

erences also given in the U. S. ~~Pharmacopoeia and the~~ Dispensatory, while the Index Medicus, 1879, gives help on specific substances.

#### *Photochemistry and photography*

For the first, the Zeitschrift für wissenschaftliche photochemie und photographie, and for the latter Photominiature for scientific, and Photo-era for popular, are here.

#### *Water supply and sewage treatment*

For these we do not have Wasser und abwässer, said to be the best in German. The Journal of infectious diseases, Journal of the American waterworks association, and the abstract section of Hygienische rundschau and Chemical Abstracts will give enough for most purposes.

Some special topics like mining, and mine problems are cared for by the U. S. Bureau of mines Bulletins, Circulars, Technical papers; for others, State of U. S. (or both) Geological survey publications. The U. S. Bureau of Standards does much valuable work, to be most easily sought through the Journal of industrial and engineering chemistry. State and municipal publications on water supply problems are in the Water survey library, with some others in the Municipal reference collection, now in Lincoln Hall.

Topics where emphasis is put on the engineering side should be looked up in the various indexes to that literature, and these are in both the main library and at the Engineering library, where most of the mining literature is to be found.

Every special industry, as ceramics, has its own serials, and papers dealing with the special chemical problems are apt to be published in such serials. In general, the abstract serials include most of these, but reference should be made to the list in the index of Chemical Abstracts, for any year to be certain.

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## LECTURE IX.

### APPLIED (INDUSTRIAL) CHEMISTRY: BOOKS

Books upon this general topic are entered in the catalogue under the subject heading "chemical technology", while special works are given the most specific headings possible.

Progress in this field is so rapid that a book is nearly out of date by the time the final proof is read. Principles remain and general methods based upon them can usually be found at greater length in books. All statements upon such books must be taken as qualified and limited by the specifications, "best at present" or "best at hand" or some similar phrase.

1. Dictionaries and works of reference
2. General descriptive texts
3. General analytical works
4. Books upon special topics or industries or processes.

1. Thorpe, Dictionary of applied chemistry, Ed. 2, in five volumes is at present the best in English.

Ullmann's Enzyklopedie der technischen chemie, to be in ten volumes, is not here (1919), and only one volume was ready in 1914.

Andes' Lexikon, published in Vienna, 1895-1900 (?), gives explanation of unusual German technical terms in more ordinary German.

Bersch edits three similar volumes, also undated, upon chemical industries, metal industries, and dyes.

The Scientific American cyclopedia of formulas, Ed. 2, gives a large amount of miscellaneous chemical information in small space.

## 2. General descriptive texts.

These try to give some idea of methods of production, descriptions of finished product and raw materials, with generally a little on analysis, or methods for tests.

Martin, Ed. 2, English, 2 vol. in 3, is newest, has fairly complete reference lists, and includes both inorganic and the organic industries. Ed. 2 is 1914-17.

Molinari, 2 vol., is next in order of completeness, but is of date 1908. The methods are in some cases, quite obsolete in this country; he does try to give production costs, but the radical change in all prices now makes these seem queer.

Rogers (original edition, Rogers and Aubert) now in Ed. 2, specializes on methods in use in American industrial plants.

Sadtler, Ed. 4, in English, and Herzog, 1908, in German, are devoted to methods, etc., in the organic industries.

Bolley's Handbuch is the familiar German type, a long "publisher's series", each a distinct work; the second edition is in course of publication.

Groves and Thorpe, in four volumes in English, is rather old.

Chabrie, 2 vol., French, is of 1908.

Wagner, in the latest edition in English, is only of historical value now.

Single volumes, for use as textbooks are, Thorp, Outlines of industrial chemistry, Ed. 3, 1917, and Rogers, Elements, 1916, an abridgement of his larger work. Benson is the same type, but less in size.

Two somewhat different are Hale, really an elementary general chemistry for engineers, who are supposed to need a minimum of it, and Service chemistry, Ed. 4, 1913, by Lewes and Brame; this is for the use of army and navy training schools for officers, and pays attention to their special problems in chemistry and metallurgy, giving some general chemistry also. Apparatus, plant, and equipment, are dealt with by Nagel in two small volumes; Dyson, Manual of chemical plant, 1916-, is being published in small parts, and is to include "description of every new piece of chemical plant introduced in the past quarter of a century", with "exhaustive analysis of the patent literature for the same period."

Köhler, on the utilization of waste products, and Baskerville in his Municipal chemistry, discuss general problems.

## 3. Analysis

Here a few huge works nearly cover the field.

Allen, Commercial organic analysis, Ed. 4, 9 volumes, and collective index

in the ninth, <sup>gives</sup> information upon every material of organic character. Does not always give the newest methods.

Lunge, Technical chemical analysis, 3 vol. in 6 in English, includes inorganic to a considerable extent.

Post, Ed, 3, has two large but older volumes.

Two German series on analysis in general, that by Margosches, and another by Peters (not here), consist of monograph-like works, published as a series. Neither one is complete.

The newest book in this field of technological analysis is that by Villavecchia, 2 vol., 1918, in English. It seems to cover almost every substance.

Works on special analysis, of general interest are, Leach, Food analysis, Ed. 4, and Lewkowitsch, Ed. 5, in three volumes, on oils, fats, and waxes.

Wiley in English, and Pott in German do agricultural analysis, particularly the latter on feeding stuffs, very well. Methods of the Association of official agricultural chemists are in the U. S. Chemistry Bureau Bulletin 107, and in the Journal of the Association.

#### 4. Books upon special industries

These are innumerable, and get out of date more speedily than the general works.

Some typical ones in various fields are noted below.

#### *Coal tar industries*

This includes gas, coal, coke, dyestuffs, drugs. Wagner has three recent books on the first three. Hempel, Harrop, Dennis, take up gas analysis, and Parr includes coal. Making of gas is discussed by Hornby, Latta, Stone, Russell. For dyes in English there are Fay, Cain and Thorpe, Beacall, Knecht, and many others. Friedländer's Fortschritte, 1877- (at present) 1914, gives German and other patents in abstract, in a fairly satisfactory manner.

#### *Explosives*

There are new editions of Brunschwig, and Guttman, the huge new work to be ten volumes, two out now, by Worden on nitrocellulose, and, largest to date, the two volumes of Ed. 2 of Marshall; Colver is one volume.

#### *Food*

Leach, Allen, Sherman's two books, and the U. S. Chem. Bur. Bulletin 107, deal with analysis. The comprehensive treatise is König, in German, 4 volumes now in Ed. 4, giving data on source, use composition, and analysis of practically every substance used in and for human food.

#### *Oils*

Lewkowitsch is the most elaborate on fats and oils, animal and vegetable. There are also special works as on linseed oil, cottonseed oil, etc.

For mineral oils, Bacon and Hamor is newest large work. The one volume by Tinkler is good. Redwood, in the two-volume edition of 1906, gives a list of 5904 references; the later edition is in three volumes. In German, Engler-Höfer is in three huge volumes, the more chemical is here. Various U. S. and State publications from Geological surveys, etc., take up particular fields and phases; note specially papers by the U. S. Bureau of Mines on gasoline.

### *Paint and materials*

Some of the more important now are Toch, Ed. 2, Sabin on manufacture, Gardner, Holley, Cushman on analysis and tests, papers from the Paint Manufacturers' Association; Friend, Andes, Newman and others discuss use and corrosion. Bottler and Sabin take up varnish. Hurst's Dictionary lists raw materials with descriptions.

### *Pharmacology*

The U. S., British, and German pharmacopoeias give standards, and more details are given in the U. S. Dispensatory. The German cyclopedia is here in part only. New editions of Sollmann, Cushny, and Dixon are the best now. Synthesis, and analysis of drugs is taken up by late editions of May, Autenrieth, Nelson, Fuller. Works in German, and slightly older are, Heinz, 2 vol., 1905-06, Fränkel, Kobert.

### *Photography, including microphotography*

Derr is here, Sheppard and Mees is for theory, Flint for actual work. Schaum (in German, incomplete) discusses photochemistry, so does Sheppard in English in the series, Textbooks of physical chemistry. Hind and Randles takes up photomicrography, and Doubleday, 1916, presents examples of work.

The special books mentioned are given as fairly typical sample works for particular fields, in each of which there are specialists, and authorities.

Consult the newest serial literature for recent work, new discoveries. Use books to obtain fundamental facts, history, general statements with discussion.

It is probable that in a live industry, or growing science, any book that has been published more than ten years, contains much that has been superseded, in the way of methods, perhaps theories as well.

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## LECTURE X.

### THEORETICAL, PHYSICAL, COLLOID CHEMISTRY: SERIALS

Theoretical chemistry has, by its very nature, been scattered through all chemical serials, and seems likely to continue thus. General and special publications in serial form all contain it.

Use the general abstract and review serials, looking up the specific topic, as nearly as possible.

### *Physical chemistry*

- A. "Original paper" serials
- B. Abstract, index, and review serials.

A. Much of the earlier work is in the *Annalen der physik*, and, due to Kopp's editorship, in the *Annalen der chemie*. *Annales de chimie*, and all the general serials were used. The *Annalen der physik* is often referred to by the names of the various editors, Poggendorff, or Wiedemann.

In 1887, Wilhelm Ostwald and J. H. van't Hoff started the *Zeitschrift für physikalische chemie*, and, quoting an eminent physiologist, described it as "the

chemistry of the future." Until 1906, this had book reviews and also some abstracts. Indexes are annual, though often several volumes were published in a year; two collective indexes cover the period to 1906, when abstracts ceased.

Journal of physical chemistry, began at Cornell in 1896, and had abstracts till the Chemical Abstracts began in 1907. The annual volume has nine numbers, none in July, August and September.

Journal de chimie physique, founded at the University of Geneva, Switzerland, 1903, was started "to provide a central place of publication." After vol. 4, 1905, the abstracts become merely a subject index to the current literature of physical chemistry. Collective index for vol. 1-10.

The Russian journal of physical chemistry (this is on file at the University of Minnesota) has contained many important papers, some of which were also published in the Journal für praktische chemie.

B. Abstract, index, and review serials.

Here, we must depend chiefly on the general serials of these classes. There are two special ones however.

Biophysikalisches centralblatt, 1905-10, was then made a part of the Zentralblatt für biochemie und physik.

Physikalisch-chemisches centralblatt, 1904-09, and continued as Fortschritte der chemie, physik, und physikalischen chemie; this began at Darmstadt "as an international abstract serial for physical chemistry and the debatable land between chemistry and physics." Series 1 was abstracts, with annual index; series 2, is review in form, and has had one collective index, for vol. 1-5.

#### *Colloid chemistry serials*

There is at present only one, with a supplement containing papers of considerable length. R. Ditmar edited vol. 1 of the Zeitschrift für chemie und industrie der kolloide, 1906. Then it was moved to Germany, Wolfgang Ostwald became editor and has continued to be, except for a period of a year and a half when he was on military duty; then his wife, sister and brother ~~did~~ <sup>edit</sup> it. The name was changed to Kolloid-zeitschrift, in 1913; the supplement is Kolloid-chemische beihefte.

There are some abstracts in the Kolloid-zeitschrift, but not a complete set; much of the earlier work was published in the Zeitschrift für physikalische chemie. To obtain all references to literature, use the general abstract, index, and review serials.

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## LECTURE XI.

### THEORETICAL, PHYSICAL, COLLOID CHEMISTRY: BOOKS

The division between the first and second group is not definite, in all respects. Books will be discussed in the group in which their authors place them:

#### A. Theoretical

1. Historical

2. General

3. Special