medicorum, sive De primis medicinae scriptoribus. Strasbourg, Schott, 1530.
2. Champier, Symphorien. De medicine claris scriptoribus . . . [Lyons, 1506]
3. Fuchs, Remaclus. Illustrium medicorum qui superiori saeculo floruerunt, ac scripserunt vitae. Paris, 1541.
4. Gallus, Paschalis (Le Coq, Pascal). Bibliotheca medica; sive Catalogus illorum, qui ex professo artem medicam in hunc usque annum scriptis illustrarunt . . . Basel, Waldkirch, 1590.
5. Jobst, Wolfgang (Justis, Guolphgangus; Justus, Wolfgang). Chronologia sive Temporum supputatio, omnium illustrium medicorum, tàm veterum, quàm recentiorum, in omni linguorum cognitione, à primis artis medicae inventoribus et scriptoribus usque ad nostram aetatem et seculum. Frankfort-on-Oder, 1556. (Thornton, p. 158.)
6. Lupeus, Alfonsus. Catalogus auctorum qui post Galeni aevum Galeno et Hippocrati contradixerunt. Valentia, 1589. (Lipenius)
7. Spach, Israel. Nomenclator scriptorum medicorum, hoc est: Elenchus eorum qui artem medicam suis scriptis illustrarunt, secundum locos communes ipsius medicinae, cum duplici indice et rerum et authorum. Frankfurt am Main, Bassaeus, 1591.

Seventeenth Century

8. Beughem, Cornelius à. Bibliographia medica et physica novissima . . . Amsterdam, Jansson-Waesberg, 1681.
9. ————. Syllabus recens exploratorum in re medica, physica et chymica. . . Amsterdam, Jansson-Waesberg, 1696.
10. Castro, Petrus à. Bibliotheca medici eruditi. Padua, Pasquatus, 1654.
11. Fuires, Henry. Bibliotheca medica. Hafnia, 1659. (Petzholdt, p. 585)

12. Linden, Johannes Antonides van der. De scriptis medicis. Amsterdam, Blaev, 1637.
13. Lipenius, Martinus. Bibliotheca realis medica, omnium materiarum, rerum, et titulorum, in universa medicina occurrentium . . . Frankfurt am Main, Friederic, 1679.
14. Mercklin, Georg Abraham. Lindenius renovatus sive Johannis Antonidae van der Linden De scriptis medicis . . . à postrema editionis anno M.DC.LXII usque ad praesentem. Nuremberg, Endterus, 1686.
15. Moronus, Matthias. Directorium medico-practicum: sive Praeternaturalium affectuum cum simplicium, tum complicatorum, de quibus peculiares extent gravissimorum virorum consultationes, epistolae, responsiones, observationes, historiae, etc. medicis, praesertim Tyronibus, quae consimilibus in casibus imitentur exempla praemonstrantes. Lyons, Huguetan, 1647.
16. ———. Directorium medico-practicum, sive Indices duo praeternaturalium affectum, cum distinctorum, tum implicatiorum de quibus extant gravissimorum virorum consultationes, epistolae, quaestiones. . . . Frankfurt am Main, Schönwetter, 1663.
17. Schenck, Johann Georg. Biblia iatrica, sive Bibliotheca medica . . Frankfurt am Main, Spieff, 1609.
18. Walther, Johann Georg. Sylva medica opulentissima . . . Bautzen, Arnst, 1679. 2v.
19. Welschius, Georg. Hieron. Sylva medica. 1679. (Bib. Nat. Cat.)

Eighteenth Century

20. Albert, Michael. Lexici realis observationum physico-medicorum ex variis scriptoribus congestarum; pars altera ad usum litteraturae medicae singularumque facultatum inter eruditos commodum directa omnibusque medicis causis ac casibus inserviens. Halle, Orphanotroph, 1731.
21. ———. Tentamen lexici realis observationum medicorum et variis authoribus selectarum. . . Halle, Orphanotroph, 1727.
22. Allgemeine medizinische Zeitung. Altenburg, 1798–1832.
23. Augustin, F. L. Neueste Entdeckkung und Erläutt. a. d. Arzneyk. system. dargest. Berlin, v. 1–5, 1799–1805. (Ersch, no. 44)

24. ———. Systematische Darstellung der neuesten Entdeckungen und Erläuterungen aus der Arzneikunde. Berlin, 1797–1802. (Meyer, p. 24)

25. Baldinger, Ernst Gottfried. Catalogus dissertationum, quae medicamentorum historiam, fata et vires exponunt. Altenburg, Richter, 1768. (Petzholdt, p. 576)

26. ———. Russische physisch-medicinische Litteratur dieses Jahrhunderts. I. Stück. Teutsche Aerzte und Naturforscher in Russland, von Peter I. bis Catharina II. Marburg, Neue Academische Buchhandlung, 1792.

27. ———. Litteratura universa materiae medicae, alimentariae, toxicologiae, pharmaciae, et therapiae generalis, medicae atque chirurgicae, potissimum academica. Marburg, Academia, 1795.

28. Behr, Georg Heinrich. Lexicon physico-chymico-medicum reale . . . Strasbourg, Beckius, 1738.

29. Bibliographie médicinale raisonnée . . . Paris, Ganeau, 1756?

30. Bibliotheca Ludwigana. Sect. I–II. Leipzig, Saalbach, 1774. 2v. (Petzholdt, p. 585)

31. Bibliothek der practischen Heilkunde. Jena, v. 1–86, 1799–1843.

32. Bibliothèque germanique médico-chirurgicale, ou Extrait des meilleurs ouvrages de medécine et de chirurgie publiés en Allemagne. Paris, v. 1–8, 1799–1802.

33. Blumenbach, Johann Friedrich. Introductio in historiam medicinae litterariam. Göttingen, Dieterich, 1796.

34. Bodin, L. Bibliographie analytique de médecine, ou Journal abbréviateur des meilleurs ouvrages nouveaux . . . Paris, 1799. (Sprengel, p. 29)

35. Boehmer, Johann Benjamin. Bibliotheca medico-philosophica. Leipzig, Crusius, 1755.

36. Boerhaave, Hermann. Methodus studii medici emaculata et accessionibus locupletata ab Alberto ab Haller. Amsterdam, Wetstein, 1751. 2v. in 1.

37. Boerner, Friderich. Bibliothecae librorum rariorum physico-medicorum historico-criticae specimen primum . . . Helmstedt, Leuckard, 1751–1752. 2v. in 1.

38. ———. Relations de libris physico-medicis, partim antiquis, partim raris. Fasc. 1. Wittenberg, Ahlfeld, 1756.

39. ———. Nachrichten von den vornehmsten Lebensumständen und Schriften jetzlebender berühmter Aertze und Naturforscher in und um Deutschland. . . . Wolfenbüttel, Meissner, 1749–1753.

40. Carrère, Joseph Françoise. Bibliothèque littéraire, historique, et critique de la médecine ancienne et moderne. Paris, Rualt, 1776. 2v.

41. Commentarien der neuern Arzneykunde. Tübingen, v. 1–6, 1793–1800.

42. Commentarii de rebus in scientia naturali et medicina gestis. Leipzig, v. 1–37, 1752–1798.

43. Conring, Hermann. De scriptoribus XVI. post Christum naturum saeculorum commentarius cum prolegomenis antiquiorem eruditionis historiam existentibus . . . Wratislavia, 1727. (Hahn, p. 87.)

44. Eyring, Jeremiah Nicolas. Literatur der Arzeneygelehrsamkeit auf die Jahre 1775 bis 1777. Göttingen, Baudenhoeck, 1779. (Petzholdt, p. 577.)

45. Geist und Kritik der medicinischen und chirurgischen Zeitschriften Deutschlands für Aerzte und Wundärzte. Leipzig, v. 1–9 (in 18 v.), 1798–1806.

46. Gessner, J. A. Ph. Die Entdeckung der neuesten Zeit in der Arzneygelahrtheit. Nördlingen, Beck, 1778–1790. 4v. (Ersch, p. 10)

47. Gianella, Charles. Epistola ad Morgagnum de legendorum librorum medicorum ratione instituenda. Dissertatio epistolaris. Venice, 1746. (Burdach, 1: 38; Peignot, p. 433)

48. Goelicke, Andrea Ottomaro. Institutiones medicae secundum principia mechanico-organica reformatae . . . Frankfurt am Main, Conrad, 1735.

49. Goerling, Johann Christian. Catalogus dissertationum et programmatum ad medicinam spectantium. Erfurt, 1796. (Petzholdt, p. 578)

50. Grüner, Christian Gottfried. Neue kritische Nachrichten von kleinen medizinischen Schriften inn- [*sic*!] und ausländischer Akademien, von 1780–1783. Leipzig, Böhmen, 1783.

51. Haller, Albrecht von. Bibliotheca medicinae practicae quo scripta ad partem medicinae practicam facientia a rerum initiis

ad MDCCLXXV recensentur. Basel, Schweighauser, 1776–1788. 4v.

52. Heffter, Johann Carl. Commentatio epistolica. . . . Zittau, Schoeps, 1762. (Petzholdt, p. 575)
53. ————. Museum disputatorium physicomedicum tripartitum. . . . Editio nova. [Zittau] Schoeps, 1763–1764. 2v. in 3.
54. Hoffmann, Fr. Conspectus dissertationum, librorum omniumque scriptorum quae ab Anno 1681 usque ad Anno 1734 edidit, curante E. G. S. Halle, Hillinger, 1734.
55. John, Johann Dionys. Arzneywissenschaftliche Aufsätze Böhmischer Gelehrten. Prag, Walther, 1798. (Petzholdt, p. 578)
56. Kestner, Christoph Wilhelm. Bibliotheca medica, optimorum per singulas medicinae partes auctorum delectu circumscripta, et in duos tomos distributa. Jena, Cuno, 1746.
57. Kortum, Carl Georg Theodor and Schäfer, J. Ephr. Medizinisch-praktische Bibliothek für Aerzte und Wundärzte. Münster, 1789–1794. 3v. (Meyer, p. 23)
58. Kühn, C. G. Bibliotheca medica, continens scripta medicorum omnis aevi, ordine methodico disposita. Leipzig, Crusius, 1794.
59. Kühn, C. G. and Weigel, C. Italienische medizinisch-chirurgische Bibliothek. Leipzig, Müller, 1795–1799. 2v.
60. Lange, Christian Johann. Bibliotheca, s. Catalogus quod partem priorem potissimum medicos, historicos, philologicos, geographicos et philosophicos . . . Leipzig, Lange, 1702. (Petzholdt, p. 585)
61. Malacarne, Michaele Vincenzo Giacinto. Delle opere de'medici e de'cerusici, che nacquero o fiorirono prima del secolo XVI negli stati della real casa di Savoja. Monumenti. Turin, Stamperia reale, 1786–1789. 2v. in 1.
62. Manget, Johann Jacob. Bibliotheca scriptorum medicorum, veterum et recentiorum . . . Geneva, Perachon, 1731. 2v.
63. Medicinisch-chirurgische Bibliothek. Copenhagen, 1775–1787. 10v.
64. Medicinisch-chirurgisches Journal von Johann Clemens Tode. Copenhagen, v. 1–5, 1793–1800.
65. Medizinisch-praktische Bibliothek in Verbindung mit mehreren

Mitgliedern der korrespondirenden Gesellschaft Schweizerischer Aerzte und Wundärzte, hrsg. von Rahn. Zurich, 1796- (Meyer, p. 23)

66. Medizinisch-praktische Bibliothek . . . Göttingen, 1774–1778/80.
67. Medicinische Literatur für practische Aerzte. Leipzig, Schneider, 1781–1794. 12v. in 9.
68. Medizinisches Magazin der holländischen Literatur [von Jansen und Jones]. Marburg, 1790. (Meyer, p. 22)
69. Meyer, Heinrich Lohalin. Bibliographia physico-medica, das ist: Historische Abhandlung derer vornehmsten physicalischen und medicinischen Bücher, welche von uralten Zeiten her bis auf uns geschrieben sind. Lüneburg, Lipper, 1704.
70. du Monchaux, P.-J. Bibliographie médicinale raisonnée ou Essai sur l'exposition des livres les plus utiles à ceux qui se destinent à l'étude de la médecine. Paris, Ganeau, 1756.
71. Murray, Johann Andreas. Enumeratio librorum praecipuorum medici argumenti. Leipzig, Weygand, 1773. 2nd ed. rev. by F. G. von Halem, 1792.
72. Neue litterarische Nachrichten für Aerzte, Wundärzte und Naturforscher aufs Jahr 1785 und 1786. [1787]. Halle, v. 1–3, 1786–1787.
73. Neue medicinisch-chirurgische Zeitung. Salzburg, 1790–1856. (For changes in title, see Union List of Serials.)
74. Neue medicinische Bibliothek. Göttingen, v. 1–8, 1754–1769/72.
75. Neue medicinische Litteratur. Leipzig, v. 1–4, 1787/89–1792/94.
76. Nuovo giornale della piu'recente letteratura medico-chirurgica d'Europa. Milan, v. 1–11, 1791–1796.
77. Palm, Johann Jacob. Tentamen medicae bibliothecae manualis. Erlangen, Palm, 1788. (Ersch, p. 7; Kuhn, p. vii–viii)
78. Paxton, Peter. Directory physico-medical . . . and catalogue of such authors . . . as are necessary to be consulted by all young students. London, Sprint, 1707.
79. Pereboom, Cornelius. Index auctorum et rerum maxime memorabilium methodi studii medici Hermanni Boërhaave. Leiden, Wetstein, 1759.
80. Planque, François. Bibliothèque choisie de médecine, tirée des

ouvrages périodiques tant français qu'étrangers . . . Paris' d'Houry, 1748–1770. 10v.

81. Ploucquet, Wilhelm Gottfried. Bibliotheca medico-practica et chirurgica realis recentior sive Continuato et supplementa Initiorum Bibliothecae medico-practicae et chirurgicae . . . Tübingen, Cotta, 1799–1803. 4v.
82. ———. Initia bibliothecae medico-practica et chirurgica realis sive Repertorii medicinae practicae et chirurgicae. Tübingen, Cotta, 1793–1797. 8v.
83. Repertorium chirurgischer und medicinischer Abhandlungen für praktische Aerzte und Wundärzte aus den wichtigsten und neuesten englischen Zeitschriften. Leipzig, v. 1–4, 1792–1801.
84. Repertorium der medicinischen Litteratur des Jahres 1789–(1794). Zurich, 1790–(1796). 4v. in 6.
85. Rothe, Immanuel Vertraugott. Handbuch für die medizinische Literatur nach allen ihren Theilen; oder Anleitung zur Kenntnis der besten auserlesenen medizinischen Bücher, mit beygesetztem Inhalt, Werth, Jahrzal [*sic!*] angeführten Rezensionen, historischen, biographischen und andern Anmerkungen in systematischer Ordnung . . . Leipzig, Kleefeld, 1799.
86. Sandifort, Eduard. Natuur- en genees-kundige Bibliothek. Bevattende den Zaakelyken in houd van alle nieuwe Werken, welke in de Geneeskunde en Natuurlyke Historie, buiten ous Vaterland mitkomen. The Hague, van Cleef, 1765–1775. 11v.
87. Tournon, D.-J. Liste chronologique des ouvrages des médecins et chirurgiens de Bordeaux, et de ceux qui ont exercé l'art de guérir dans cette ville, avec des annotations et l'éloge de Pierre Desault. Bordeaux, La Walle, 1799. (Supp., Toulouse, Manavit, 1806.)
88. Vogel, A. Medicinische Bibliothek, darinne [*sic!*] von den neuesten zur Arzneygelahrtheit gehörigen Büchern und Schriften ausführliche Nachricht gegeben, und nützliche Erfahrungen nebst andern Neuigkeiten bekannt gemacht werden. Erfurt, 1752–1753. 2v. (Boehmer, no. 27)
89. Weber, Carl Martin. Entwurf einer auserlesenen medicinisch-practischen Bibliothek für angehende Aerzte. Dessau, Kasse, 1784.

90. Wittwer, Philip Louis. Bibliotheca—summo olim studio multisque in pensis collecta, libros exquisitissimos ad medicinam non solum, sed ad alia quoque scientiarum artiumque genera spectantes complectans. Nürnberg, 1794. 2v. in 3. (Petzholdt, p. 585)

Nineteenth Century

91. Allgemeines Repertorium der gesamten deutschen medizinisch-chirurgischen Journalistik. Leipzig, v. 1–10, 1827–1836. [n. s.] v. 1–11, 1837–1847. Index, v. 1–10; [n. s.] v. 1–8.
92. Allgemeines Repertorium der medizinisch-chirurgischen Journalistik des Auslandes. Leipzig, v. 1–21, 1830–1835.
93. Annales de littérature médicale étrangère. Ghent, v. 1–2, 1806–1807.
94. Annali della medicina fisiologico-pathologica. Milan, 1824–1825. 5v.
95. Annuario delle scienze mediche. Milan, v. 1–20, 1870–1889.
96. Arnemann, Justus. Bibliothek für Medizin, Chirurgie und Geburtshülfe. Göttingen, 1800. (Meyer, p. 23)
97. Atkinson, James. Medical bibliography. [A. B.] London, Churchill, 1834.
98. Baldamus, E. Die Erscheinungen der deutschen Literatur auf dem Gebiete der Medicin und Pharmazie. (1871–1875), Alphabetisch geordnet. Leipzig, Hinrichs, 1876.
99. Baldamus, E. and Haupt, R. Die literarischen Erscheinungen der letzten 5 Jahre auf dem Gebiete der Medicin und Pharmacie. [1866–70, 1871–75, 1876–80, 1881–85] Leipzig, Hinrichs, 1871–1886. (Kricker, p. 11)
100. Berger, C. and Rey, H. Répertoire bibliographique des travaux des médecins et des pharmaciens de la marine française, 1698–1873 . . . Paris, Baillière, 1874.
100a. Bernstein, Johann Gottlieb. Medicinisch-chirurgische Bibliothek . . . von 1750 bis mit Einschluss 1828. Frankfurt am Main, Andrea, 1829.
101. Bibliografia medica italiana . . . v. 1–3, 1891–1893. Turin, 1893–1895. (John Crerar)

102. Bibliographia medica italica. Rome, 1897+ (Adams)

103. Bibliotheca medico-chirurgica, pharmaceutico-chemica et veterinaria, oder Geordnete Uebersicht aller in Deutschland (und im Ausland) neu erschienenen medicinisch-chirurgisch-geburtshülflichen, pharmaceutisch-chemischen und veterinär-wissenschaftlichen Bücher. Göttingen, v. 1–17, 1847–1892.

104. Borgen, B. Fortegnelse over laegevidenskabelig litteratur for Aarene, 1859–1893. Copenhagen, Lund, 1894.

105. Brugnoli, G. and Taruffi, A. C. Bibliografia italiana delle scienze mediche. Bologna, Monti, 1858–1859. 2v.

106. Büchting, Adolph. Bibliotheca medico-generalis oder Verzeichniss aller über Medicin im allgemeinen und über vermischte Disciplinen derselben in den letzten 20 Jahren 1848–1867 im deutschen Buchhandel erschienenen Bücher und Zeitschriften. Mit einem ausführlichen Sachregister. Nordhausen, Büchting, 1868.

107. ———. Bibliotheca praxeos medicae oder Verzeichniss aller in Bezug auf die Ausübung der ärztlichen Kunst in den letzten 20 Jahren 1848–1868 im deutschen Buchhandel erschienenen Bücher und Zeitschriften. Mit einem ausführlichen Sachregister. Nordhausen, Büchting, 1868. (Vallee Supp. no. 7409)

108. Bulletin des sciences médicales. Paris, 1824–1831. 27v.

109. Burdach, Carl-Friedrich. Die Literatur der Heilwissenschaft . . . Gotha, Perthes, 1810–1821. 3v.

110. Callisen, Adolph Carl Peter. Medicinisches Schriftsteller Lexicon der jetzt lebenden Aerzte, Wundärzte, Geburtshelfer, Apotheker, und Naturforscher aller gebildeten Völker. Copenhagen, Callisen, 1830–1845. 33v.

111. Chapin, William F. Index to original communications in the medical journals of the U. S. and Canada for 1877. Classified by subjects and by authors. [New York, 1878]

112. Chavassieu-D'Audebert, M. Tableau bibliographique de la littérature médicale, française et étrangère, ou Répertoire méthodique et universel des journaux, traités et mémoires relatifs à la médecine, publiés en 1810 et 1811. Paris, Mequignon-Marvis, 1812.

113. Choulant, Ludwig. Handbuch der Bücherkunde für die altere Medicin . . . 2 Aufl. Leipzig, Voss, 1841.

114. ———. Historisch-literarisches Jahrbuch für die deutsche Medicin. I–III Jahrgang. Leipzig, Voss, 1838–1840. 3v.

115. De Marchi, Luigi. Indice sistematico delle opere di medicina entrate nel quinquennio 1892–6 (classificate seconde il sistema decimale, 016.60). Padua, Fusi, 1898.

116. Döring, Sebastian Johann Ludwig. Critisches Repertorium der auf in- und ausländischen höhern Lehranstalten vom Jahre 1781 bis 1800 . . . Schriften Erste Abtheilung . . . von 1781 bis 1791. Herborn, Hohenschulbuchhandlung, 1803.

117. Ersch, Johann Samuel. Literatur der Medicin seit der Mitte des achzehnten Jahrhunderts bis auf die neueste Zeit . . . Leipzig, Brockhaus, 1822; also, Amsterdam, Kunst- und Industrie-comptoir, 1812.

118. Excerpta medica; monatliche Journal-auszüge. Leipzig, 1892–1929.

119. Forbes, John. A manual of select medical bibliography, in which the books are arranged chronologically according to the subjects, and the derivations of the terms and the nosological and vernacular synonyms of the diseases are given. With an appendix containing lists of the collected works of authors, systematic treatises on medicine, transactions of societies, journals, etc. London, Sherwood, 1835.

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