CHEMICAL LITERATURE AND ITS USE

Notes of a course of lectures, for Third year students in chemistry and chemical engineering, University of Illinois.

LECTURE 1

CHEMICAL LITERATURE: CLASSIFICATION AND ARRANGEMENT; THE CATALOGUE; GENERAL REFERENCE WORKS

Purpose of the course

1. To show what the literature of chemistry is, how it is arranged, and made available, and to afford practice in its use.
2. To give some idea of the growth of the science.

Materials

Serials and books in the University libraries, chiefly those at Chemistry.

Methods of work

Problems, involving use of the literature, one for each lecture, are assigned to be looked up in the Chemistry library. Students will keep some notes of these for reference. Reports are given orally in class, in the first semester upon topics in the history of chemistry and noted chemists; in the second semester, reports are upon papers in current chemical serials.

Notebooks

These must contain, for reports by members of the class, the date, name of speaker, topic, reference, (these items are put upon the board by the student who speaks). Notebooks are inspected twice each semester.

Chemical Literature

Apparatus is necessary, but not all the glassware made in Jena tells you the structure of an organic compound, nor even how to look it up in Richter's Lexikon. Chemistry has been called "the intelligence department of industry", and the chemist of today, beginning on the basis of all previous knowledge, builds upon that as a foundation, further research to develop this science, which is in close contact with every phase of human welfare and endeavor.

Many of the larger industrial plants recognize the value of using all that others have learned, and have libraries that vary in size from a few hundred to many thousand pieces (since in many cases a ten-page pamphlet is of greater value than a twenty-pound volume). Such collections become for the organizations what Dr. T. H. Norton calls "artificial memories" and with careful cataloging, make it possible to learn in the shortest time all that has been done upon a given problem. Users of such libraries are experts and work done for them teaches one much. The librarian there must know the science first, and the simpler part of library methods at least; he must also be able to translate, make abstracts, bibliographies, check up lists of references, and in some cases, he has to record, file, and care for special formulas and plant data.

In the bibliography at the close of this pamphlet will be found reference to papers upon the value of a knowledge of the literature. The ones by Barrows, Dannerth, Norton, Smith, and Tafel, in particular, point out the uses of the library by the industries, with respect to manufacture as well as for research.

In the lecture notes selected lists of the literature available here will be

given, having direct reference to the library problems, and special uses are mentioned for some of the important material found in works of reference and abstract serials. Students will be shown the most necessary works and serials, and are expected to know author, title, date, number of volumes, and class number, for at least three important works discussed in each lecture.

Arrangement

Material without orderly arrangement might as well not exist. In the libraries on the campus of the University of Illinois, and in perhaps three-fourths of the other libraries in the United States, the system of arrangement is that of "relative location", most often based upon the Dewey Decimal system of classification. This scheme plans to place together on the shelves all books upon the same topic, so far as possible. Book A may not be always upon the same inch of shelf, but it is with other books on the same subject, usually subarranged by the author's name; the date of publication is used sometimes, for the secondary arrangement. New books after being properly classified, are marked, and placed then with others of their class.

The method used in the Dewey classification is fairly simple. The whole field of knowledge is regarded as divided into nine main classes, to which are assigned the digits, 1 to 9. Each class then has nine divisions, and each of these is subdivided into nine subdivisions, leaving the zero in each group to indicate very general works, for each class, division, etc. The first three figures counting from the left, are considered as forming a whole number, while all annexed figures are treated as decimals, thus making more minute subdivisions possible.

Books are classified according to the topic of the major portion of the contents. Certain divisions, by form, are used in every class, division or subject; such a form division may be recognized by the class number, since this always contains at the right, a digit preceded by a cipher. The form division numbers include: 03, dictionaries; 04, essays; 05, serials not society organs; 06, serials that are society organs; 07, works on study and teaching; 08, collected works on a topic or by an author; 09, history. These may be used for every subject; history of chemistry, is 540.9; history of agriculture, 630.9.

Extracts from Decimal Classification showing location of most of the material upon chemistry and allied subjects

General classes	*Divisions*	
0 General	510 Mathematics	640 Household science
1 Philosophy	530 Physics	660 Chemical technology
2 Religion	540 Chemistry	670 Manufactures
3 Sociology	550 Geology	680 Mechanic trades
4 Philology	570 Biology	690 Building and materials
5 Natural sciences	590 Zoology	750 Painting (artists' materials)
6 Useful arts	610 Medicine	770 Photography
7 Fine arts	612.01 Biochemistry	920 Biography of individuals
8 Literature	615 Pharmacy	925.4 Biographies of groups of chemists
9 History	620 Engineering	
	630 Agriculture	

Subdivisions of theoretical and applied chemistry

540 General	660 General applications
541 Theory, physical	661 Manufacture of chemicals
542 Laboratory methods	662 Explosives, fuel
543 Analysis	663 Beverages
544 Analysis, qualitative	664 Manufacture of foods
545 Analysis, quantitative	665 Lighting materials
546 Inorganic chemistry	666 Ceramics
547 Organic chemistry	667 Bleaching, dyeing, paints
548 Crystallography	668 Organic chemical industries
549 Mineralogy	669 Metallurgy, assaying

The books classified according to this plan are placed together upon the shelves, and those having the same class number are here arranged alphabetically according to the surname of the author. Each book then has a class number and the author mark, the two forming the call number, by which the book is called for and recorded. The author mark requires a brief explanation; it consists of the first letter if that is a consonant, or the first two letters, if the name of the author begins with a vowel, followed by two or more figures; this combination of letters and figures is obtained from a table made up of a large number of possible beginnings of surnames. To this may be annexed the letter of the first word of the title, a figure indicating the edition, capital letter showing what language the book is in, letter for translator's name, and other marks. A sample is given:

546	546 inorganic chemistry (subject)
M73t3Ef	M73 Molinari (author)
	t first word of Italian title
	3 third edition
	E translated into English
	f, initial of translator.

Books are shelved from left to right, while the spaces between the upright divisions supporting the shelves are treated as pages, with the shelves corresponding to the lines.

Serials, as distinguished from books, are those publications, whether organs of a society or not, that once begun, continue for an indefinite period. Because the serials increase each year they are usually shelved separately from books. Class numbers of serials end as a rule in 05 or 06; the decimal point may be either before or after both these, or between the 0 and the digit. Serials containing abstracts solely, with no original articles, or which merely index the literature, or review it, are shelved, again, separately from the ones containing principally original papers. The latter are considered as reserve books and may be taken out; the former are reference works and do not circulate.

Arrangement in Chemistry Library

The books and serials in the Chemistry library are arranged in five groups, those in each group being in numerical order, as follows:

I. Palmer Memorial Library, comprising (a) books; (b) serials; a special

collection, shelved separately, in southeast stack.

II. General works, not serials nor works of reference; these include "reserve" books which are each marked by a special label. This group begins with those having low numbers, in the southwest corner, on the south side of stack A, and continues to the shelf having the label, Group III

III. This group consists of reference books which do not circulate outside the library room. These are marked with a capital R on the outside, in addition to the ordinary label that contains the call number.

IV. Here are the abstract, index, and review serials, that like Group III, are strictly for reference.

V. This includes all the serials that contain, chiefly, original papers. They are arranged by call number and extend from the end of Group IV and the sign (shelf label) for Group V, to the north end of the library.

Unbound numbers of all serials are placed on the shelf after their bound volumes. Collective indexes, covering several volumes, are placed together after the unbound numbers.

A few books, much too large for their regular places, are on an "oversize" shelf along the north wall. Wooden or pasteboard dummies bearing the call number, and location of the oversize shelf, occupy the numerical places for these books.

The Catalogue

The catalogue of the Chemistry library consists of three parts:

1. An author list of books, with serials entered there under their titles, arranged in one alphabet.
2. A dictionary catalogue of all the chemical literature on the University campus; entries in this are under author, title, and subject. For such books and serials as are at Chemistry ONLY, the author or title entries are omitted from the dictionary catalogue, because they are in the author list.
3. A shelf list, of the five groups, cards arranged in each as the books stand upon the shelves. Labels of these trays are marked with group and class numbers, not letter labels.

Articles published in serials are, except for a few government and state publications, not entered separately in the catalogue. These may be found through the abstract and review serials, if a reference to the original place of publication is not given where the article is mentioned.

An alphabetic list of the serials actually at the Chemistry library, giving call number, title, stack, and side, is posted on the south side of the right hand (south) column.

Books in general may be taken out for two weeks, on signing a slip at the desk. Reference books do not circulate, nor do the abstract, index, and review serials. Reserve books may be taken at nine any evening, to be returned by nine the next day the library is open. General serials are treated as reserve books. Author and subject cards in the dictionary catalogue trays are marked in the margin below the call number to show location, if the work is in one or several seminar libraries.

General Reference Works

These for chemistry may be considered as belonging to three classes; first, those giving tabular data, chemical and physical constants; second, dictionaries, covering either the whole field, or large fairly comprehensive topics; third, encyclopedic works, giving in addition to description and discussion, references to the literature. All these are of course "reference books".

Class 1. Here belong the old Chemiker-Kalender, with the newer English work, The Chemist's Yearbook; Van Nostrand's Chemical Annual (published at irregular intervals), and the Chemical Rubber Company's Handbook. All these note some of the newer books, and add various kinds of information to the data that are their major content. Types of larger works are Landolt-Börnstein, Physikalisch-chemische Tabellen, Recueil, published by the Société française de physique, and the Annual Tables, now v. 1-5, for 1910-20, planned to supplement Landolt-Börnstein by giving the new work of each year.

Class 2. This includes all the general dictionaries, beginning with early editions of Ure and Watt, through Ladenburg, Wurtz, and Thorpe. This last in the third edition, 1921, is now the most important, but the others, particularly Ladenburg, are useful for the history of substances. Here also we find the dictionaries of solubilities, as Comey and Hahn, edition of 1921, Seidell, good for organic in particular, and the more elementary Segerblom.

Class 3. The works included here are apt to be more specific in topics treated; the monumental Encyclopédie chimique, 1882-99, edited by Frémy, is a series of monographs covering almost every possible section of chemistry, but these are no longer new. For inorganic, there are the works, called in both cases, Handbuch, begun by Gmelin, (now called Gmelin-Kraut's), and the other by Abegg as first editor; the Gmelin-Kraut work is now in the seventh edition while the first edition of Abegg is as yet not complete. The English work recently begun edited by Friend gives more descriptive material and fewer references. Hoffmann's Lexikon is doing for inorganic what Richter's Lexikon does for organic, furnishing a list of compounds with an index to all the literature. Beilstein's Handbuch, in the new fourth edition is to have some fifteen volumes, but it will be some time before it is completed. The third edition in four volumes, four supplements and a collective index for the eight, has been necessary for the organic chemist. Of the many special dictionaries and encyclopedias, Abderhalden's Biochemisches Handlexikon might be placed here since it gives much recent material, newer than Edition 3 of Beilstein.

Importance of Chemistry and Its Literature

A very brief survey of chemical literature will convince most people that the science, starting as it did before written history, for the chemist had to prepare writing materials first, cannot be thought of as the invention or the monopoly of any group or nation. It has been in all cases a gradual development and utilization of knowledge gained by earlier workers, to the best advantage, for the improvement of living conditions and the production of articles designed for use or beauty. The ideas now current as to the theoretical basis of the science have been varied many times, and the study of these changes, the

men and influences that produced them, may give some indication of the amount that remains to be done before we know all about even the simplest particle of substance and its real formation, not to mention its possible uses.

Since the discovery of radium, we no longer laugh at the idea of a "primitive substance" and no one ventures to predict the final discoveries. No research worker ever arrives at the point where there is nothing more to discover.

Abstract of Dewey Decimal Classification

These class numbers include the principal groups of books on chemistry.

016.54		Bibliography of chemistry
340.6		Medical jurisprudence
389		Weights and measures
	389.05	Publications of the U. S. Bureau of Standards
510		Mathematics
	530	Physics
	532	Light
	533	Liquids
	537	Electricity
	537.85	Electrometallurgy
540		Chemistry
	541	Theory, physical chemistry
	542	Laboratory handbooks, tables
	543	Analysis, general
	544	" qualitative
	545	" quantitative
		Under 543, there are
		543.1, Analysis of food, .2, milk, .3, water, .4, drugs, .5 poisons, .6, rocks, .7, gases, .8, oils and fats, .9, animal body
	546	Inorganic chemistry
	547	Organic chemistry
	548	Crystallography
	549	Mineralogy
550		Geology
575		Evolution
580		Botany 581.6 Plant chemistry
	589.9	Bacteriology
590		Zoology
610		Medicine
	611	Anatomy
	612	Physiology
	612.01	Physiological chemistry
614		Hygiene, public
615		Materia medica, pharmacy
616		Pathology
620		Engineering
	622	Mining engineering
	628	Sanitary engineering

	628.1	Water supply
	628.16	Water purification
	628.2	Sewerage work
	628.3	Sewage
630		Agriculture
	630.16	Agricultural chemistry
	631	Soils and fertilizers
	635.4	Feeding stuffs
	637	Dairy
640		Domestic economy
	643	Food
660		Chemical technology, manufacturing processes
	661	Chemicals
	662	Explosives
	663	Beverages
	664	Foods
	665	Fuel, gas, oil
	666	Ceramics, glass
	667	Dyes, paint, bleaching
	668	Soap, glue, glycerine
	669	Metallurgy, assaying
670		Manufactured articles (chemistry incidental)

671	Metallic	674	Wooden	677	Textiles
672	Iron and steel	675	Leather	678	Rubber
673	Brass, bronze	676	Paper	679	Celluloid

690		Building
	691	Materials, processes, preservatives
	698	Painting
770		Photography
920		Biography (B for lives of individuals)
	925.4	Biographies of groups of chemists

Any of these may have decimal subdivisions, and the original or secondary number may have the form divisions, indicated by the cipher followed by a digit, thus: 03, dictionaries, 05, serials, 06, society publications, 09, history.

LECTURE 2

Literature on the History of Chemistry

There are five fairly well-marked periods in the history of chemistry; some of these are subdivided by certain writers, and in all cases, the dates for the periods are only approximate. The beginning of a new period does not mean that all chemists at once adopt the new theories.

Ancient period, to 350 A. D.

During this time, so far as we now know, chemistry was largely a craft, observations of phenomena that occurred, and application to industries. The Greek philosophers presented the first elaborate theories.

Alchemical period, 350 to 1500

Basing their work on faulty translations of Egyptian manuscripts men wasted centuries here in the search for a substance that would transmute all metals into gold or silver. Incidentally, they made some discoveries improved apparatus and methods.

Iatrochemical period, 1500 to 1650 or 1670

In this time the chief aim was to discover a universal medicine, to be derived perhaps from the philosopher's stone. The use of inorganic chemicals as medicines and the preparation of drugs from plants made progress.

Phlogiston period, 1670 to 1780

The phenomenon of combustion had long presented a problem for explanation, and in the work of Becher and Stahl we have the first attempt to form a theory to account for it. Gases were studied, methods for investigation improved, leading up to the discovery of oxygen.

Modern period, 1780 to ?

Oxygen was discovered by Scheele, Priestley, Lavoisier. The study of acids, quantitative work, the chemistry of the carbon compounds, investigation of the chemistry of living matter, physical chemistry, growth of chemistry of colloidal substances, radio-chemistry, make this seem to be the most fruitful period.

LITERATURE

This consists of general histories, more or less elaborate, the accounts of special periods and divisions, studies on theory, biographies and essays, these latter being often biographical.

General histories

These since Lavoisier, are in order of time, Trommsdorf, German, 1806, not here; Thomson, English, second edition, 1831, here; Hoefer, French, 1843, in two volumes, includes history down to 1815; a third volume was planned but not published; Kopp, Geschichte, four volumes, covers all chemistry to 1840, with a supplementary volume bringing it down to 1860. The Geschichte of E. von Meyer, German, 1888 has been re-edited and translated several times. Stange, Die Zeitalter, 1908, gives chronologically, "a general view of the development of chemistry" with emphasis upon individuals.

The most comprehensive work in English is that of J. C. Brown, covering the time to 1900, now in the second edition. E. von Meyer in his Chemie, 1913, gives much on the work since Liebig. Thorpe's two small volumes in English are very condensed but include the time to 1900; it has some good pictures of the chemists of the nineteenth century, rather more recent than those in Stange. Bauer, originally in German, Armitage (not here), and the History by Moore (American), are small books, each giving most space to the work of the time since 1780.

The development of chemistry in connection with other sciences is discussed in the histories of science, as Libby, Introduction to the history of science, 1905; Sedgwick and Tyler, Short history of science, 1917; similar treatment at greater length is in H. S. Williams and E. H. Williams, History of science, 10 v. 1904-10.

Alchemy

Chapters in the larger works are supplemented by Kopp's volume. Later knowledge from manuscripts and investigations is given by Berthelot, in his 3-volume work containing facsimiles and translations of Arabic manuscripts; he has edited a similar set of volumes of Greek and Latin texts (not here); besides his Origines de l'alchemie, 1885, he has written a work in 4 volumes on chemistry in the middle ages. M. M. P. Muir has two small books here on alchemy and its theories. Svedberg, Die Materie, 1914, has a good chapter on alchemy. Five of the nine chapters of Strunze, Die Vergangenheit der Naturforschung, 1913, are upon chemistry, i. e. the Arabians, alchemy, and van Helmont.

Modern chemistry

This is dealt with in English in two books, by Tilden, presenting the progress of the science since 1830 in particular. His Progress of scientific chemistry, Ed. 2, 1913, has some brief biographies with references to periodical articles; in Chemical discovery and invention, 1916, he describes buildings, theories and general advancement of the science, "a book of popular character on modern chemical discovery". Ladenburg has a small book, in German, also translated into English, taking up the time from Lavoisier to 1886, and his summary of work done from 1880-1900 was first published in the Sammlung, but is also here separately.

Theories

The first modern work is Lothar Meyer's Moderne Theorien, 1864, written "for the information of scientists who are not chemists"; there are more recent editions and versions in French, Russian and English. M. M. P. Muir, History of chemical theories and laws, 1907, describes "investigations which in my judgment have given powerful impulses to the advancement of chemical science". Freund's book, on chemical constitution, has now the title, The experimental basis of chemistry, Ed. 2, 1921, and deals with theories affecting composition especially.

Divisions, special phases

Pope, Modern research in organic chemistry, 1912, Ed. 2, 1921, and Stewart in his two volumes on advances in organic, and in physical and inorganic, respectively (Editions of 1921), present accounts of work done since 1880. Lowry Historical introduction to chemistry, 1915, traces the development of apparatus and methods. Bolton has written a number of short papers on topics in chemical history, besides preparing the Bibliography of Chemistry, 1492-1892, with supplements including much up to 1902. Hjelt has an elaborate Geschichte der organische Chemie, 1916. Smith, Chemistry in America, is a vivid picture of early American work upon which there are also various short papers, such as that of Williams in School Science and Mathematics, *1*, 75-82 (1901); *2*, 139-48 (1902). Some recent American works of a semi-popular type, designed to interest non-chemists are: Hendrick, Everyman's chemistry, 1917; Slosson, Creative chemistry, 1919; Hale, American chemistry; a record of achievements, the basis for future progress, 1921. Older works of a similar nature are by Duncan, Friend, Finlay, Letts, Martin, and Philip.

Biographies

Chemistry has no adequate biographical dictionary. Brief notes with refer ences to longer articles are in Tilden's Progress of scientific chemistry, 1913 brief notices appear in Meyer, Stange, Kopp, for the older men, while Thorpe' History gives accounts of more recent workers. Thorpe's Essays are largely bio graphical, and so is Ramsay's volume, the latter not here. Harrow, Eminen chemists of today, 1920, presents some material of value. There is a small book by Roberts, two volumes of collected Memorial addresses from the Chemical Society (London), while a few individuals are discussed in volume one of Wurtz' Dictionnaire. The small German biographical dictionary by Schaedler, published in 1891, has been out of print for years. The Berichte der deutschen chemischen Gesellschaft has in volume 51 an index to the biographical accounts in its first fifty volumes. Memorial addresses usually appear in various serials the year man dies. Articles, of biographical nature, are published when the Perkin, and the Willard Gibbs medals are awarded, and on other special occasions.

There are biographies of perhaps twenty-five important chemists with some collections of letters. The biographies of individuals, are marked with "B" for the class, really 920, and the author mark is derived from the name of the subject rather than that of the author, to place all accounts of one person together.

Essays

These include biography, criticism and history. Brown, Ramsay, Thorp and others are available.

Early Chemical Laboratories

Individuals permitted special students to work in their laboratories from the earliest times, but the idea of general distribution of chemical knowledge had to wait nearly a century after the invention of printing had made multiplication of accounts possible. The first chair of chemistry is said to have been established in the University of Marburg about 1600; two laboratories supported by the state for government work were opened in 1683, at Altdorf in Bavaria, and at Stockholm, the latter being under the patronage of Charles XI, with Urban Hiärne a director; one of the pupil-assistants at Stockholm was Leopold Gmelin, first of seven generations of chemists. Both of these State laboratories began publishing "contributions", giving results of their work, and this definitely marks the end of the era of mystery for the science.

It is probable that at first the instructor merely did lecture experiments for his classes to observe; such experiments are noted as part of Nicholas Lemery's popular lectures on chemistry in Paris, 1672-80. Lomonossoff, professor of chemistry at the University of St. Petersburg, had a laboratory built there, opened in 1748, for instruction and research, where students are said to have done work. Thomas C. Hope, professor at Glasgow, 1787-95, and at Edinburgh, 1795-1843, did experiments himself in lectures, though the first record of his students doing practical work dates from 1823, when his assistant Anderson was given charge of this work. Thomas Thomson used laboratory work as a means of instruction for his students before 1811, in Edinburgh, and he continued the practice on his removal to Glasgow in 1818. The commonly accepted date of 1824, under Liebig

at Giessen, as the beginning of instruction by the classes doing laboratory work remains, however, the first introduction of it as an official university policy.

Chemical Societies

These form an important part of the history of chemistry, since their activities promote public knowledge of the science. They mark the beginning of organized, concerted effort to extend to all whatever any man found out, and were a powerful influence in the banishment of mystery. The first societies of chemists were devoted to the older ideas, but their places were soon taken by more scientific organizations.

Bolton's list, in the Journal of the American Chemical Society, in 1901, gives 66, having about 30,000 members, with Germany in the lead. At present the American society alone has more than half that number of members, while the number of societies has increased. The first modern society for chemistry only, was founded by James Woodhouse, the Chemical Society of Philadelphia, 1792, and it met every week for the seventeen years it existed; the second society for chemistry only, also in the United States, was the Columbian Chemical Society, founded in 1811, in Philadelphia, under the patronage of Thomas Jefferson.

The following list includes what seem to be now (1921) the principal societies for the countries named, the date of founding, and their publications, with the year of the first volume.

Belgium

Société chimique de Belgique, 1887
Bulletin, 1887

Canada

Canadian Institute of Chemistry, 1916
Canadian chemistry and metallurgy, 1916

France

Société chimique de France, 1857
Bulletin, 1858
Société de chimie industrielle,
Chimie et industrie, 1918

Germany

Deutsche chemische Gesellschaft zu Berlin, 1867
Berichte, 1867
Chemisches Zentralblatt, since 1897 (founded 1830)
Beilstein's Handbuch der organischen Chemie, since 1900; this is beginning of Ergänzungsband I of Edition 3.
Literatur-Register der organischen Chemie, 1910; being supplement to Richter's Lexikon.
Verein deutscher Chemiker, 1887; absorbed Verein analytischer Chemiker, founded 1878; was Deutsche Gesellschaft für angewandte Chemie, 1887-1896.
Zeitschrift für angewandte Chemie, 1887

Verein zur Wahrung der Interessen der chemischen Industrie Deutschlands E. V.

Die chemische Industrie, 1877

This is also printed as Wirtschaftlicher Teil of the Zeitschrift für angewandte Chemie now.

Great Britain

Chemical Society, London, 1841

Journal, 1841

(called Memoirs and Proceedings, 1841-47; Quarterly Journal, 1848-62)

Proceedings, 1885-1914; ceased as a separate volume.

Annual Reports on the Progress of Chemistry, 1904

Jubilee volume, (history of Society, 1841-91)

Memorial Addresses 1893-1913, two volumes

Society of Chemical Industry, 1881

Journal, 1882

Reports of the progress of Applied Chemistry, 1916

Society of Public Analysts, 1874

The Analyst, 1877

Holland

Nederlandsche Chemische Vereeniging, 1903

Chemisch Weekblad, 1903

Recueil des travaux chimiques des Pays-Bas, 1882; taken over by the Dutch society named above in 1920.

Vereeniging van de Nederlandsche chemische Industrie, joined the other society, 1920, in publication of Chemisch Weekblad.

Italy

Associazione Italiana di Chimica Generale ed Applicata,

Gazzetta chimica italiana, 1871

Società di chimica industriale di Milana, 1895

Annuario, 1896

Giornale di chimica industriale ed applicata, 1919

The Giornale is published by the two Italian societies, and is also the official organ of the Federazione Nazionale delle Associazioni fra Industriali chimici.

Japan

Chemical Society of Tokyo, 1878,

Tokyo Kagakkai Kaishi, 1880

Society of Chemical Industry of Japan, 1898

Kogyo Kagaku Zasshi, 1898

Neither of these two publications is in this library.

Sweden

Kemistsamfundet i Stockholm

Svensk Kemisk Tidskrift, 1889 (was Kemiska Notiser, 1887-88)

This is also the official organ of the sections at Lund and Upsala, as well as for the industrial society.

K. Svenska Vetenskapsakademien

Arkiv för kemi, mineralogi och geologi, 1903; this had previously appeared as the chemical section of the publication of the Swedish Academy of Sciences; articles may be in either Swedish or German, and chemistry has had the most space so far.

Switzerland

Société suisse de chimie

Helvetica chimica acta, 1918

Articles are published in French or German

United States

American Chemical Society, 1876

Journal of the American Chemical Society, 1876; volume 1, 1876-78 was called Proceedings.

This absorbed, January, 1914 on, the American Chemical Journal, 1879-1913.

Chemical Abstracts, 1907

Journal of Industrial and Engineering Chemistry, 1909.

LECTURE 3

GENERAL CHEMISTRY: BOOKS AND SERIALS

The books and serials upon general chemistry may be grouped as follows:

I. General
   1. General cyclopedias and dictionaries
   2. Special cyclopedias and dictionaries
   3. Dictionaries of languages

II. Tables of data, constants and formulas
   1. Large
   2. Small

III. Texts
   1. Comprehensive
   2. Brief
   3. Special

IV. Serials
   1. Those containing chiefly original papers
   2. Reference serials, i. e. giving indexes, reviews or abstracts

I, 1. *General cyclopedias and dictionaries*

The best now is Thorpe, Dictionary of applied chemistry, in the third edition, 1921, to be complete in six volumes; it contains fairly long accounts of the processes and products with some references. The Condensed Chemical Dictionary, 1919, while prepared for the manufacturer and dealer, is a good work of