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

K. Svenska Vetenskapsakademien
Arxiv för hemi, mikrologi och geologi, 1903; this had previously appeared as the chemical section of the publication of the Royal 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
Revue suisse de chimie, 1915
Articles are published in French or German

United States
American Chemical Society, 1878
Journal of the American Chemical Society, 1876;
volume 1, 1876-78 was called Proceedings.
This abstracted, January, 1914 on, the American Chemical Journal, 1879-1913.
Chemical Abstracts, 1907

LECTURE 3

GENERAL CHEMISTRY: BOOKS AND SERIALS

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

I. General
   1. General encyclopedias and dictionaries
   2. Special encyclopedias 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. General encyclopedias and dictionaries
   The best now is Thorpe, Dictionary of applied chemistry, in the third edition, 1919, to be complete in six volumes; it contains partly 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 17
reference where not much detailed information is needed. The French Encyclo- pédie chimique, 94 volumes and a collective index, a series of monographs 1 authorities, is now rather old, being finished in 1890. Watt, Ure, and Menapre in the various editions are valuable historically; Ladenburg, Handwörterbuch der Chemie, 832296, 13 volumes and index is better for history, being more elaborated. Wurtz, Edition 2, 1874-88 is helpful at times; so is the much older work of Lassig Poggendorf's Wiedler; the newer edition of the latter, revised by Feihling, is now here.

1.3. Special cyclopadia and dictionaries

The organic has Beilstein's Handbuch; Richter's Lexicon, and the older monats released a formula index to Beilstein. The Lexicon (inorganic) by Joffmann is incomplete as yet it is on the plan of Richter, but gives more material material it refers to Gmelin-Kraus, Handbuch der anorganischen Chemie, Edition 7, thus N: 4, 5, 73, i.e. volume 4, part 3 page 113. Abderhalden's Biochemische Handlexikon contains material upon both organic and inorganic chemistry; it is not recent than the third editions of Beilstein and Richter, and gives man, references to the literature.

1.4. Dictionaries of languages

The chemist will in most cases have to read French or German; the be special dictionaries are the ones compiled by A. M. Patterson, one for each languages. Long, German English dictionary of medical terms, gives those used in medicine and the allied sciences, useful to the student of biochemistry. Ando Technologisches Lexikon, translates medical German terms into more ordinary words. For general German, Sturt-Received, Encyclopedia Dictionary; abridged edition, German-English, Ed. 2, 1908, is perhaps the best one-volume work; the larger edition contains many unusual local and technical terms.

11. Tables of data, large

Lambert-Bierstein, Physikalische chemische Tabellen, in Ed. 4, is perhaps the largest. The volume, Render, 1913, published by the Société française de physique contains newer data. Both are supplemented by the Annual Tables, giving material newly published; vol. 13, covering 1910-12, appeared before the war, with the title in French, Tables annuelles; vol. 4 has data for 1913-16, and will appear this summer; vol. 5, with data for 1917-1920 is announced for early in 1922. It only comparable books in English is the two-volume Physicochemical tables, 190 by John Castell Evans, a much briefer work. and no longer up to date.

11. Tables of data, small

The oldest is the Chemiker-Kindersch, published annually for over thirty years; The Chemists' Yearbook, begun in 1917, is on the same plan in two volumes; Van Nostrand's Chemical Annual, one volume, is residual at varying intervals. The Chemical Rubber company puts out a Handbook, less in size and price. There are several chemists' and metallurgists' handbooks of similar character, as Cremer's, and they are not in this library. Tables giving solubilities are the elementary work by Schomberg, Noldell that includes organic compounds and the new Comer and Ribas, Ed. 2, 1921, inorganic only.

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1. Texts, comprehensive

The comprehensive texts are not many. Graham's work has been reprinted in the German version, but is too old. Ostwald's Lehrbuch der allgemeinen Chemie, Ed. 2, is incomplete here; his Handbuch, to be 20 volumes of an encyclopedic nature, was interrupted by the war. In English the best for the various elements has been Beerce and Schonheimer's Treatise on chemistry, i.e., the two organic volumes covering the non-metals and the metals, in the most recent editions; the latest edition of the organic part here in English is about forty years old. The new English work being published under the editorship of J. N. Reid, is called a Textbook of inorganic chemistry; it goes into detail more than Beerce and Schonheimer but is not close. Mader's new work, Higher inorganic and theoretical chemistry, to be six volumes should be better than Beerce and Schonheimer. The Textbook of inorganic chemistry by Partington, 1920, is early as good for a general chemistry, giving new material and many references.

2. Texts, brief

Types of the briefer works are:

- MacThorn and W. E. Henderson, A course in general chemistry, 1913;
- W. A. Noyes, Textbook of chemistry, 1916;
- Louis Kahlenberg, Outlines of chemistry, revised, 1916;
- H. P. Curly, General chemistry, 1916;
- Alexander Smith, General Chemistry for Colleges, Ed. 2, 1917;
- H. N. Holmes, General chemistry, 1921.

These are intended for college textbooks: Bailey's (English) Tutorial chemistry in two volumes, Ed. 4, 1918, seems to correspond nearly to the American text; there are similar small French and German works though not here. The German work, Chemistry, by E. von Meyer, 1913, is more nearly historical. Texts of English type suited to secondary schools are numerous, but not here.

3. Texts, special

Special works here may be, (a) for students in a particular field, or (b), general for a division of chemistry. Under (a) are Hare's Practical chemistry for engineering students, 1912; Kahlenberg and Hart, Chemistry in its relations daily life, for students of agriculture and home economics in secondary schools, 1915; Elementary household chemistry, an introductory textbook for students of home economics, by J. F. Smith, 1916.

In particular fields, Meyer and Jacobsen, in German, Ed. 2 is the most complete for organic; Hickox, Chemistry of the carbon compounds, Ed. 11, gives an idea of Cohn's Organic chemistry in three volumes, Ed. 2, 1919, is for the specialists; Ed. 3 is 1921. Beller, 1918, and Partington, 1920, are recent good English texts for general inorganic works in one volume, while Norris, Textbook inorganic chemistry, 1921, is the newest American work.

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The literature of any live science is largely in the current volumes of serials. The principal societies publish periodical proceedings, with original papers, under the name of the combination "Journal." Most of these have been mentioned in Lectures 2. The general serials, both society publications and others, at Chemistry can be considered, in order of age; these contain original, original papers, which abstracts are also given in these will be noted.

A. Quaterly Journal of Chemistry. The name of this periodical was proposed by the science editor of the French Academy, to promote the science of chemistry, since, if one among the many sciences may be called the essential one, chemistry is that one. It has abstracts till about 1877. The physics section became a separate serial in 1914. There are collective indexes for each series of twenty to forty volumes. Published in 1832 as Annalen der Physik, it continued in 1960, with the addition of separate annual and collective indexes. It is useful as a supplement for the annual and collective indexes. The practical weekly was in 1854 under this title, based on the combination of two others, the one Berthier's Alumineus Journal having existed under various titles from 1788; the Journal had abstracts till about 1877. It has one collective index, and annual ones. The Annalen, Annalen, and Journal have now principally papers upon organic topics; the Annalen began its fifth volume with a paper upon tannic acid, while applied chemistry has no place in the Journal.

The Journal of the Chemical Society, though the first three volumes at Memoirs, may be said to date from 1841; from 1849 to 1862 the title was Quarterly Journal. The Journal has always had abstracts of great value, with good annual and collective indexes. Two serials in English of less importance, deserve mention since they give abstracts for the early period, The Chemist, 1849-56, London, edited by Clatworthy and John Watt, and The Chemical Gazette, 1843-59, London, edited by Willis Fairless and Henry Croft; the Gazette was merged into the Chemical News founded by Crookes in 1859, to publish scientific processes and discoveries. A weekly paper is the first chemical newspaper, and following up its old periodical has abstracts but presents also reprints of whole papers upon the importance of the subject is great. Beginning July, 1921, a special section of book reviews is in the first number of each month. It has annual indexes, and a collective index for the first hundred volumes. The Bulletin de la Société chimique de France (formerly, de Paris) was started in 1858, and absorbed the Annals that were edited by Wurtz and Barre in 1841 and continued under this title. It has abstracts less complete than those of the Journal of the Chemical Society, and both annual and collective indexes. The Deutsche Chemischen Gesellschaft publishes its Berichte, 1857 on; had abstracts to 1896, when they were transferred to the Chemisches Zentralblatt. There are annual and collective indexes, with formula indexes, after the manner of Richter's Lexicon for the original papers for recent years.
The Chemical-Zeitung, 1877-on, published three times a week, has always
some abstracts, forming at times a separate volume. It is for the manufac-
ture particularly, but is a serial of general chemistry.

The American Chemical Society's Journal began in 1878, and some abstracts
1891, published a Review of American Chemical Research, 1886-1905, since
07, when the Society began the publication of Chemical Abstracts, the Journal
had only original papers, book reviews and proceedings of the Society. It
bought the American Chemical Journal in 1911.

Several others, less widely read are: Gazettes chimiques Italiani, 1871 to
; Montschrifte (Austria), 1880 on; Bulletin of the Belgian society. 1887.
At the Research from Leyden, 1882, all four giving only original papers; so too
these: Chemie in Werkland, Arbeiter-Kennt, Societe kemiak Tit Skrift.
The Chemical, Montschrie, and Arkiv were formerly the chemical sections of
the proceedings of the various Royal societies. The Reime paro de chimie, 1899,
with its brief abstracts in a separate volume as Jabloartes, is largely indus-
trial and seems to have died since the war.

The Journal of Industrial and Engineering Chemistry, 1909, is perhaps
an early applied chemistry, and this holds for the Chemical Age (New York).
Sub also contains the old Chemical Engineer; the Chemical Age is for the business
person who has chemical investments rather than for the scientist. The Sammlung
wissenschaftlich-chemisch-technischer Vertriebe, 1886, edited by F. B. Ahrens is
mixtures of monographs on general and technical chemical topics; a collective
only here in manuscript includes vol. 1-20.

V. 2. Index, reviews, and abstract serials

These, called sometimes, the reference serials, are of the greatest importance,
for they make it more nearly possible to know something of what other workers
were doing, and thus prevent duplication. They fall into three groups, according
to contents and arrangement.

Index serials give the reference only, i.e., name of author, title of paper in
a language of the original, name of serial, volume, pages, and date of publica-
tion. For books, which are included by some index serials, author, title, date,
and place of publication are usually given. The principal index serial for chem-
istry is the Chemistry section of the International Catalogue of Scientific Liter-
ature; this began in 1822 with the literature of 1801, and each annual volume
contains approximately one year's publications. There are both author and
subject entries, the latter being brief, while full details are found under the
author entry. The scheme of classification by subjects is given at the front of
each volume, and the period covered by the volume is stated.

Review serials present a more or less critical, concentrated account of the prog-
ress for the year, noting the more important papers, and have only brief refer-
ences to author and place of original publication. Berzelius' Jahresbericht,
1822-49, is the oldest we have here of this type. This was published in Swedish,
while we have the German translation, volumes for the years 1841-46 were also
published in French as Rappels annuels sur les progres des sciences physiques et
chimiques. The Fortschiitte der Chemie, 1904-., was an abstract serial called
Ganzlich-chemischen Centralblatt, to 1909, when it took the present name and

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The Annual Reports of the Progress of Chemistry, 1994, by the Anglist Chemical Society, is perhaps the most useful to the chemist now, in the field of pure science. Comparable, in German, is the Jahrbuch der Chemie (Meyer 1891), that also takes up only the more important articles. The review serials general cover periods of one year and have annual indexes, sometimes collective ones too.

Abstract serials are published frequently, and provide a comprehensive record of all the chemical work being done, so far as the editors are able to compile it. They give author, title (usually in the language of the abstract serial), serial volume, pages, and date; the abstractor may or may not sign his work; his aim is to give a complete but fairly complete summary of the contents of each article.

The three at present of most value for general chemistry are:

1. Chemisches Zentralblatt, 1852, published weekly, indexes for annual volumes to 1853; semiannual volumes 1859-1918 inclusive; in January, 1891, it took over the technical abstracts formerly done by the Zeitschrift für angewandte Chemie, and now has four volumes a year. Collective indexes have been made for 1870-84, and the period 1896-1911.

2. The Abstract sections, two in each month but appearing only at monthly intervals, of the Journal of the Chemical Society, London. Annual indexes for the time since 1841, the date of the first volume of Mémoires (successor of the Journal), are available, with collective indexes, that now include 1911. These abstracts are sometimes the best to be had, being of fair length and usually appear very soon after the original papers.

3. Chemical Abstracts, 1907, appears twice a month, has annual indexes and docehial (collective) index for 1907-16 inclusive. The volume for 1923 has a formula index, including organic and inorganic compounds, after the manner of Richter's Lexikon; such indexes, for their own original papers only, are also in these: Journal of the Chemical Society, Annales, Annales Berichts, Journal für praktische Chemie, Materiae, and Recueil des travaux des Pays-Bas, for recent years, and these provide a supplement to the volumes of the Literatur-Register for looking up organic compounds.

The abstracts in the French Bulletin, dating as they do from 1828, cover the field somewhat less completely than those of the Journal of the Chemical Society, but are sometimes of great assistance for papers appearing on the continent, and in particular for those in some of the less widely known French serials. There are annual indexes, and several collective ones, the latter including 1886-1908 at present.

The Jahresbericht (Liebig and Kopp) 1817, started as a review serial, and kept this form in part until 1893, when it began to give titles of articles. It has good annual and collective indexes, with for the later years, formula indexes of organic compounds; however, the volumes for 1910 are the most recent we have, so that the Literatur-Register is newer. Meyer's Jahrbuch, 1891, gives abstracts of the selected articles that seem to the editors of the greatest importance; it has annual indexes and one collective one.

The reference serials listed above are the most important for general chemistry, though they contain much on special fields, as organic, physical, biocer-
Lecture 4

Literature upon Analysis and Apparatus

This material is in two groups; first, the books and serials upon analysis in general, special methods, and substances; and second, that upon the apparatus and equipment of laboratories used for the purpose of teaching and research; the fencing up of plants for large-scale production belongs to the industrial or applied chemistry section.

A. Analysis: books and serials.

I. Books on methods

II. Books on analysis of special substances

III. Serials

A. I. Books on methods

These books include those on qualitative, quantitative, volumetric, electro- lytic, and spectrum analysis; calorimetric may be either qualitative or quanti- tative. The older works, due to the many improvements in apparatus and technique, are of use for reference and as history. Fresenius, often reissued and translated, has been replaced largely by the newest version of Tropschuldt, but Ed. 17, 1921, is edited by C. A. Mitchell. Prosser and Johnson in its latest revision is useful for qualitative work. The older presentation of general theory in Ostwald is supplemented by the theoretical volume of Steiglitz on qualitative. Clasen, Augeuscharite Methodein, and Crookes, Select methods have been re- vised; newer are Scott, Standard methods, 1917, giving American practice, and Goss's book on methods in use at Yale, A. A. Noyes, on qualitative analysis, Ed. 8, rev. in 1920.

The German works in many volumes, edited by Jägeresche and Peters respectively are rather "publisher's series" of monographs, and the Peters series has not been received here as yet. Villachebaum's Traité upon applied analytic chemistry, translated from the Italian in two volumes, 1918, has considerable general material in the first volume. Gardner's Chemical analysis, qualitative and quantitative, 1914, London, is a textbook of nearly 500 pages.

Mellor's Traité on quantitative inorganic analysis, 1907, is specially for ceramists; it is excellent, with many references to the literature. Low, Technical methods of ore analysis, Ed. 8, revised, 1919, is good and new, perhaps the best one in this field. The Bulletin of the U. S. Geological Survey by J. J. Heubeck, Analysis of silicate and carbonate rocks (formerly Bulletin 380, and then 422) is now revised and appears as Bulletin 700, 1919.

Smaller works include Julius, Metz, Talbot, Hettger, Beckert; these of Blancho, and G. McF. Smith are more recent. Volumetric analysis practically began with Meiss's Titrißbuch, 1855; even the tenth edition of Sutton on volumetric has long been out of print; the small text on qualitative by Schimpe, Ed. 3, 21
1917, is said to be excellent for volumetric, with new methods. Clamer, Theresia
and Praxis der Massenanalyse, 1912, is here in German only.

For electrolytic analysis there are in English, Cairns, Clason, Denny, and,
the newest, Dr. P. Smith's Electroanalysis, Ed. 6, 1918; the work of Lab on
electrochemistry of organic compounds, translated by Lorenz, is dated 1906.
Spectroscopic analysis, discovered by Bunsen and Kirchhoff, 1850-60, is considered
in one volume in English by Daly, while Kayser with six volumes in German, is
an example of a more comprehensive book.

A. II. Books and analysis of organic substances.

Books upon special sections of chemistry, as special substances are numerous.
Studier in his work upon methods for inorganic chemistry, German, to be four
volumes, not completed, gives many suggestions. For the organic industrial,
the fourth edition of Allen is helpful, with its ninth supplementary volume
giving a collective index. Lange, with three volumes in six on technical work,
and Zittel, Ed. 3, two volumes (this is in German only) provide methods for both
organic and inorganic. Lassen-Colin's Analysemethoden, Ed. 2, Hans Moyer's
Analyse, 1922, are upon organic substances only; as is Mulkens, Identification of
pure organic compounds; there are to be four volumes, but the fourth is not out
yet; the new edition of Weyl on organic methods is to be four volumes, nearly
a dictionary in size, edited by J. Hinze, volume 1 being published in 1921. Rosen-
thaler's Organic analysis, 1914, is published as vol. 19-20 of Marpechke's Die
chemische Analyse.

Smaller works upon organic analysis are by Keasen, (1922), Sherman, Ed. 2,
Clarke, Weston, Ed. 2, (also in French) Naive, Kingscott and Knight (this last
is quantitative organic), and the two volumes by Vamold in German on quantita-
tive organic analysis; this last is rather old, 1902.

Applied chemistry:

Allen, Lange (newer), and Zittel (both in German only), are general with the two
volumes Villacrossa in the most recent. Some material upon analysis is given in
the works on industrial chemistry by Zolliari, and by Martin, for both organic
and inorganic, Griffin, Technical methods, 1921 is American.

Analysemethoden gives much; the new 1920 edition to be
13 volumes; the older single volume of Hugpe-Seyler-Thielefelder is good; Hank, Thiemer, Hammerschmied, Cole, are in English; use the newest edition of
these.

Pooe, hydrazines, etc.:

Lacha, Ed. 4, is invaluable, and with this is the volume on methods by the
Association of Official Agricultural Chemists, 1921; the latter is planned to re-
place U. S. Chemistry, Bureau Bulletin 107. Sherman, Organic analysis is good
here; the encyclopedia on composition of food materials is Kölig, Chemische der
Food-Mehlen Nahrungsmittel Geleswerten, Ed. 4, in 4 volumes and supplement,
the methods being in Vol. 3 and 4.

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Typical works for gas, Diesel, Henpel. Part. White; oil, Leuckwitz, %
St. Andrew; sigma, Brown, Lippmann; steel, Johnson; pearl, Friend, Hurst,
adulter; sigma, Gay, Green, Wahl. Agriculture, Wiley, Pott, Angle; vol. 3, chem
ical, Emerson, March, Murray, the last an American work of 1929.

211. Series et alia
Material upon the topic is found in all general and special serials; there are
more however upon analysis particularly; all these have always given abstracts
as well as original papers, and all have collective indexes.

This is the Zielzeitschrift für analytische Chemie, founded by R. Fresenius
and called sometimes Fresenius' Zeitschrift: it was begun in 1862. Second in time
the Analyst, organ of the English Society of Public Analysts, dating from 1877,
is has special interest for food and drug analysis. The thesaurus is the French
Vocabulaire de chimie analytique et de chimie appliquee, 1896, which has absorbed
almost every serial of like character; both originals and abstracts in this are
crystal clear. The Annales des fabriques (now, et des fabricants) was begun in
1896, as an international bulletin to aid in preventing adulterations of food and
rugs; it has always given both original papers and abstracts; it is now pub
lished by the Société des experts-chimistes de France.

A similar publication is the Reptertoire international des travaux publiés sur
la composition, l'analyse et les utilisations des deniers alimentaires, 1916—,
of which the first two volumes were published in Dutch, the remainder in French;
it has no original papers, and the abstracts are extremely brief, or even lacking
altogether; this is almost an index serial. The volume for 1910 is the newest here,
and this is the only "abstracts only" serial for analysis. Usually, abstracts must
be booked up in the serials for chemistry in general, or in those for applied
chemistry, with special care to include serials upon the topic being investigated, a
Gradual Survey Record, for agricultural chemistry.

212. Physical and Agricultural
Here we may consider books upon the testing of reagents and the prepara
tion and care of apparatus. For the first class the older work of Knaus, the
cook by Misch is which an amplification of Knaus, and the new Standards and
sets for chemicals and reagents by Murray, 1920, will be sufficient in most cases
and reagents, vol. 1, 1915, by A. J. Cohn lists the tests, etc., that are known
by their authors' names. Proceedings, Theory and use of indicators 1917, is more
than the older small work by Cohn.

Physical methods in the chemical laboratory are dealt with in volume 1 of
Linde's Handbuch, 1913, in German; apparatus is described here too. Ost
wald's Lehrbuch, Physico-chemische Messungen, vol. 3, 1910, is very useful, it may
be supplemented by a number of the bulletins and circulars of the U. S. Bureau
of Standards.

Glassblowing is a science not to be quickly learned; some books that may
help the student are the following: 1908, Thirfall, the laboratory arts;
1907, Vosofk, Jens glass and its scientific and industrial applications;
1909, Albert, Anleitung zum Glashauen, ed. 3;
1919, Shimmem, Methods of glass blowing (ed. 3 was 1907).
This, the oldest section of chemistry, has in recent times seemed almost overshadowed in importance by the developments in the organic section; recent work upon theoretical inorganic structure and other phases, with alloys as metallurgy, has brought the inorganic side to prominence. The book here includes those on the elements, inorganic projects, and those on the mineral and metals, the manufactured products.

**A. General works**
1. Comprehensive
2. Brief
3. Dictionary

**B. Special works**
1. Methods
2. Preparations
3. Analysis

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