

## **Chemical societies of the nineteenth century / by Henry Carrington Bolton.**

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# CHEMICAL SOCIETIES

OF THE

# NINETEENTH CENTURY.

BY

HENRY CARRINGTON BOLTON.



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# CHEMICAL SOCIETIES OF THE XIX CENTURY.\*

BY HENRY CARRINGTON BOLTON, PH.D.

The beginning of a new century affords an opportune period for chronicling the progress of chemistry as shown by the organizations formed to foster its study and to stimulate its adherents. In the following pages an attempt has been made to place on record the statistics of the Chemical Societies of the World for the year 1900, and to indicate those that ended their careers within the nineteenth century. The data have been obtained chiefly by correspondence, and thanks are due to the officers of societies who have responded to inquiries. I am also under special obligations to Dr. Paul Dorveaux, Librarian of the École Supérieure de Pharmacie, Paris; to Professor Bohuslav Brauner, of the Bohemian University, Prague; to Professor George W. A. Kahlbaum, of the University of Basel; and particularly to the Smithsonian Institution, for aid in securing the information sought.

The fact that chemical societies were organized and in operation in the United States of America long before they existed in Europe has been shown in my paper, "Early American Chemical Societies," read to the Chemical Society of Washington, April 8, 1897. The two pioneers in this field were the "Chemical Society of Philadelphia," founded in 1792, and the "Columbian Chemical Society of Philadelphia," founded in 1811. Of these some particulars will be found in their proper order.

In the following list the societies are placed in chronological order under each country, and the countries are arranged alphabetically. Of each society the following data are given so far as attainable:

Seat, and date of founding,  
Name of President, and membership in 1900,†  
Serial publications,‡  
Remarks.

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\* Read at the 25th Anniversary of the American Chemical Society held in New York City, April 12-13, 1901.

† No deductions have been made for duplication.

‡ For full details consult: A Select Bibliography of Chemistry, by Henry Carrington Bolton, Washington, 1893-1899. 3 vols. 8vo.

The results of this census are given in the following Table:

# CHEMICAL SOCIETIES OF THE WORLD.

## MEMBERSHIP IN 1900.

<i>Country.</i>	<i>No. of Societies.</i>	<i>No. of Members.</i>
Austria.....	7 .....	3,072
Belgium... ..	3 .....	740
France.....	10 .....	4,065
Germany.....	10 .....	7,559
Great Britain.....	9 .....	7,550
Italy.....	5 .....	479
Japan. ....	2 .....	1,012
Russia... ..	1 .....	327
South Africa.....	1 .....	(?)
Switzerland... ..	2 .....	94
United States America .	5 .....	2,379
Victoria.....	1 .....	100
TOTALS	<hr/> 56	<hr/> 27,377

March, 1901.  
WASHINGTON, D. C.



## AUSTRIA.

### CENTRALVEREIN FÜR RÜBENZUCKER INDUSTRIE IN DER OESTER- REICHISCH-UNGARISCHEN MONARCHIE.

Founded in 1854 at Vienna. In 1900: President, August Freiherr von Stummer; members, 213; associates, 49.

*Publications:* Organ des Vereins für R.-I., 1863-1874; Organ des Centralvereins für R.-I., 1875-1887; Oesterreichisch-ungarische Zeitschrift für Zucker-Industrie und Landwirthschaft, 1888-1900.

(Beilagen): Der Marktbericht, 1874-1885; Wochenschrift des Centralvereins für Rübenzucker in der oesterreichisch-ungarischen Monarchie, 1886-1900.

NOTE.—The Society maintains a Chemical Experiment Station under the direction of F. Stohmer.

### VEREIN ZUR HEBUNG DER ZUCKERFABRIKATION IM KÖNIGREICH BÖHMEN. [Also with a Bohemian name.]

Founded in 1868 at Prag under the presidency of Ferdinand Urbánek; the languages used were Bohemian and German. It was disbanded in 1874.

*Publication:* Zeitschrift für Zucker-Industrie. Organ des Vereins. Prag. 3 vols., 1872-74.

NOTE.—This journal is not to be confounded with: Zeitschrift für Zucker-Industrie in Böhmen, established at Prag in 1877 and current.

### CHEMICKA SPOLEČNOST: SPOLEK ČESKÝCH CHEMIKŮ. [Chemical Society: Union of Bohemian Chemists.]

Founded in 1872 at Prag. In 1900: President, K. Preis; honorary members, 11; active members, 318; correspondents, 77.

*Publications:* Zprávy spolku českých chemiků. 2 vols., 1872-76. (Reports.) Listy Chemické, 1877-1900. (Letters.)

NOTE.—The Society has also published a Chemická Knihovna (Chemical Library) in 8 vols.

### ZEMSKY SPOLEK PRO PRŮMYSL CUKROVARNICKÝ V ČECHÁCH; VEREIN DER ZUCKERINDUSTRIE IM KÖNIGREICH BÖHMEN.

Founded in 1876 at Prag. In 1900: President, Gustav Hodek; members, 325.



*Publications:* Zeitschrift für Zucker-Industrie in Böhmen, 1877-1900. (Beilage): Prager Zuckermarkt, 1881-1900.

#### OESTERREICHISCHE GESELLSCHAFT ZUR FÖRDERUNG DER CHEMISCHEN INDUSTRIE.

Founded in 1878 at Prag. In 1900: President, Georg Zetter; honorary members, 3; members, 196.

*Publications:* Bericht der oesterreichischen Gesellschaft zur Förderung der chemischen Industrie, 1879-98. Since 1899 the organ of the Society is: Oesterreichische Chemiker-Zeitung.

#### SPOLEČNOST PRO PRŮMYSL CHEMICKÝ. [Society of Chemical Industry.]

Founded in 1892 at Prag. In 1900: President, J. B. Lambl; honorary members, 20; active members, 440; correspondents, 54; founders, 57.

*Publications:* The organ of the Society since 1892 is: Časopis pro průmysl chemický, of Prag, which had been established in 1891. The Society has also published three volumes of a technological library: Knihovna technologicko chemická.

#### WIENER VEREIN ZUR FÖRDERUNG DES PHYSIKALISCHEN UND CHEMISCHEN UNTERRICHTS.

Founded in 1895 at Vienna. In 1900: President, Victor von Lang; members, 317.

*Publication:* Vierteljahrsberichte der Wiener Verein zur Förderung des physikalischen und chemischen Unterrichts, 1895-1900.

#### VEREIN OESTERREICHISCHER CHEMIKER IN WIEN.

Founded in 1897 at Vienna. In 1900: President, J. Klaudy; members, 878; founders, 14.

*Publication:* Oesterreichische Chemiker Zeitung, 1898-1900.

### BELGIUM.

#### ASSOCIATION BELGE DES CHIMISTES.

Founded August 4, 1887, at Brussels. In 1900: President, L. L. de Koninck; honorary members, 4; active members, 482; associates, 21; correspondents, 8.

*Publication:* Bulletin de l'Association Belge des Chimistes, 1887-1900.

NOTE.—The Association has 8 sections, viz: Liège, Louvain, Gembloux, Charleroi, Mons, Gans, Antwerp, Brussels.

## SOCIÉTÉ TECHNIQUE ET CHIMIQUE DE SUCRERIE DE BELGIQUE.

Founded February 26, 1896, at Brussels. In 1900: President, Eugène Meeus; members, 173; patron, 1.

*Publications:* La sucrerie Belge, which was established August 31, 1872, has been the organ of the Society since its foundation. The Society has also published several pamphlets on technical topics.

NOTE.—The formation of Sections was under discussion in 1900.

## SYNDICAT DES CHIMISTES PUBLICS DE BELGIQUE.

Founded in 1897 at Brussels. In 1900: President, François Sachs; members, 51.

*Publication:* Bulletin du Syndicat des chimistes publics de Belgique, 1897-1900.

NOTE.—The Society has in preparation: Recueil générale des méthodes d'analyse usitée dans les laboratoires publics.

SOCIÉTÉ GÉNÉRALE DES FABRICANTS DE SUCRE DE BELGIQUE is not a chemical society; its organ is: La sucrerie Belge, 1872-1900.

## FRANCE.

## SOCIÉTÉ INDUSTRIELLE DE MULHOUSE.

Founded in December, 1825, at Mulhouse (first meeting, May 11, 1826). In 1900: President, Auguste Dollfus; honorary members, 9; resident members, 190; non-resident members, 378; correspondents, 54.

*Publication:* Bulletin de la Société industrielle de Mulhausen (*sic*), 1827-1900.

NOTE.—This is not purely a chemical society, but it has a Committee on chemistry, and its Bulletin contains many papers on applied chemistry.

## SOCIÉTÉ CHIMIQUE DE PARIS.

Founded June 4, 1857, at Paris. In 1900: President, Edouard Grimaux; members, 365; patrons, 121; life members, 91; corresponding members, 449.

*Publications:* (a) Bulletin des séances de la Société chimique de Paris, 1858-62; (b) Répertoire de chimie pure et appliquée, 1858-63; (c) Bulletin de la Société chimique de Paris, 1864-1900; (d) Conférences et Leçons, 5 vols.



## ASSOCIATION DES ÉLÈVES DE M. FREMY.

Founded in 1878 at Paris. In 1900: President, Louis Barthélemy; members, 200.

*Publication:* Bulletin trimestriel de l'Association des élèves de M. Fremy, 1878-1900.

NOTE.—A social organization which, however, publishes the work of its members.

## ASSOCIATION DES CHIMISTES DE SUCRERIE ET DE DISTILLERIE DE FRANCE ET DES COLONIES.

Founded in 1883 at Paris. In 1900: President, M. Durin; honorary members, 3; resident members, 160; non-resident members, 710; corresponding members, 395.

*Publication:* Bulletin de l'Association des chimistes de sucrerie et de distillerie de France et des Colonies, 1883-1900.

## ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'ÉCOLE DE PHYSIQUE ET DE CHIMIE INDUSTRIELLE DE LA VILLE DE PARIS.

Founded in 1885 at Paris. In 1900: President, Octave Boudouard; honorary members, 41; members, 300.

*Publication:* Bulletin mensuel de l'Association amicale des anciens élèves de l'École de physique et de chimie industrielle de la ville de Paris, 1885-1900. Annuaire [etc.], 1885-1900.

## ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'ÉCOLE DE CHIMIE INDUSTRIELLE DE L'LYON.

Founded in 1886 at the Institut chimique de Lyon. In 1900: President, Alphonse Seyewitz; honorary members, 6; members, 104.

*Publication:* Bulletin des séances de l'Association amicale des anciens élèves de l'École de chimie industrielle de Lyon.

## SYNDICAT CENTRAL DES CHIMISTES ET ESSAYEURS DE FRANCE.

Founded in 1890 at Paris. In 1900: President, Ferdinand Jean; members, 125.

*Publications:* Revue de chimie analytique appliquée à l'industrie, 1893-98. Annales de chimie analytique appliquée à l'industrie became the organ of the Society in 1899; the Annales had been established in 1896, and was united with the Revue (above named) in 1899.

## SOCIÉTÉ CHIMIQUE DU NORD DE LA FRANCE.

Founded at Lille in 1891. In 1900: President, A. Pouriez; members, 100.

*Publication:* Bulletin mensuel de la Société chimique du Nord de la France, 1891-1900

## ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'INSTITUT CHIMIQUE DE NANCY.

Founded November 9, 1892, at Nancy. In 1900: President, M. Noel; honorary members, 8; patrons, 7; members, 52; associates, 75.

*Publication:* Bulletin (annuel) de l'Association.

## ASSOCIATION AMICALE DES ÉLÈVES ET ANCIENS ÉLÈVES DU LABORATOIRE D'ENSEIGNEMENT PRATIQUE APPLIQUÉE DE L'UNIVERSITÉ DE PARIS.

Founded in 1897 at Paris. In 1900: President, M. Loyer; honorary members, 12; members, 110.

*Publication:* Gazette de chimie, Paris, 1900.

## GERMANY.

## VEREIN FÜR DIE RÜBENZUCKER INDUSTRIE IM ZOLLVEREIN [later, DES DEUTSCHEN REICHS; later, VEREIN DER DEUTSCHEN ZUCKERINDUSTRIE].

Founded in 1850 at Berlin. In 1900: President, De Coste; members, 447.

*Publication:* Zeitschrift des Vereins [etc.], 1850-1900.

## DEUTSCHE CHEMISCHE GESELLSCHAFT ZU BERLIN.

Founded in 1867 at Berlin. In 1900: President, G. Volhard; honorary members, 15; life members, 92; members, 2637; associates, 372.

*Publication:* Berichte der deutschen chemischen Gesellschaft zu Berlin, 1868-1900. Since 1897 also: Chemisches Centralblatt (established in 1830).

## VEREIN ANALYTISCHER CHEMIKER.

Founded in 1878 at Magdeburg, and merged in 1887 with the Deutsche Gesellschaft für angewandte Chemie. See Verein deutscher Chemiker.

*Publication:* Correspondenzblatt des Vereines analytischer Chemiker, 1878-80.



FREIE VEREINIGUNG BAYERISCHER VERTRETER DER ANGEWANDTEN  
CHEMIE.

Founded in May, 1883, at Munich. In 1900: President, Albert Hilger; honorary members, 2; members, 124; correspondents, 69.

*Publications:* Bericht über die 1 [- 18] Versammlung der freien Vereinigung bayerischer Vertreter der angewandten Chemie, 1883-1900. Also reports in: Forschungsberichte über Lebensmittel und ihre Beziehung zur Hygiene, 1894-97; and in: Zeitschrift für Untersuchung der Nahrungs- und Genuss-Mittel, 1898-1900.

VEREIN DEUTSCHER BERUFS-CHEMIKER.

Founded in 1887 at Dresden.

*Publication:* The "Chemiker und Droguist" (Dresden, 1885) had in 1887 the sub-title: Correspondenzblatt des Vereines deutscher Berufs Chemiker. This title was dropped in 1888.

DEUTSCHE GESELLSCHAFT FÜR ANGEWANDTE CHEMIE.

Founded November, 1887, at Berlin, absorbing the Verein analytischer Chemiker. In 1896 the Society became: Verein deutscher Chemiker, *q. v.*

*Publication:* Zeitschrift für angewandte Chemie, 1888-1900. This was begun as: Zeitschrift für die chemische Industrie in 1887.

VEREINIGUNG ÖFFENTLICHER ANALYTISCHER CHEMIKER SACHSENS.

Founded in 1890 at Plauen in Vogtland. In 1900: President, Arthur Forster; members, about 25.

*Publication:* Zeitschrift für öffentliche Chemie, 1897-1900. Also: Bericht über die Hauptversammlung des Vereines öffentlicher analytischer Chemiker Sachsens.

VEREIN AKADEMISCH-GEBILDETE [later, DEUTSCHER] ZUCKERTECHNIKER.

Founded in 1891 at Berlin. In 1900: President, H. Claassen; honorary members, 1; members, 406; correspondents, 3.

*Publication:* Zeitschrift des Vereins akademisch-gebildete Zuckertechniker, 1891-92.

NOTE.—The organ of publication changed several times.

VERBAND DES LABORATORIUMS-VORSTÄNDE VON DEUTSCHEN HOCHSCHULEN.

Founded in 1898 [?].

## ZWEIGVEREIN DER ZUCKERTECHNIKER FÜR DAS AUSLAND.

Founded at Berlin. In 1901: President, C. Huck.

## DEUTSCHE ELEKTROCHEMISCHE GESELLSCHAFT.

Founded in October, 1894, at Berlin. In 1900: President, J. H. van't Hoff; members, about 700.

*Publication:* Bericht der deutschen elektrochemischen Gesellschaft, 1894-1900.

## VEREIN DEUTSCHER CHEMIKER.

Founded in 1896 at Berlin, as successor to Gesellschaft für angewandte Chemie (1887). Its seat is the residence of the President for a given year. In 1900: President, H. Caro; honorary members, 4; members, 2271. Embraced in 1900 the following sections (Bezirk-Vereine): Aachen, Belgien, Berlin, Frankfurt, Hamburg, Hannover, Mittel-Franken, Mittel- und Niederschlesien, Oberrhein, Oberschlesien, Pommern, Rheinland, Rheinland-Westphalen, Saar, Sachsen-Anhalt, Sachsen-Thüringen, Württemberg.

*Publication:* Zeitschrift für angewandte Chemie, 1887-1900. Cf. Deutsche Gesellschaft für angewandte Chemie.

## VERBAND SELBSTÄNDIGER ÖFFENTLICHER CHEMIKER DEUTSCHLANDS.

Founded May 30, 1896, at Nürnberg. In 1900: President, Robert Kayser; members, 161; associates, 102.

*Publication:* Zeitschrift für öffentliche Chemie (established in 1895), 1897-1900. Also Vol. I. as Vol. III., 1897, of Centralblatt für Nahrungs- und Genussmittel Chemie, sowie Hygiene.

## GREAT BRITAIN.

## SOCIETY FOR PHILOSOPHICAL EXPERIMENTS.

Founded in 1794 at London.

*Publication:* Minutes of the Society for Philosophical Experiments, 1794.

NOTE.—A German translation of the *Minutes* was edited by Alex. Nic. Scherer and published at Halle in 1803.

## CHEMICAL SECTION OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Founded in 1831. This is, however, a corporate part of the British Association, and the papers read to the Section are published in the annual Reports of the British Association, 1831-1900. In 1900: President, W. H. Perkin, jun.; number of members not given.



## CHEMICAL SOCIETY OF LONDON.

Founded in 1841 at London. In 1900: President, T. E. Thorpe; honorary and foreign members, 33; members, 2300.

*Publications:* Memoirs and Proceedings of the Chemical Society of London (1841-48); Quarterly Journal, 1849-62; Journal of the Chemical Society, 1863-1900.

## SOCIETY OF PUBLIC ANALYSTS.

Founded in 1874 at London. In 1900: President, Walter W. Fisher; honorary members, 9; members, 260.

*Publication:* Proceedings of the Society of Public Analysts, 1876; The Analyst, 1877-1900.

## INSTITUTE OF CHEMISTRY OF GREAT BRITAIN AND IRELAND.

Founded October, 1877, in London; incorporated, 1885. In 1900: President, John Miller Thomson; members, fellows, and associates, 1008 (resident members, 904); students, 118. Total, 1126.

*Publications:* Proceedings, half yearly, 1878-1900; Register, yearly, 1878-1900; Regulations, yearly, 1878-1900.

## SOCIETY OF CHEMICAL INDUSTRY.

Founded in 1881 at London. In 1900: President, Charles F. Chandler; honorary member, 1 (John Glover); members, 3459.

*Publication:* Journal of the Society of Chemical Industry, 1882-1900.

NOTE.—The Society has eight sections: London, Liverpool, Manchester, Newcastle, New York, Nottingham, Scotland, and Yorkshire.

## SOCIETY OF DYERS AND COLOURISTS.

Founded in 1884 at Bradford. In 1900: President, H. Grandage; honorary members, 3; members, 553.

*Publication:* Journal of the Society of Dyers and Colourists, 1884-1900.

## ALEMBIC CLUB.

Founded in 1889 at Edinburgh. This is a private club of only six members and has no president; the Secretary is Leonard Dobbin.

Publishes no journal, but has issued 15 Reprints of Chemical Monographs, etc., 1893-1900, and other works.

## INTERNATIONAL ASSOCIATION OF LEATHER-TRADES CHEMISTS.

Founded September, 1897, at London. In 1900: President H. R. Proctor; number of members, —.

*Publication:* Report of the Proceedings of the Conference of Leather-Trades Chemists, 1897.

## ITALY.

## ASSOCIAZIONE CHIMICO-FARMACEUTICA FIORENTINA.

Founded in 1877 at Florence. In 1900: honorary members, 20; resident members, 100.

*Publication:* L'Orosi, Bollettino di chimica, farmacia e scienze affini. Firenze, 1878-1900.

## SOCIETÀ CHIMICA DI MILANO.

Founded in February, 1895, at Milan. In 1900: President, Angelo Menozzi; resident members, 152; correspondents, 133.

*Publication:* Annuario della Società chimica di Milano, 1896-1900.

## ASSOCIAZIONE CHIMICO-INDUSTRIALE DI TORINO.

Founded June 25, 1899, at Turin. In 1900: President, Vittorio Sclopis; honorary members, 4; resident members, 103; correspondents, 87.

*Publication:* La Chimica industriale, 1899-1900.

## SOCIETÀ ITALIANA DEI CHIMICI ANALISTI.

Founded in 1893 at Pavia.

*Publication:* Atti ufficiale delle Società italiana dei chimici analisti, 1893. This forms a pamphlet of 18 pp. only, and is perhaps a mere prospectus, as the Society ceased to exist before 1900.

## JAPAN.

## CHEMICAL SOCIETY OF TOKYO.

Founded April, 1878, at Tokyo. In 1900: President, Naokichi Matsui; number of members, 156; associates, 197.

*Publication:* Tokyo Kagakkai Kaishi, 1880-1900.



## SOCIETY OF CHEMICAL INDUSTRY OF JAPAN.

Founded February, 1898, at Tokyo. In 1900: President, Takeaki Enomoto; honorary members, 7; members, 223; associates, 429.

*Publication:* Kōgyō Kagaku Zasshi, 1898-1900.

## RUSSIA.

## RUSSKAGO KHMICHESKAGO OBSHTCHESTVA [Russian Chemical Society].

Founded October 26, 1868. The Chairman of the first meeting was D. Mendeléeff. In 1900: President, F. F. Petrushevsky; members, 327.

*Publications:* Zhurnal Russkago Khimicheskago Obshtchestva. St. Petersburg, 1869-72, 4 vols.

*Continued as:*

Zhurnal Russkago Khimicheskago Obshtchestva i Fisicheskago Obshtchestva, 1873-78. 6 vols.

*Continued as:*

Zhurnal Russkago Fisiko-Khimicheskago Obshtchestva, 1879-1900.

## SOUTH AFRICA.

## CHEMICAL AND METALLURGICAL SOCIETY OF SOUTH AFRICA.

Founded May, 1894, at Johannesburg.

*Publication:* Proceedings of the Chemical and Metallurgical Society of South Africa, 1894-1897.

## SWITZERLAND.

## SOCIÉTÉ CHIMIQUE DE GENÈVE.

Founded February 10, 1878, at Geneva. In 1900: President, F. Kehrman.

*Publication:* The Minutes of the monthly meetings are published in: Archives des sciences physiques et naturelles de Genève, and in the Chemiker Zeitung.

## VEREIN SCHWEIZERISCHER ANALYTISCHER CHEMIKER.

Founded March 12, 1887, at Zürich. In 1900: President, A. Bertschinger; number of members, 94.

*Publication:* The organ of the Society is Schweizerische Wochenschrift für Chemie und Pharmacie, which was established under the title, Schweizerische Zeitschrift für Pharmacie, 1856-62.

## UNITED STATES OF AMERICA.

## CHEMICAL SOCIETY OF PHILADELPHIA.

Founded in 1792 at Philadelphia, under the presidency of James Woodhouse. Number of members unknown. The Society was in existence for more than ten years.

*Publication:* Memoir on the Supply and Application of the Blowpipe [etc.] by Robert Hare, 1802.

## COLUMBIAN CHEMICAL SOCIETY OF PHILADELPHIA.

Founded August, 1811, at Philadelphia, under the presidency of James Cutbush. Honorary members, 69; junior members, 13.

*Publication:* Memoirs of the Columbian Chemical Society of Philadelphia. Vol. I., 1813.

## CHEMICAL SECTION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A migratory organization, founded in 1875 as a Sub-Section; it became Section C of the A. A. A. S. in 1882 at the second meeting in Montreal. In 1900: Chairman of the Section, Jas. Lewis Howe; members, 89; fellows, 181.

*Publications:* The Proceedings of the A. A. A. S. has a division containing papers read before the Section of Chemistry.

## AMERICAN CHEMICAL SOCIETY.

Founded April 20, 1876, in New York City. In 1900: President, William McMurtrie; honorary members, 10; members, 1546; associates, 123.

*Publications:* Proceedings of the American Chemical Society, 1877-78; Journal of the American Chemical Society, 1879-1900.

Note.—In 1900 the Society had 12 sections: Rhode Island, Cincinnati, New York, Washington, Lehigh Valley, Chicago, Nebraska, North Carolina, Columbus, North Eastern, Philadelphia, and Michigan.

## ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

Founded September 8, 1884, at Philadelphia. In 1900: President, B. W. Kilgore; members, 350.

*Publications:* Methods of Analyses, 1884-88; Proceedings, 1889-1900.

NOTE.—Conventions of the Official Agricultural Chemists had been held prior to 1884; in 1880 at Washington and Boston; in 1881 at Cincinnati; and in May, 1884, at Atlanta.



## CHEMICAL SOCIETY OF WASHINGTON.

Founded at Washington in 1884. In 1893 became the Washington Section of the American Chemical Society, retaining also its name as above. In 1900: President, H. Carrington Bolton; members, 114.

*Publication:* Bulletin of the Chemical Society of Washington, 1884-92.

## NEW ENGLAND ASSOCIATION OF CHEMISTRY TEACHERS.

Founded February 19, 1898. Meetings are held in New England. In 1900: President, Rufus P. Williams; honorary members, 8; active members, 50; associates, 22.

*Publications:* Circulars of Information and Reports, 1898-1900. Also Registers.

## VICTORIA.

## SOCIETY OF CHEMICAL INDUSTRY OF VICTORIA.

Founded in 1900 under the Presidency of Orme Masson; membership, about 100.

## ADDENDUM.

## SOCIÉTÉ D'ARCUEIL.

Founded in 1807 at Arcueil. Dissolved in 1822. Members (at any one time), 12.

*Publication:* Mémoires de physique et de chimie. Paris, 3 vols., 8vo. 1807-17.

NOTE.—This private organization was founded by C. L. Berthollet; the meetings were held at his country house in Arcueil, near Paris. The membership included: La Place, C. L. Berthollet and his son A. B. Berthollet, Biot, Gay Lussac, Humboldt, Thénard, Decandolle, Collet-Descotils, Berard, Chaptal, Dulong, Poisson, Malus.

The foregoing list does not include Academies of science nor Associations of general science (with a few exceptions); it does not embrace societies having for their object industries involving chemical processes in part, excepting the refining of sugar; nor does it include the numerous societies of brewers and of beer-making, among which may be named the following:

BRAU-INDUSTRIE VEREIN IM KÖNIGREICH BÖHMEN, founded at Prague in 1874, and publishing the Böhmische Bierbrauer.

DEUTSCHE BRAUERBUND, founded at Nürnberg in 1861, and publishing the Allgemeine Hopfen-Zeitung.

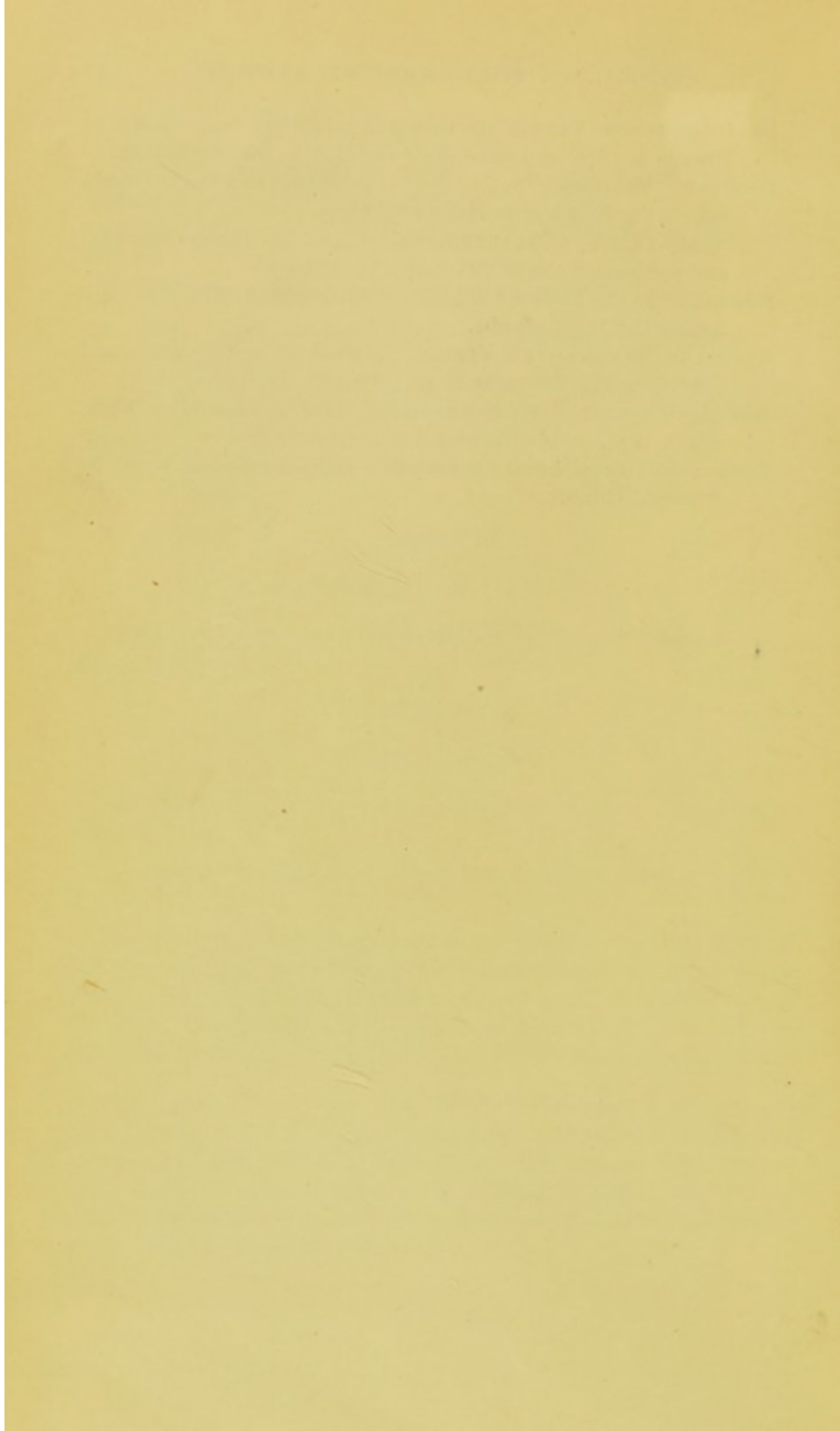
WÜRTTEMBERGISCHE BRAUERBUND, founded at Waldsee in 1872, and publishing the Schwäbische Bierbrauer.

BADISCHE BRAUERBUND, founded at Nürnberg in 1876, and publishing the Hopfenlaube.

DEUTSCHE BRAUMEISTER VEREIN, founded at Berlin, 1887, and publishing the Deutsche Brau-Industrie.

ASSOCIATION GÉNÉRALE DES BRASSEURS BELGES, founded at Brussels in 1874, and publishing Revue des Bieres.

COUNTY BREWERS' SOCIETY, England, publishing since 1871 the Brewers' Guardian.





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INDEX TO THE LITERATURE

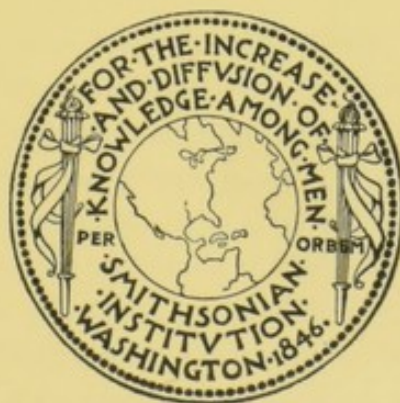
OF

GALLIUM

1874-1903

PREPARED BY

PHILIP E. BROWNING, Ph. D.



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## LETTER OF TRANSMITTAL.

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WASHINGTON AND LEE UNIVERSITY,  
DEPARTMENT OF CHEMISTRY,  
LEXINGTON, VA., *October 18, 1904.*

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the following:

INDEX TO THE LITERATURE OF GALLIUM, 1875-1903;

INDEX TO THE LITERATURE OF GERMANIUM, 1886-1903;

both prepared by Philip E. Browning, Ph. D., of the Kent Chemical Laboratory of Yale University.

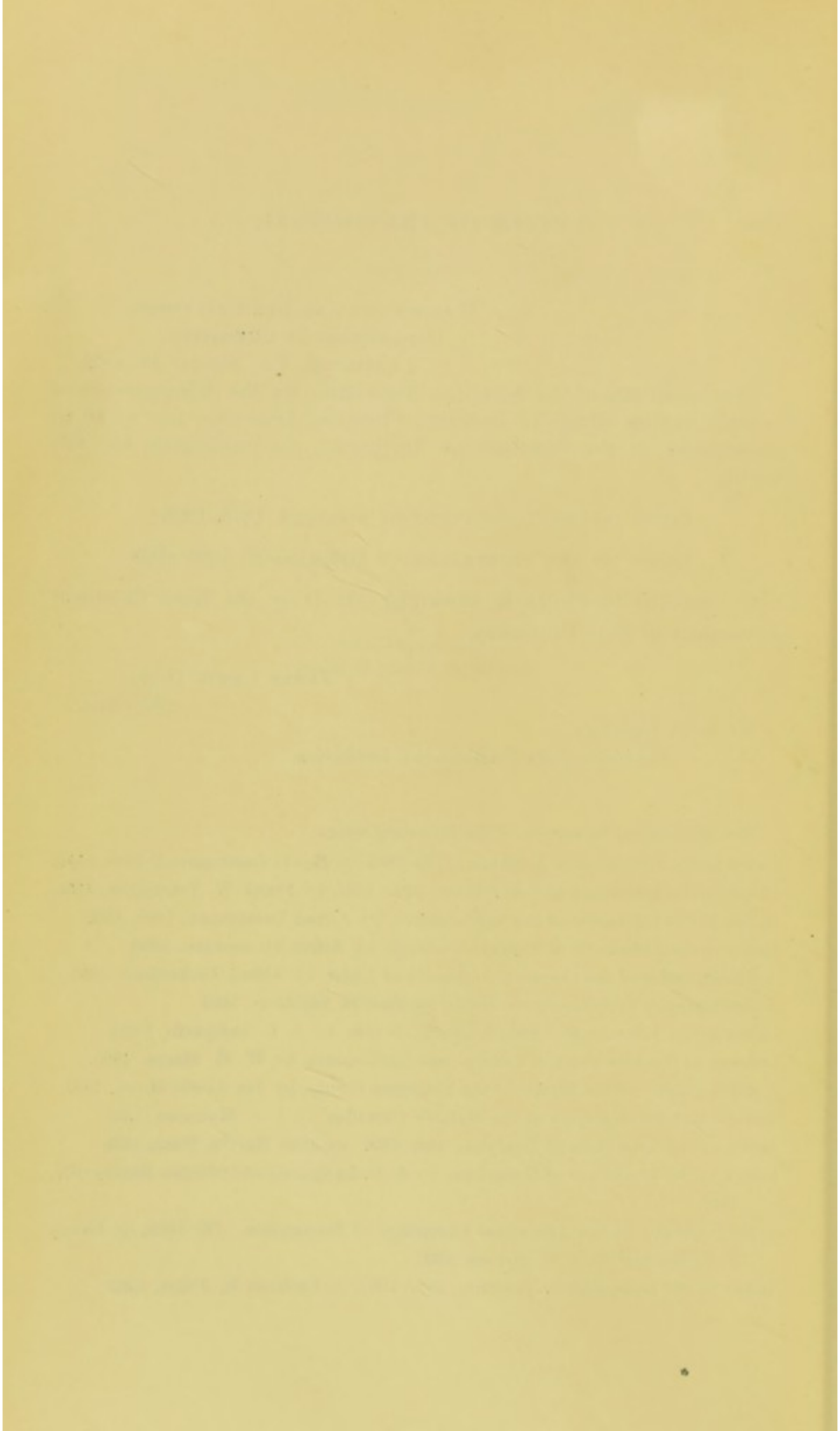
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# INDEX TO THE LITERATURE OF GALLIUM.

(1875-1903.)

PREPARED BY PHILIP E. BROWNING.

1875: (1). LECOQ DE BOISBAUDRAN. (Discovery.)

Compt. rend., LXXXI, 493; Ber. VIII, 1355, 1680; Ztschr. Anal. Chem., XVI, 239; Bull. Soc. Chim. (Paris), n. f., XXIV, 370; Amer. J. Sci., (3), XI, 320; Jsb. (1875), 205; Pogg. Ann., CLVIII, 494; Chem. News, XXXII, 159, 294; Amer. Chemist, VI, 146; Pharm. J. Trans., (3), VI, 282; N. Arch. Ph. Nat. liv., 283; Ann. Chim. Phys., (5), X, 100; J. Chem. Soc. (Lond.), XXX, 190; Chem. Centrbl. (1875), 658; Ding. Pol. J., CCXVIII, 376; Tidsskrift, (1), XIV, 349; Gazz. Chim. Ital., VIII, 24; Phil. Mag., I, 414; Monit. Scientif. (1876), 88; Berg. u. Hüttenmännische Ztg. (1876), 198, 207, 237; Arch. der Pharm., V, 352; Deutsche Industriezeit (1875), 731.

1875: (2). HUGO. (Objection to name.)

Compt. rend., LXXXI, 530.

1875: (3). MENDELEEFF. (Prediction previous to discovery.)

Compt. rend., LXXXI, 969; J. Chem. Soc. (Lond.), XXX, 530; Chem. News, XXXII, 293; Jsb. (1875), 207; Bull. Soc. Chim., n. f., XXV, 295; Chem. Centrbl. (1875), 817; Phil. Mag., (5), I, 542.

1876: (1). LECOQ DE BOISBAUDRAN. (Spectrum.)

Compt. Rend., LXXXII, 168; Chem. News, XXXIII, 35; Phil. Mag., (5), I, 176; Amer. Chemist, VI, 299; Chem. Centrbl. (1876), 194.

1876: (2). LECOQ DE BOISBAUDRAN. (Physical and chemical properties of the metal.)

Compt. rend., LXXXII, 1036, 1037; Bull. Soc. Chim. (Paris), (2), XXV, 400, 521; XXVI, 158, 433; Arch. Ph. Nat., LVI, 45; Chem. News, XXXIV, 150, 183; Phil. Mag., (5), II, 398, 479; Pogg. Ann., CLVIII, 494; Chem. Centrbl. (1876), 451, (1877), 19; Gazz. Chim. Ital., VII, 32; Ber., IX, 64, 1608, 1807.

1876: (3). LECOQ DE BOISBAUDRAN. (Extraction.)

Compt. rend., LXXXII, 1098; LXXXIII, 636; Bull. Soc. Chim. (Paris), (2), XXVII, 49, 144; J. Chem. Soc. (Lond.), XXX, 275; XXXI, 48, 521; Chem. Centrbl. (1876), 452, 705; Gazz. Chim. Ital., VII, 34; Chem. News, XXXIII, 230; XXXIV, 173; Ber., IX, 726, 731; Phil. Mag., (5), II, 480.

1876: (4). LECOQ DE BOISBAUDRAN. (Physical properties.)

Compt. rend., LXXXIII, 611, 1100; Phil. Mag., (5), I, 175; II, 398; Wag. Jsb., XXIII, 7; Chem. News, XXXIII, 193; Bull. Soc. Chim. (Paris), XXVI, 458; Arch. d. Pharm., VII, 453.

- 1876: (5). DELACHANAL and MERMET. (Presence in zinc.)  
Bull. Soc. Chim. (Paris), n. f., xxv, 197; xxvii, 49; Chem. Centrbl. (1876), 339; Ber., x, 91; Wag. Jsb., xxii, 1; xxiii, 9.
- 1876: (6). LECOQ DE BOISBAUDRAN. (Reactions, behavior toward reagents.)  
Compt. rend., lxxxiii, 663, 824; Chem. Centrbl. (1876), 721; (1877), 51; Chem. News, xxxiv, 217.
- 1876: (7). LECOQ DE BOISBAUDRAN. (Gallium crystals.)  
Compt. rend., lxxxiii, 1044; J. Chem. Soc. (Lond.), xxxi, 440; Chem. News, xxxv, 11; Chem. Centrbl. (1877), 65.
- 1877: (1). MUIR. (Comparison with Ekaaluminum.)  
Phil. Mag., (5), iii, 281; Chem. Centrbl. (1877), 434; Wag. Jsb., xxiii, 8.
- 1877: (2). LECOQ DE BOISBAUDRAN. (Review of work.)  
Ann. Chim. Phys., (5), x, 100; Chem. Centrbl. (1877), 178; Gazz. Chim. Ital., vii, 332; Chem. News, xxxv, 148, 157, 167.
- 1878: (1). LECOQ DE BOISBAUDRAN and JUNGFLEISCH. (Extraction.)  
Compt. rend., lxxxvi, 475; Amer. J. Sci., (3), xv, 473; Phil. Mag., (5), v, 318; Jsb. (1878), 251; J. Chem. Soc. (Lond.), xxxiv, 374, 556, 837; Chem. Centrbl. (1878), 210; Chem. News, xxxvii, 121; Monit. Scientif. (1878), 290; Chem. Industrie (1878), 130; Wag. Jsb., xxiii, 9; xxiv, 5; Bull. Soc. Chim. (Paris), xxvii, 144; xxx, 501; Amer. Chemist, vii, 309.
- 1878: (2). LECOQ DE BOISBAUDRAN and JUNGFLEISCH. (Properties of the metal.)  
Compt. rend., lxxxvi, 577; Jsb. (1878), 253; Chem. Centrbl. (1878), 276; Chem. News, xxxvii, 142.
- 1878: (3). LECOQ DE BOISBAUDRAN. (Halogens.)  
Comp. rend., lxxxvi, 756; Jsb. (1878), 254; Chem. Centrbl. (1878), 322.
- 1878: (4). DUPRE. (Researches.)  
Compt. rend., lxxxvi, 720; Amer. J. Sci., (3), xv, 474; Jsb. (1878), 254; Bull. Soc. Chim. (Paris), n. s., xxx, 503; J. Chem. Soc. (Lond.), xxxiv, 472; Chem. Centrbl. (1878), 322; Wag. Jsb., xxiv, 7; Chem. News, xxxvii, 184.
- 1878: (5). BERTHELOT. (Physical constants.)  
Compt. rend., lxxxvi, 786; Amer. J. Sci., (3), xvii, 166; Phil. Mag., (5), vii, 75; Ann. Chim. Phys., (5), xv, 242; Jsb. (1878), 78; J. Amer. Chem. Soc., x, 279; J. Chem. Soc. (Lond.), xxxiv, 556; Chem. Centrbl. (1878), 353; Wag. Jsb., xxiv, 8.



- 1878: (7). LECOQ DE BOISBAUDRAN. (Equivalent.)  
Comp. rend., LXXXVI, 756, 941; Bull. Soc. Chim. (Paris), n. s., XXIX, 385; J. Amer. Chem. Soc., I, 320; J. Chem. Soc. (Lond.), XXXIV, 646; Wag. Jsb., XXIV, 8; Chem. Centrbl. (1878), 387; Chem. News, XXXVI, 216; Tidsskrift, (1), XVII, 144.
- 1878: (8). LECOQ DE BOISBAUDRAN. (Alloys with aluminum.)  
Compt. rend., LXXXVI, 1249; Chem. Centrbl. (1878), 483; Chem. News, XXXVII, 274; Wag. Jsb., XXIV, 9.
- 1878: (9). LECOQ DE BOISBAUDRAN. (Atomic weight.)  
Bull. Soc. Chim. (Paris), n. s., XXXII, 393; Amer. J. Sci., (3), XVI, 137; Jsb. (1878), 250; Chem. News, XXXVII, 138.
- 1878: (10). REGNAULD. (Electrochemistry.)  
Compt. rend., LXXXVI, 1457; Jsb. (1878), 135; Chem. Centrbl. (1878), 561; Wag. Jsb., XXV, 9.
- 1879: (1). LOCKYER. (Heating of metal in vacuo.)  
Chem. News, XI, 101; Jsb. (1879), 176; Compt. Rend., LXXXIX, 514.
- 1879: (2). JUNGFLEISCH. (Separation from blendes.)  
Bull. Soc. Chim. (Paris), XXXI, 50; Ber., XII, 276, 382; Wag. Jsb., XXV, 9; Berg. u. Hüttenmannische Ztg. (1879), 206.
- 1880: (1). SCHUCHT. (Electrolysis of salts.)  
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- 1880: (2). CORNWALL. (Occurrence in American blendes.)  
Amer. Chem. J., II, 44; Chem. Ztg. (1880), 443; Jsb. (1880), 327; J. Chem. Soc. (Lond.), XL, 997.
- 1881: (1). CLARKE. (Atomic weight.)  
Amer. Chem. J., III, 263; Phil. Mag., (5), XII, 101; Jsb. (1881), 7.
- 1881: (2). LECOQ DE BOISBAUDRAN. (Anhydrous chlorides.)  
Compt. rend., XCIII, 294, 329, 815; Jsb. (1881), 221; Chem. Soc. (Lond.), XL, 1103; XLII, 364; Chem. Centrbl. (1881), 645; (1882), 5; Chem. Ztg. (1881), 979.
- 1881: (3). CLARKE. (Atomic weight.)  
Amer. Chem. J., III, 263; Phil. Mag., (5), XII, 101; Jsb. (1881), 7.
- 1882: (1). LECOQ DE BOISBAUDRAN. (Oxychloride.)  
Compt. rend., XCIV, 695; Jsb. (1882), 287; J. Chem. Soc. (Lond.), XLII, 698; Chem. Centrbl. (1882), 284; Chem. Ztg. (1882), VI, 266.
- 1882: (2). LECOQ DE BOISBAUDRAN. (Decomposition of protochloride.)  
Compt. rend., XCV, 18; J. Chem. Soc. (Lond.), XLII, 1167.

- 1882: (3). LECOQ DE BOISBAUDRAN. (Precipitants.)  
 Comp. rend., xciv, 1154, 1228; Jsb. (1882), 1295; J. Chem. Soc. (Lond.), xlii, 897; Chem. Centrbl. (1882), 418.
- 1882: (4). LECOQ DE BOISBAUDRAN. (Separations.)  
 FROM NA., K., LI., CS., RB., BA., SR., CA., MG., AL., CR.  
 Compt. rend., xciv, 1228; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Chem. Ztg. (1882), vi, 493.  
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 Compt. rend., xciv, 1625; xcix, 526; Jsb. (1882), 1295; Ann. Chim. Phys. (6), ii, 176; Chem. Centrbl. (1882), 519.  
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 Compt. rend., xcv, 157; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxxix, 547; Chem. Centrbl. (1882), 606.  
 FROM IN., CD.  
 Compt. rend., xcv, 410; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxxix, 547; Chem. Centrbl. (1882), 646.  
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 Compt. rend., xcv, 705, 1192, 1332; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxix, 547; Chem. Centrbl. (1882) 826, (1883) 36, 130.
- 1883: (1). LECOQ DE BOISBAUDRAN. (Separations.)  
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 Compt. rend., xcvi, 152, 1696, 1838; Ann. Chim. Phys., (6), ii, 176; Jsb. (1883), 1571; Bull. Soc. Chim. (Paris), xl, 350; xli, 353; Chem. Centrbl. (1883), 130, 501.  
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- 1883: (2). DONATH and MAYRHOFER. (Atomic volume.)  
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- 1883: (3). RABUTEAU. (Physiological effect.)  
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- 1884: (1). LECOQ DE BOISBAUDRAN. (Separations.)  
FROM B. (Organic matter.)  
Compt. rend., xcvi, 711, 781; Ann. Chim. Phys., (6), ii, 176; Jsb. (1884), 1600; Chem. Centrbl. (1884), 419; Chem. Ztg. (1884), 1040.
- 1884: (2). LECOQ DE BOISBAUDRAN. (Solubility of the ferrocyanide.)  
Compt. rend., xcix, 526; Jsb. (1884), 1602.
- 1884: (3). CARNELLY. (Relation of color to atomic weight.)  
Phil. Mag., (5), xviii, 130; Ber. (1884), 2151; Chem. News, L, 193; Jsb. (1884), 43.
- 1884: (4). CLARKE. (Atomic weight.)  
Chem. News, xlix, 260, 273; Chem. Ztg. (1884), 930.
- 1885: (1). EHRLICH. (Extraction.)  
Chem. News, li, 115; Chem. Ztg. (1885), 78; Jsb. (1885), 496.
- 1885: (2). LECOQ DE BOISBAUDRAN. (Alloys with indium.)  
Compt. rend., c, 701; Chem. News, li, 165; Jsb. (1885), 496; Chem. Centrbl. (1885), 297; Chem. Ztg. (1885), 1, 470.
- 1885: (3). GLADSTONE. (Refraction equivalent.)  
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- 1885: (4). KUNERT. (Extraction.)  
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- 1886: (1). LECOQ DE BOISBAUDRAN. (Identity with austrium.)  
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- 1886: (2). LECOQ DE BOISBAUDRAN. (Estimation.)  
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- 1886: (3). WILLGEROOT. (As halogen transferrer.)  
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- 1887: (1). LECOQ DE BOISBAUDRAN. (Red fluorescence of the oxide with chromium.)  
Compt. rend., civ, 330, 1584; Chem. News, lvi, 12; Ber., xx, 456r; Jsb. (1887), 358.
- 1887: (2). LECOQ DE BOISBAUDRAN. (Volatility of the chloride.)  
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- 1888: (1). LECOQ DE BOISBAUDRAN. (Fluorescence of compounds.)  
Compt. rend., cv, 1228; Chem. Centrbl. (1888), 462.
- 1888: (2). FRIEDEL and CRAFTS. (Vapor density of the chloride.)  
Compt. rend., cvii, 306; J. Chem. Soc. (Lond.), liv, 1250; liii, 825; Chem. Centrbl. (1888), 1167; Chem. Ztg. Rep. (1888), 213.

- 1888: (3). NILSON and PETTERSSON. (Valence and the chloride.)  
Compt. rend, cvii, 527; Ber., xxi, 691r; Jsb. (1888), 572; Chem.  
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- 1889: (1). BARTLETT. (Occurrence.)  
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- 1889: (2). RAMSAY. (Molecular weight.)  
J. Chem. Soc. (Lond.), lv, 531.
- 1890: (1). WINKLER. (Reduction of the oxide by magnesium.)  
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- 1891: (1). CLARKE. (Atomic weight.)  
Chem. News, lxiii, 76; Jsb. (1891), 79.
- 1892: (1). LECOQ DE BOISBAUDRAN. (Spark spectrum.)  
Compt. rend., cxiv, 815; Jsb. (1892), 456; J. Chem. Soc. (Lond.),  
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- 1893: (1). WILDE. (Spectrum.)  
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- 1893: (2). GLADSTONE. (Molecular refraction and dispersion.)  
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- 1893: (3). KIRTLAND. (Occurrence in Australian blends.)  
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- 1895: (1). LECOQ DE BOISBAUDRAN. (Atomic weight.)  
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- 1896: (1). HARTLEY and RAMAGE. (Occurrence.)  
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- 1897: (1). HARTLEY and RAMAGE. (Occurrence.)  
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- 1897: (2). WINKLER. (History of the discovery.)  
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- 1897: (3). WYRUBOFF. (Silico-tungstate.)  
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- 1898: (1). LANDOLT, OSWALD, and SEUBERT. (Atomic weight.)  
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- 1898: (2). HARTLEY and RAMAGE. (Occurrence in iron ores, etc.)  
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 Chem. Centrbl. (1897), I, 455; Ztschr. anorg. chem., XVIII, 232;  
 Dublin Roy. Soc. Proc., n. s., VIII, 703.
- 1899: (1). MEYER. (Magnetic properties.)  
 Monatsh. f. Chem., XX, 380.
- 1899: (2). HARTLEY and RAMAGE. (Spectrum.)  
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- 1901: (1). HARTLEY and RAMAGE. (Occurrence.)  
 Lond. Roy. Soc. Proc., LXVIII, 99; Dublin Roy. Soc. Sci. Trans., VII;  
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- 1904: (1). RIMATORI. (Occurrence in Sardinian blendes.)  
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SMITHSONIAN MISCELLANEOUS COLLECTIONS

PART OF VOLUME XLVI

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INDEX TO THE LITERATURE  
OF  
GERMANIUM

1886-1903

PREPARED BY  
PHILIP E. BROWNING



(No. 1544)

CITY OF WASHINGTON  
PUBLISHED BY THE SMITHSONIAN INSTITUTION

1904

WASHINGTON, D. C.  
PRESS OF JUDD & DETWEILER  
1904



## LETTER OF TRANSMITTAL.

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WASHINGTON AND LEE UNIVERSITY,  
DEPARTMENT OF CHEMISTRY,  
LEXINGTON, VA., *October 18, 1904.*

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the following:

INDEX TO THE LITERATURE OF GALLIUM, 1875-1903;

INDEX TO THE LITERATURE OF GERMANIUM, 1886-1903;

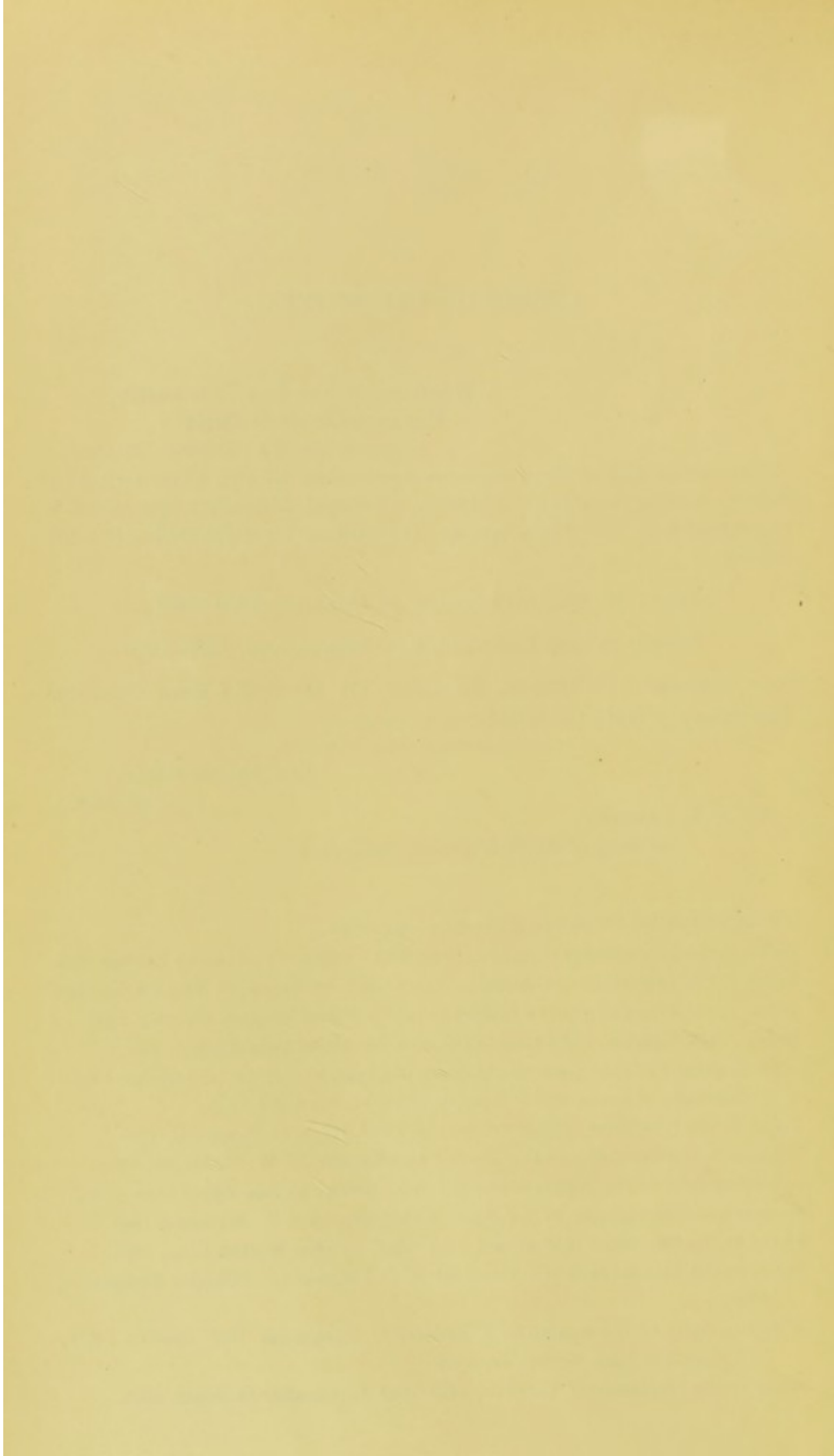
both prepared by Philip E. Browning, Ph. D., of the Kent Chemical Laboratory of Yale University.

JAS. LEWIS HOWE,  
*Chairman.*

Mr. S. P. LANGLEY,  
*Secretary of the Smithsonian Institution.*

This publication forms one of the following series:

- Index to the Literature of Uranium, 1785-1885, by Henry Carrington Bolton, 1885.
- Index to the Literature of Columbium, 1801-1887, by Frank W. Traphagen, 1888.
- Index to the Literature of the Spectroscope, by Alfred Tuckerman, 1888, 1902.
- Index to the Literature of Thermodynamics, by Alfred Tuckerman, 1890.
- A Bibliography of the Chemical Influence of Light, by Alfred Tuckerman, 1891.
- A Bibliography of Aceto-Acetic Ester, by Paul H. Seymour, 1894.
- Index to the Literature of Didymium, 1842-1893, by A. C. Langmuir, 1895.
- Indexes to the Literature of Cerium and Lanthanum, by W. H. Magee, 1895.
- A Bibliography of the Metals of the Platinum Group, by Jas. Lewis Howe, 1897.
- Review and Bibliography of the Metallic Carbides, by J. A. Mathews, 1898.
- Index to the Literature of Thallium, 1861-1897, by Miss Martha Doan, 1898.
- Index to the Literature of Zirconium, by A. C. Langmuir and Charles Baskerville, 1899.
- A Bibliography of the Analytical Chemistry of Manganese, 1785-1900, by Henry P. Talbot and John W. Brown, 1902.
- Index to the Literature of Thorium, 1817-1902, by Cavalier H. Joüet, 1903.



# INDEX TO THE LITERATURE OF GERMANIUM.

(1886-1903.)

PREPARED BY PHILIP E. BROWNING.

- 1886: (1). WINKLER. (Discovery.)  
Ber., XIX, 210; Chem. News, LIII, 127; J. Chem. Soc. (Lond.), I, 421;  
Chem. Ztg., X, 212, 237, 676; Amer. Chem. J., IX, 71; Ztschr. Anal.  
Chem., XXV, 226; Ding. Pol. J., CCLIX, 474; Bull. Soc. Chem. (Paris),  
XLVI, 320; Wag. Jsb., XXXIII, 223; Chem. Centrbl. (1886), 242;  
Amer. J. Sci., (3), XXXI, 308; J. de Pharm., (5), XIII, 335.
- 1886: (2). LECOQ DE BOISBAUDRAN. (Atomic weight and spectrum.)  
Compt. rend., CII, 1291; Ber., XIX, 479R; Jsb. (1886), 47; Chem.  
News, LIV, 4; J. Chem. Soc. (Lond.), I, 768; Chem. Ztg. Rep.  
(1886), 137.
- 1886: (3). WINKLER. (Extraction, properties of element, salts, etc.)  
J. Prakt. Chem., (2), XXXIV, 177; Ber., XIX, 625R; Jsb. (1886), 374;  
Chem. Ztg. (1886), 1057; Chem. News, LIV, 136; J. Chem. Soc.  
(Lond.), I, 985; Bull. Soc. Chim. (Paris), XLVI, 644; J. de Pharm.,  
(5), XIV, 478; Wag. Jsb., XXXII, 223; Chem. Centrbl. (1886), 770,  
771.
- 1886: (4). WEISBACH. (Argyrodite—A new mineral.)  
Jsb. f. Min. (1886); J. Chem. Soc. (Lond.), I, 774; Chem. News,  
LIII, 257; Ztschr. Anal. Chem., XXV, 226.
- 1886: (5). LECOQ DE BOISBAUDRAN. (Atomic weight.)  
Compt. rend., CII, 452; Ber., XIX, 738R.
- 1886: (6). C. KOB. (Emission spectrum.)  
Ann. der Phys., (2), XXIX, 670; Jsb. (1886), 304; J. Chem. Soc.  
(Lond.), LII, 313.
- 1886: (7). QUESNEVILLE. (Request for change of name to Ekasilicon.)  
Chem. News, LIV, 49.
- 1886: (8). NILSON and PETTERSSON. (Specific and atomic heat.)  
Ztschr. Phys. Chem., I, 27; Jsb. (1887), 218; Ber., XX, 134R; Chem.  
News, LV, 186; J. Chem. Soc. (Lond.), LII, 778; Chem. Centrbl.  
(1887), XVIII, 329; Tidsskrift, (2), VIII, 149.



- 1887: (1). WINKLER. (Compounds.)  
*J. Prakt. Chem.*, (2), xxxvi, 177; *J. Chem. Soc. (Lond.)*, LII, 1081; *Jsb.* (1887), 459; *Chem. Ztg.* (1887), 1123; *Ber.*, xx, 677r; *Amer. Chem. J.*, x, 245; *Ztschr. anal. Chem.*, xxvi, 273, 359; *Bull. Soc. Chim. (Paris)*, XLIX, 109; *Amer. J. Sci.*, (3), xxxiii, 68; *Chem. Centrbl.* (1887), xviii, 1340.
- 1887: (2). V. MEYER. (Properties of the element.)  
*Ber.*, xx, 498; *Jsb.* (1887), 378; *J. Chem. Soc. (Lond.)*, LII, 445; *Chem. Ztg. Rep.* (1887), 81; *Bull. Soc. Chim. (Paris)*, XLVII, 764; *Chem. Centrbl.* (1887), xviii, 474, 1340.
- 1887: (3). WINKLER. (Relation to Si. group.)  
*Naturf. Vers. zu Wiesb.*, *Sekt. f. Chem.* 20 Sept. *Tagebl.* 85 *Chem. Centrbl.* (1887), 1341.
- 1887: (4). KRÜSS and NILSON. (Potassium-Germanium Fluoride.)  
*Oefvers. af k. Swenska Vetenskaps Akademiens Forhandlingar* (1887), No. 5; *Ber.*, xx, 1696; *Jsb.* (1887), 466; *Bull. Soc. Chim. (Paris)*, XLVIII, 501; *Tidsskrift* (2), viii, 265.
- 1887: (5). J. M. VAN BEMMELEN. (Oxide.)  
*Rec. Trav. Chem. Pays Bas*, vi, 205; *Jsb.* (1887), 458; *Ber.*, xx, 677r, *J. Chem. Soc. (Lond.)*, LIV, 1041; *Chem. Centrbl.* (1887), xviii, 1099.
- 1887: (6). PAIJKULL and BRÖGGER. (Crystallographic determination of  $K_2GeF_6$ .)  
*Zeitschr. Kryst.*, xv, 95; *Oefvers. Sw. Vet. Akad. Forh.* (1887), 302; *Jsb.* (1888), 546.
- 1887: (7). K. HAUSHOFER. (Microscopic reactions.)  
*Situngsab. d. Akad. d. Wissensch. z. München* (1887), I, 133; *Ber.*, xx, 660r; *Jsb.* (1887), 2417; *J. Chem. Soc. (Lond.)*, LVI, 78.
- 1887: (8). WILLGEROOT. (Reaction with halogens.)  
*J. Prakt. Chem.*, (2), xxxv, 391; *Jsb.* (1887), 618.
- 1887: (9). KRÜSS. (Germanium in Euxenite.)  
*Ber.*, xxi, 131; *Jsb.* (1888), 546; *J. Chem. Soc. (Lond.)*, LIV, 345; *Chem. Ztg.* (1887), 1638; *Bull. Soc. Chim. (Paris)*, XLIX, 628; *Amer. J. Sci.*, (3), xxxv, 410; *Chem. Centrbl.* (1888), xix, 275.
- 1888: (1). HAMPE. (Non-conductivity.)  
*Chem. Ztg.*, xii, 171, 173; *J. Chem. Soc. (Lond.)*, LIV, 89.
- 1889: (1). HAUSHOFER. (Microscopic reactions.)  
*Ztschr. f. Kryst.*, xvii, 295; *Jsb.* (1889), 427; *Chem. Tech. Ztg.*, vi, 315; *Chem. Centrbl.* (1888), 867.
- 1891: (1). CLARKE. (Atomic weight.)  
*Chem. News*, LXIII, 76; *Jsb.* (1891), 79.

- 1891: (2). NEUMANN. (Germanium in tin compounds.)  
Monatsh. f. Chem., xii, 515.
- 1891: (3). WINKLER. (Reduction of the oxide by magnesium.)  
Ber., xxiv, 891; Jsb. (1891), 494; J. Chem. Soc. (Lond.), lx, 802;  
Bull. Soc. Chim. (Paris), (3), vi, 173.
- 1892: (1). CHRUSTSCHOW. (Germanium in Samarskite and in Nb. and Ta. minerals.)  
J. Russ. Chem.-Phys. Soc. (1892), 130; Ztschr. anorg. Chem., i, 465;  
xiv, 311; Ztschr. Kryst., xxiv, 516; Chem. Centrbl. (1895), ii, 977.
- 1893: (1). PENFIELD. (Canfieldite, a new Germanium mineral.)  
Amer. J. Sci., (3), xlvi, 107; Ber., xxvi, 754R; Chem. Centrbl. (1893),  
i, 833; Ztschr. anorg. Chem., v, 407; Bull. Soc. Chim. (Paris), (3),  
xii, 7; Tidsskrift, (3), ii, 364; Chem. Ztg. Rep., xvii, (1893), 255.
- 1894: (1). FRIEDRICH. (Tetra chloride.)  
Bull. Soc. Chim. (Paris), (3), xiii, 56; Monatsh. f. Chem., xiv, 518.
- 1895: (1). LECOQ DE BOISBAUDRAN. (Atomic weight.)  
Compt. rend., cxx, 361; Ber., xxviii, 178R.
- 1897: (1). WINKLER. (History of the discovery.)  
Ber., xxx, 15.
- 1898: (1). LANDOLT, OSTWALD and SEUBERT. (Atomic weight.)  
Ber., xxxi, 2762.
- 1898: (2). PRIOR and SPENCER. (Germanium in Bolivian minerals.)  
Min. Mag. (1898), xii, 5; J. Chem. Soc. (Lond.), lxxiv, 436.
- 1898: (3). WINKLER. (Priority of discovery.)  
Oesterreich. Ztschr. f. Berg-Hüttenwesen No. 10 (1898); Ber., xxxii,  
307; J. Chem. Soc. (Lond.), lxxvi, 297; Chem. Centrbl. (1899), i,  
726; Bull. Soc. Chim. (Paris), (3), xxii, 441; Chem. Ztg. Rep.  
(1899), xxiii, 58.
- 1899: (1). MEYER. (Magnetic properties.)  
Monatsh. f. Chem., xx, 380.
- 1901: (1). WELLS. (Double Halide.)  
Amer. Chem. J., xxvi, 398.
- 1902: (1). VOEGELEN. (Hydride.)  
Ztschr. anorg. Chem., xxx, 325; Chem. Centrbl. (1902), i, 1195;  
Ztschr. angew. Chem., xv, 679; J. Phy. Chem., vi, 432 (note).
- 1904: (1). LINCIO. (Absence in Euxenite, Samarskite, etc.).  
Centrbl. Min. and Geol. (1904), 142; Chem. Centrbl. (1904), i, 1669.



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SMITHSONIAN MISCELLANEOUS COLLECTIONS

PART OF VOLUME XLVI

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INDEX TO THE LITERATURE

OF

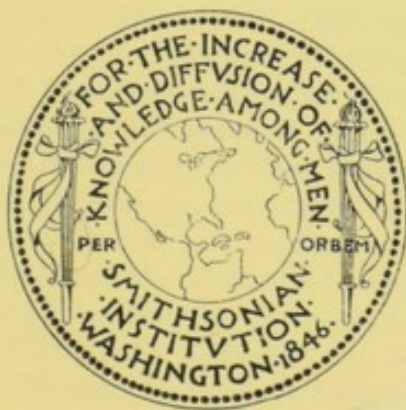
INDIUM

1863-1903

PREPARED BY

PHILIP E. BROWNING, PH. D.

of the Kent Chemical Laboratory of Yale University

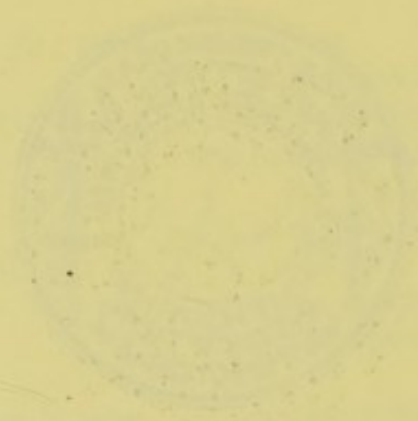


(No. 1571)

CITY OF WASHINGTON  
PUBLISHED BY THE SMITHSONIAN INSTITUTION  
1905

WASHINGTON, D. C.  
PRESS OF JUDD & DETWEILER (INC.)

1905



## LETTER OF TRANSMITTAL.

WASHINGTON AND LEE UNIVERSITY,  
DEPARTMENT OF CHEMISTRY,  
LEXINGTON, VA., *March 25, 1905.*

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the following:

INDEX TO THE LITERATURE OF INDIUM, 1863-1903;

prepared by Philip E. Browning, Ph. D., of the Kent Chemical Laboratory of Yale University.

JAS. LEWIS HOWE,  
*Chairman.*

Mr. S. P. LANGLEY,  
*Secretary of the Smithsonian Institution, Washington.*

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- Index to the Literature of Columbium, 1801-1887, by Frank W. Traphagen, 1888.
- Index to the Literature of the Spectroscope, by Alfred Tuckerman, 1888, 1902.
- Index to the Literature of Thermodynamics, by Alfred Tuckerman, 1890.
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- Index to the Literature of Gallium, 1875-1903, by Philip E. Browning, 1904.
- Index to the Literature of Germanium, 1886-1903, by Philip E. Browning, 1904.



# LETTER OF TRANSMITTAL

Washington and the District

Department of the Interior

Division of Reclamation

Dear Sir: The enclosed report contains the results of the investigation of the water supply of the Colorado River, as requested by the Department of the Interior, Bureau of Reclamation, in its letter of the 10th day of March, 1908.

I am, Sir, very respectfully,

Very truly yours,  
J. H. Thompson, Chief of Division

Enclosure

1908

Approved and Forwarded:  
J. H. Thompson, Chief of Division

The following report was prepared by the Division of Reclamation, Department of the Interior, under the direction of the Chief of Division, J. H. Thompson, and is hereby transmitted to the Department of the Interior, Bureau of Reclamation, for its consideration and action. The report contains the results of the investigation of the water supply of the Colorado River, as requested by the Department of the Interior, Bureau of Reclamation, in its letter of the 10th day of March, 1908.

The report is divided into two parts, the first of which contains a general description of the Colorado River and its tributaries, and the second of which contains a detailed description of the water supply of the Colorado River, as requested by the Department of the Interior, Bureau of Reclamation, in its letter of the 10th day of March, 1908.

# INDEX TO THE LITERATURE OF INDIUM.

(1863-1903.)

PREPARED BY PHILIP E. BROWNING.

1863: (1). REICH and RICHTER. (Discovery.)

J. prakt. Chem., LXXXIX, 441; Jsb. (1863), 236; Chem. Centrbl. (1863), 709; Chem. News, VIII, 123; Amer. J. Sci., (2), XXXVI, 415; Dingl. Pol. J., CLXX, 77; Bull. Soc. Chim. (Paris), v, 604; Phil. Mag., (4), XXVI, 448; Inst. (1864), 136; Ztsch. anal. Chem., II, 371; Vierteljahrsschr. pr. Pharm., XIII, 268; Wag. Jsb., IX, 1; N. Arch. Phy. nat., XIX, 144; Roy. Inst. Proc., IV, 285; VI, 393; Monit. Scient. (1863), 718; Poly. Centrbl. (1863), 1592; Poly. Notizbl. (1863), 302; Tidsskrift, (1), II, 311.

1863: (2). REICH and RICHTER. (Researches.)

J. prakt. Chem., XC, 174; Chem. News, VIII, 280; Amer. J. Sci., (2), XXXVII, 269; XXXVIII, 115; Berg. u. Hüttenmännische Zeit., XXIII, 142; Jsb. (1863), 236; Chem. Centrbl. (1864), 506; Phil. Mag., (4), XXVII, 199; Instit. (1864), 175; Wag. Jsb., IX, 1; X, 1; Tidsskrift, (1), III, 152; Cosmos, XXIV, 747.

1864: (1). ROSCOE. (Spectrum.)

Chem. News, IX, 303.

1864: (2). NEWLANDS. (Speculations.)

Chem. News, X, 84, 95, 240.

1864: (3). REICH and RICHTER. (Researches.)

J. prakt. Chem., XCII, 480; Chem. News, X, 219; Jsb. (1864), 240; Bull. Soc. Chim. (Paris), (2), II, 442; Ztschr. anal. Chem., III, 529; Wag. Jsb., X, 1; Vierteljahrsschr. pr. Pharm., XIV, 244; Tidsskrift, (1), III, 322.

1865: (1). WINKLER. (Researches.)

J. prakt. Chem., XCIV, I; XCV, 414; Chem. News, XI, 154, 289; Polyt. Notizbl. (1865), 153; Ausz. Ztschr. Chem. (1865), 226; Ztschr. anal. Chem., IV, 102, 426; Phil. Mag., (4), XXX, 443; Chem. Centrbl. (1865), 381, 991; Bull. Soc. Chim., (2), (Paris), III, 282; Wag. Jsb., XI, 3; N. Arch. Phy. nat., XXIII, 59; Ztschr. gesamt. Naturwissen., XXV, 446; Dingl. Pol. J., CLXXVII, 327; Berg. u. Hüttenmännische Zeit. (1865), 316.



## 1865: (2). WESELSKY. (Extraction.)

J. prakt. Chem., xciv, 443; Wien. Acad. Anz. (1865), 32; Jsb. (1865), 233; Ztsch. Anal. Chem., iv, 102; Chem. Centrbl. (1865), 573; Instit. (1865), 208; Bull. Soc. Chim., (2), iv, 194; Phil. Mag., (4), xxix, 328; Wien. Acad. Ber., LI, 286; Ztsch. gesamt. Naturwissen., xxvi, 283; Wien. Acad. Bull., VII, 1869; Wag. Jsb., XI, 4; Moniteur. Scientif. (1865), 863; Ztsch. österreich. Apoterker. Verein (1865), 301.

## 1865: (3). SCHRÖTTER. (Spectrum.)

J. prakt. Chem., xcv, 441; Wien. Acad. Anz. (1865), 139; Jsb. (1865), 235; Ztsch. Chem. (1866), 61; Instit. (1865), 392; Phil. Mag., (4), xxx, 318.

## 1865: (4). STRENG. (Occurrence.)

Berg. u. Hutten. Ztg. (1865), 191; Dingl. Pol. J., CLXXXVII, 329; Wag. Jsb., XI, 3; Deutsche Industrie. Ztg. (1865), 248; Chem. Centrbl. (1865), 800.

## 1865: (5). SCHRÖTTER. (Occurrence and extraction.)

J. prakt. Chem., xcvi, 447; Wien. Acad. Anz. (1865), 192; Instit. (1866), 199; Ztsch. Chem. (1866), 61; Berg. u. Hüttenmännische Ztg. (1866), 323; Jsb. (1865), 230; Wag. Jsb. XII, 10; Bull. Soc. Chim. (1866), 111.

## 1865: (6). MÜLLER. (Spectrum.)

Pogg. Ann., CXXIV, 637; Am. J. Sci., (2), XL, 259; Phil. Mag., (4), xxx, 76; Jsb. (1865), 235; Ztsch. gesamt. Naturwissen., xxv, 519; Ber. u. Verhandl. d. Gesell. z. Beförd. d. Naturwissen. zu Freiberg. in Br.

## 1866: (1). WINKLER. (Weselsky's process of extraction.)

J. prakt. Chem., xcvi, 344; Chem. News, xiv, 157; Ztsch. Chem. (1866), 667; Chem. Centrbl. (1866), 893; Dingl. Pol. J., CLXXXII, 142; Wag. Jsb., XII, 11; Bull. Soc. Chim., [2], VI, 110.

## 1866: (2). BOETTGER. (Occurrence in and extraction from flue dust.)

J. prakt. Chem., xcvi, 26; Chem. News, xv, 228; Dingl. Pol. J., CLXXXII, 139; Wag. Jsb., XII, 10; Vierteljahrsschr. pr. Pharm., XVI, 101; Ausz. Ztsch. Chem. (1866), 445; Chem. Centrbl. (1866), 605; Phil. Mag., (4), xxxii, 381; xxx, 443; Bull. Soc. Chim., (2), VI, 452; Jsb. (1866), 222; Ztsch. gesamt. Naturwissen., xxviii, 50; Jsb. phy. Verein Frankfurt a/M. (1864-1865), 54; Poly. Notizbl. (1866), 177; Deutsch. Industrie. Ztg. (1866), 308; Berg. u. Hutten. Ztg. (1866), 380.

## 1866: (3). GERLACH. (Sale of indium.)

J. prakt. Chem., xcvi, 384.



- 1866: (4). BUNSEN. (Flame reactions.)  
Ann. Chem. Pharm., cxxxviii, 257; Jsb. (1866), 780; Phil. Mag., (4), xxxii, 81, 96; Ztsch. anal. Chem., v, 351; Anz. N. Arch. Ph. Nat., xxvii, 25.
- 1866: (5). KUCHLER. (Preparation and occurrence.)  
J. prakt. Chem., xcvi, 447; Ztsch. gesammt. Naturwissen., xxvii, 338; Wag. Jsb., xii, 10.
- 1866: (6). THALEN. (Spectroscopic research.)  
Universitets Arsskrift (Upsala), 1866; Nova Acta. Reg. Soc. Sc. (Upsala), [3], vi; Ann. Chim. Phys., [4], xviii, 244.
- 1867: (1). HOPPE SEYLER. (Occurrence in wolframite.)  
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THE HISTORY OF THE  
CITY OF BOSTON

From its first settlement in 1630 to the present time, the city of Boston has been a center of commerce and industry. It was founded by a group of Puritan settlers who sought a place where they could practice their religion freely. The city grew rapidly, and by the mid-17th century it was one of the largest and most important cities in the colonies. It was the site of the Boston Tea Party in 1773, a key event in the American Revolution. After the war, Boston became a major center of trade and commerce, and it played a leading role in the abolitionist movement. In the 19th century, the city was the center of the Industrial Revolution, with many factories and mills. In the 20th century, Boston became a major center of education and research, with the Massachusetts Institute of Technology (MIT) and Harvard University. Today, Boston is a vibrant city with a rich history and a bright future.



INDEX TO THE LITERATURE  
OF  
THALLIUM,

1861-1896.

BY  
MARTHA DOAN.



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## LETTER OF TRANSMITTAL.

WASHINGTON, July 6th, 1898.

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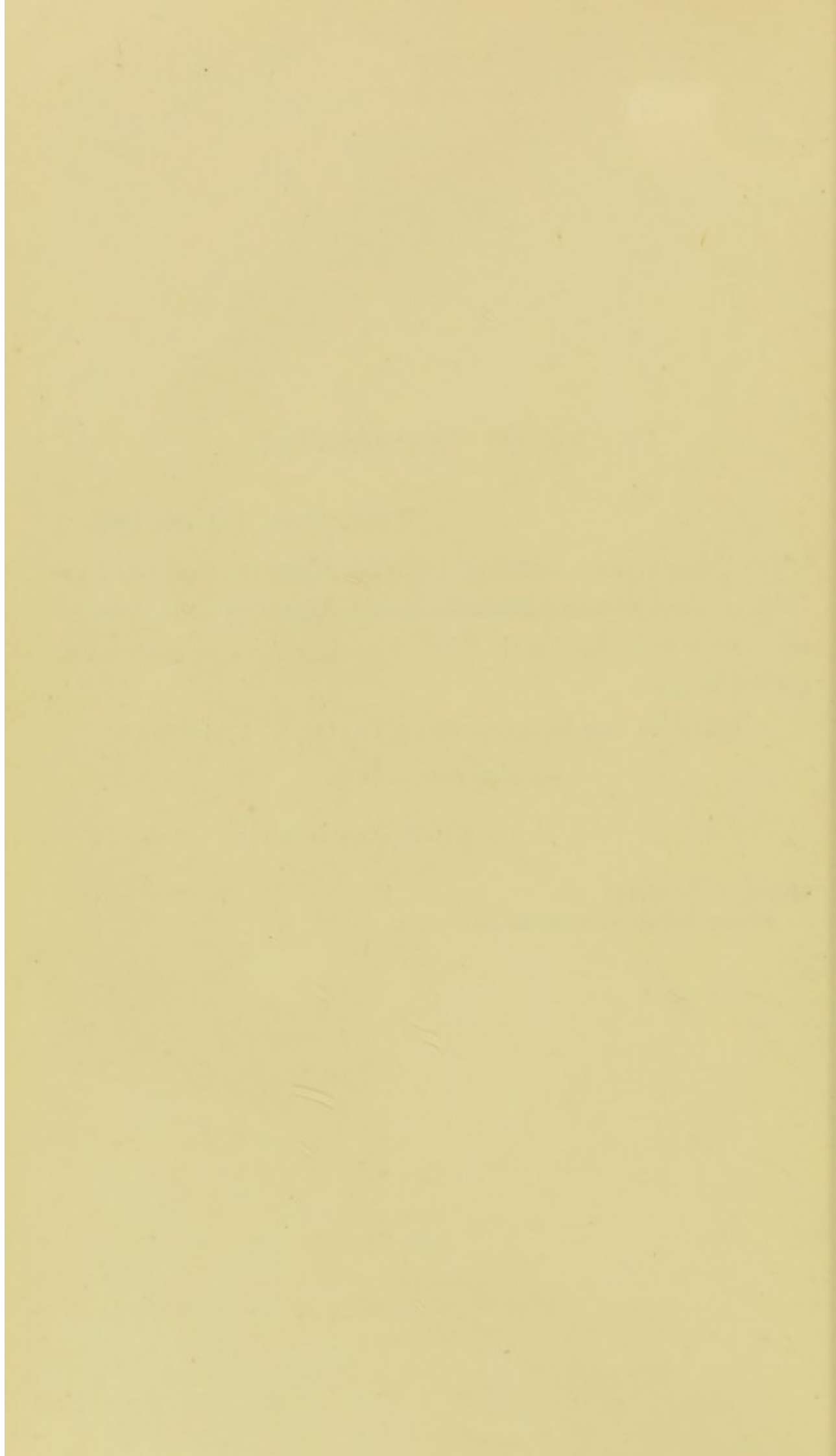
INDEX TO THE LITERATURE OF THALLIUM, 1861-1896,

by Miss Martha Doan.

H. CARRINGTON BOLTON, *Chairman.*

MR. S. P. LANGLEY,

*Secretary of the Smithsonian Institution.*





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1861-1896.

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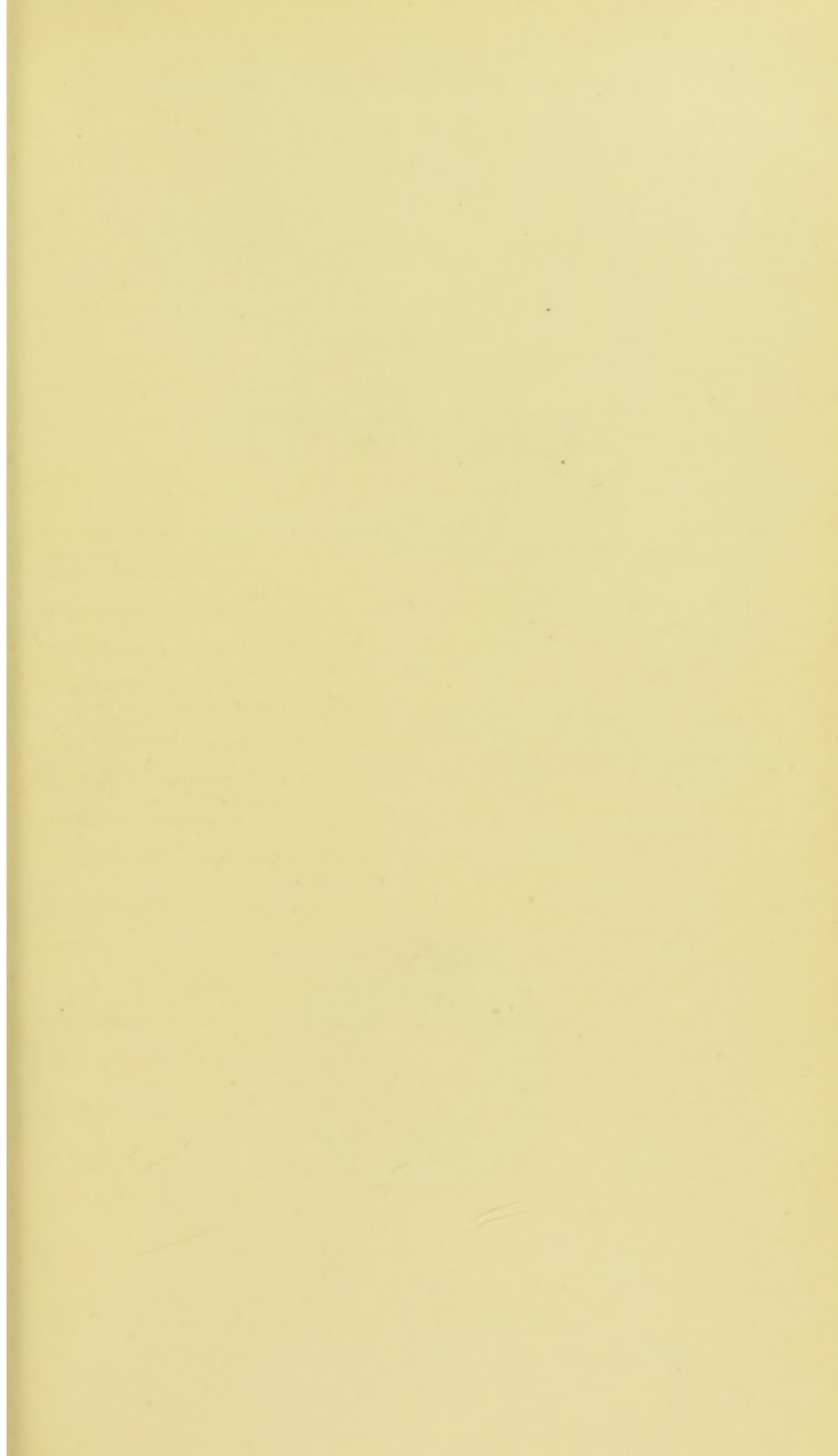
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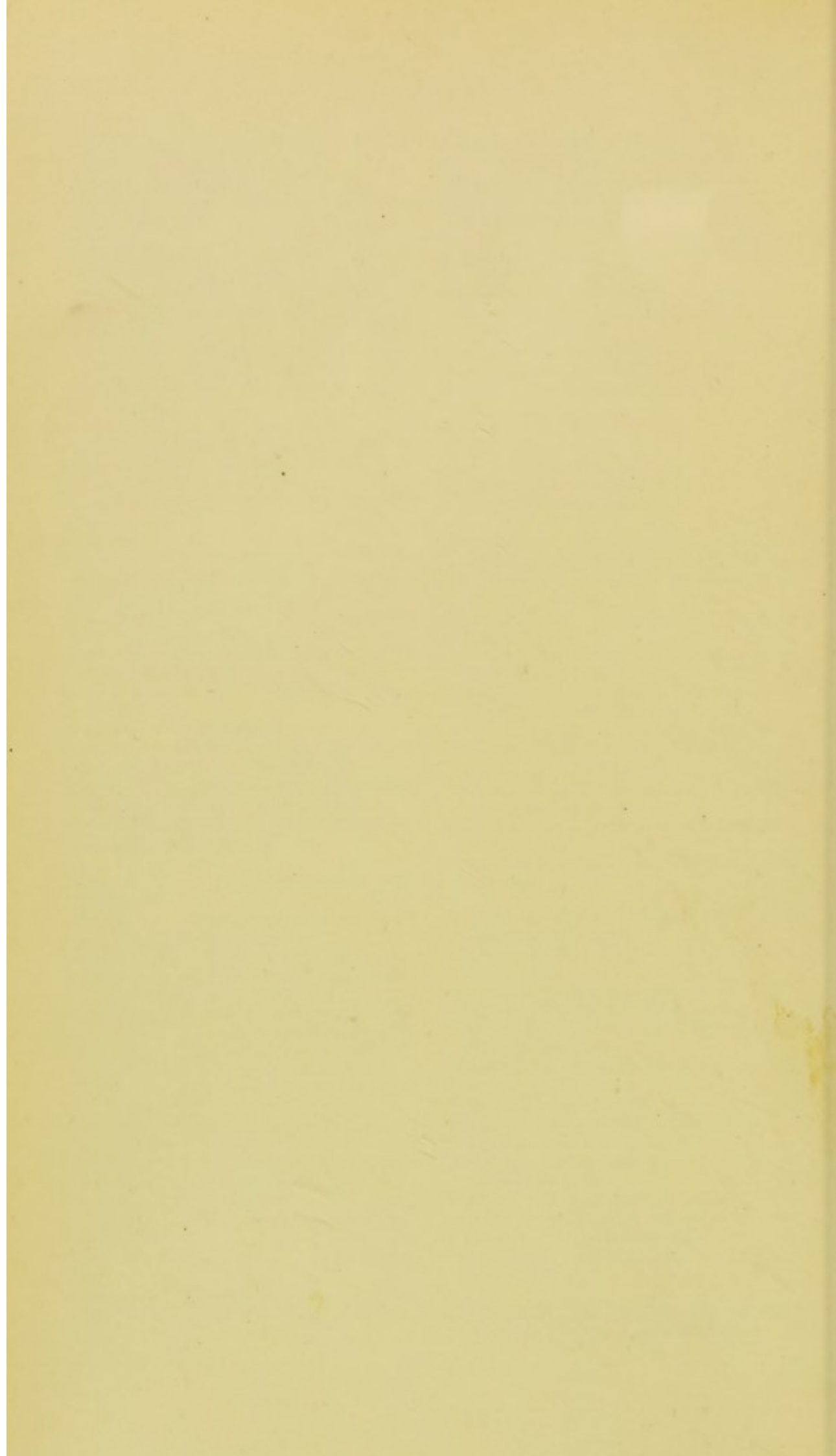
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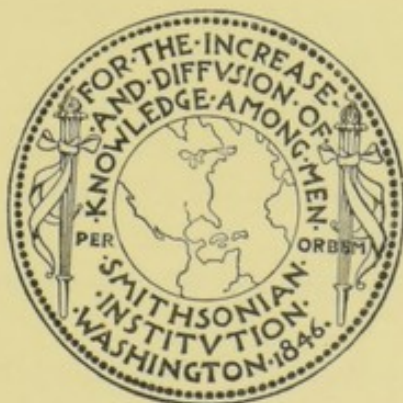
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1817-1902.

BY

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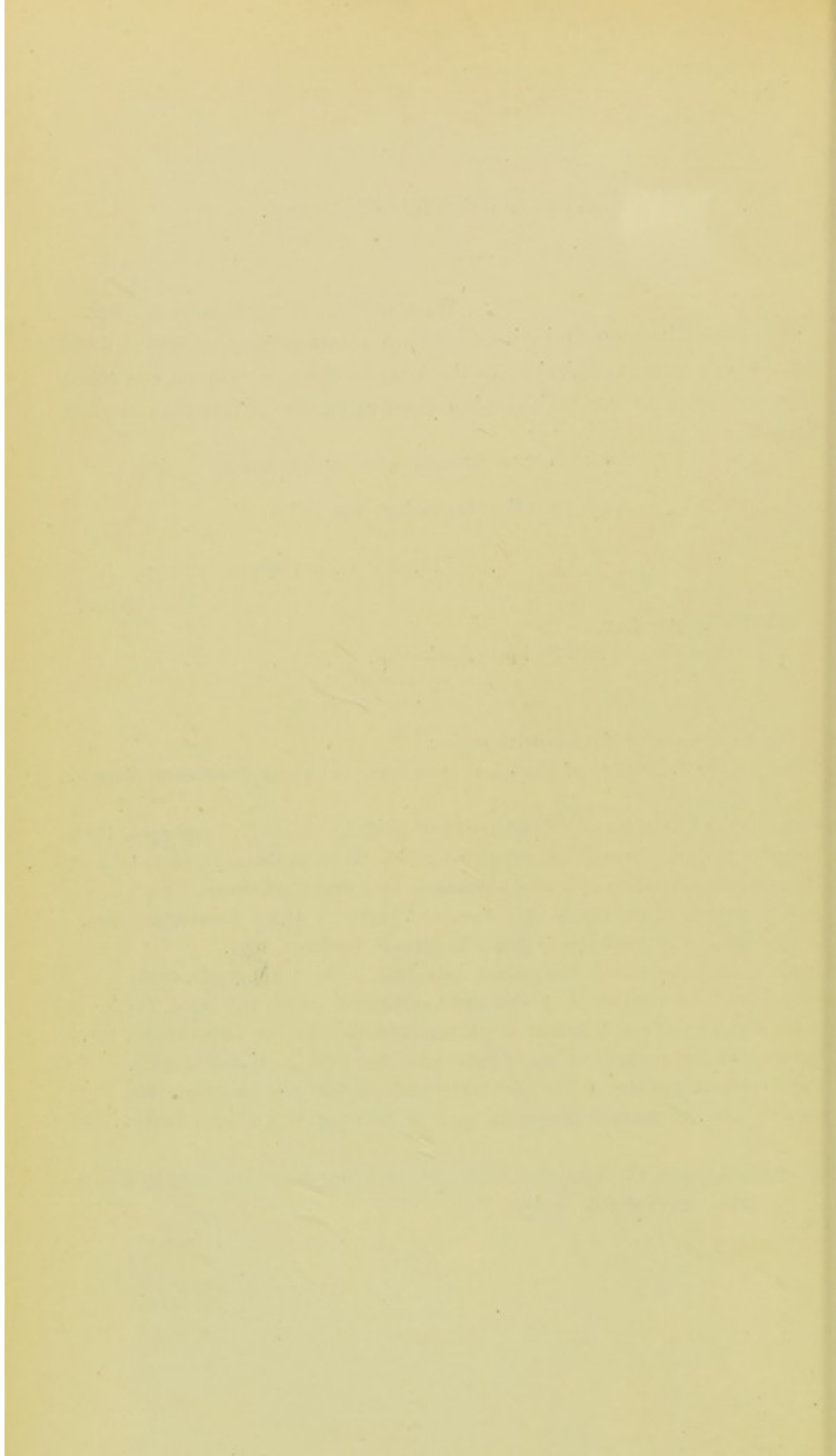
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## PREFACE.

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This Index to the Literature of Thorium has been prepared after a very laborious and painstaking search through many scientific and technical journals.

Most of the references have been verified, and usually the original article heads the list, but in some few cases this was difficult to determine.

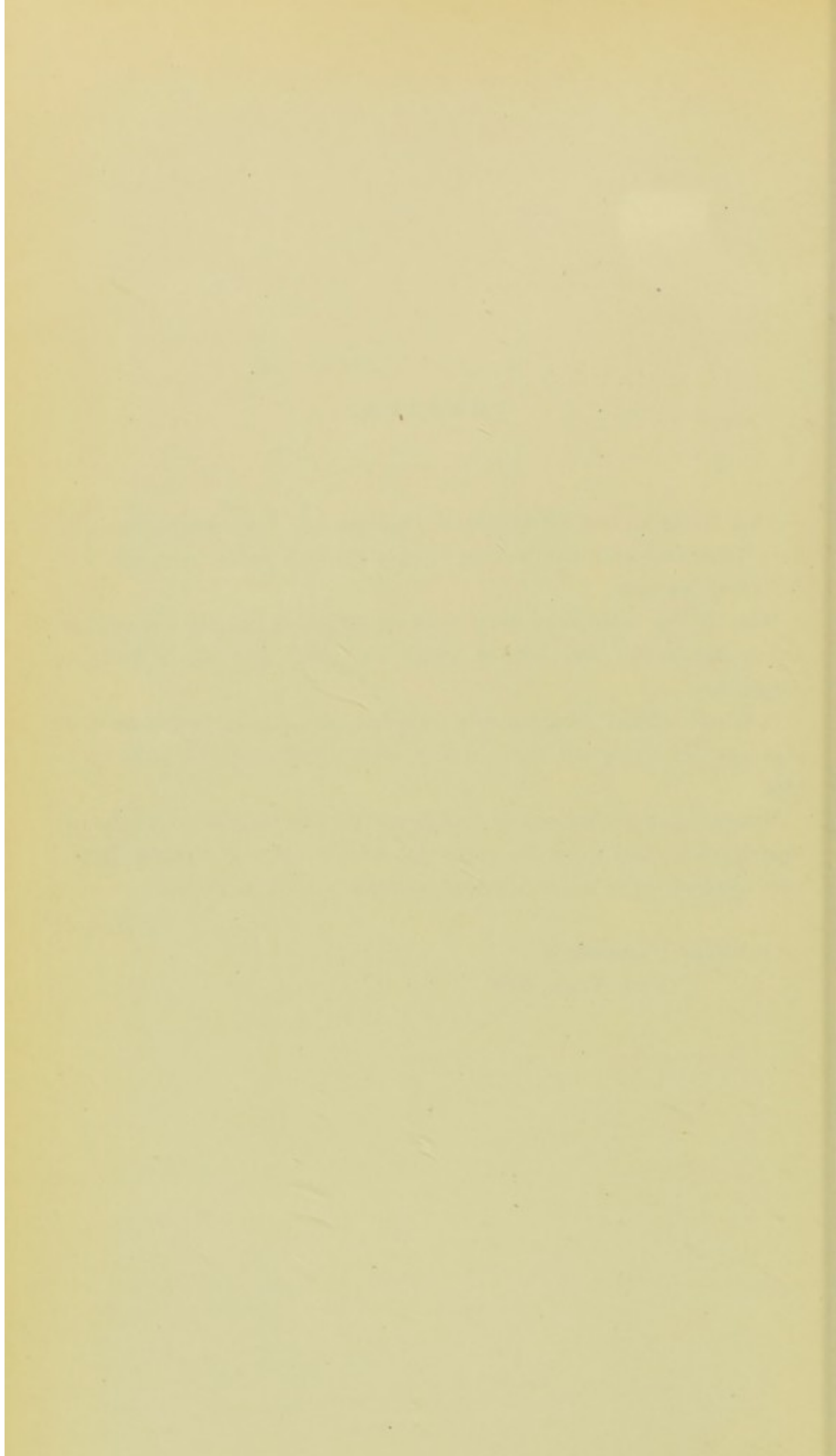
It is not offered as absolutely complete, and the compiler requests that any one using the index would send corrections and addenda to him.

Minerals now recognized as containing thorium have been mentioned only in such cases when the earth has been found. The patent literature relative to the use of thorium in the arts is not included.

C. H. J.

COLUMBIA UNIVERSITY,  
NEW YORK, 1902.





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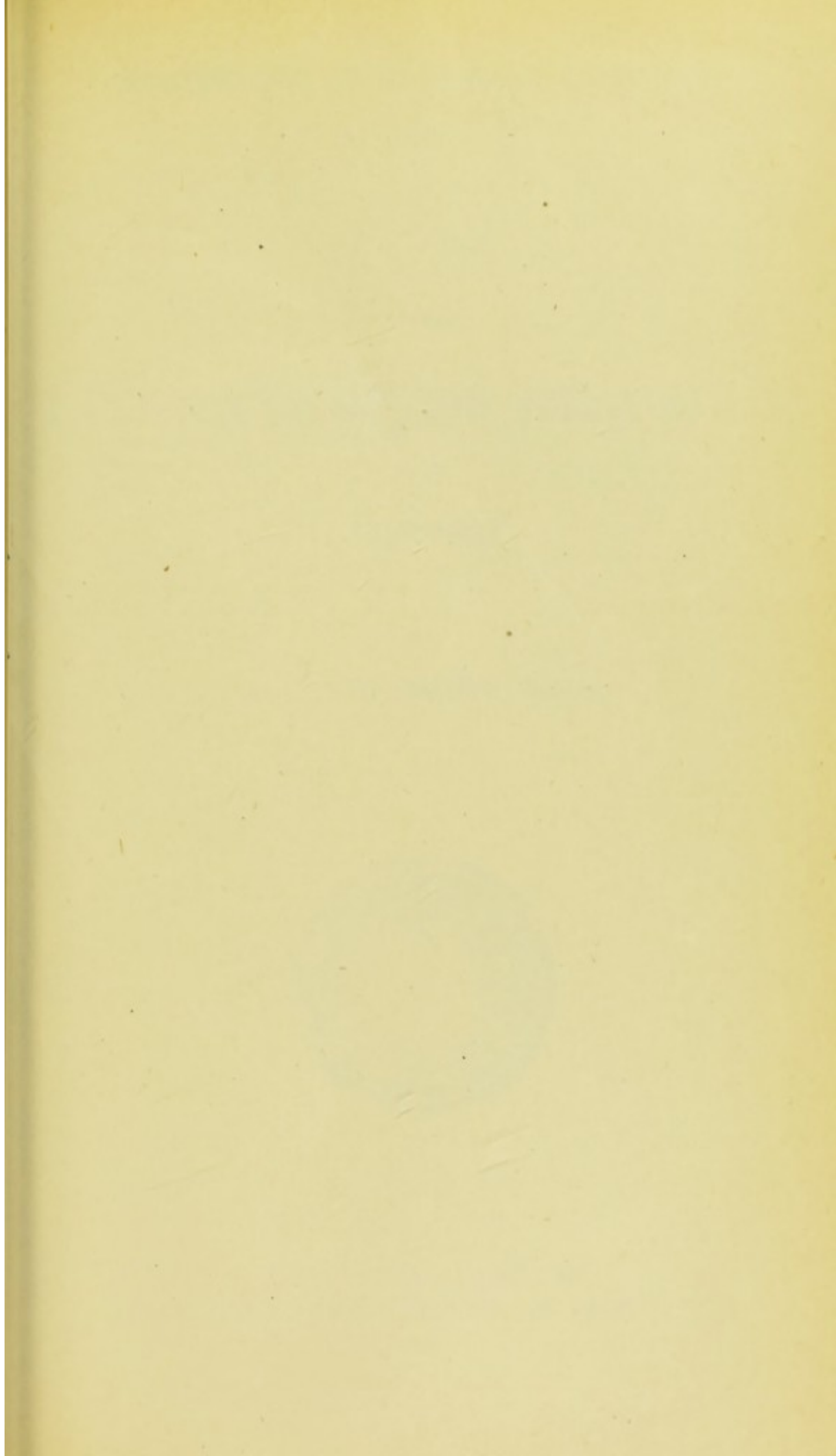
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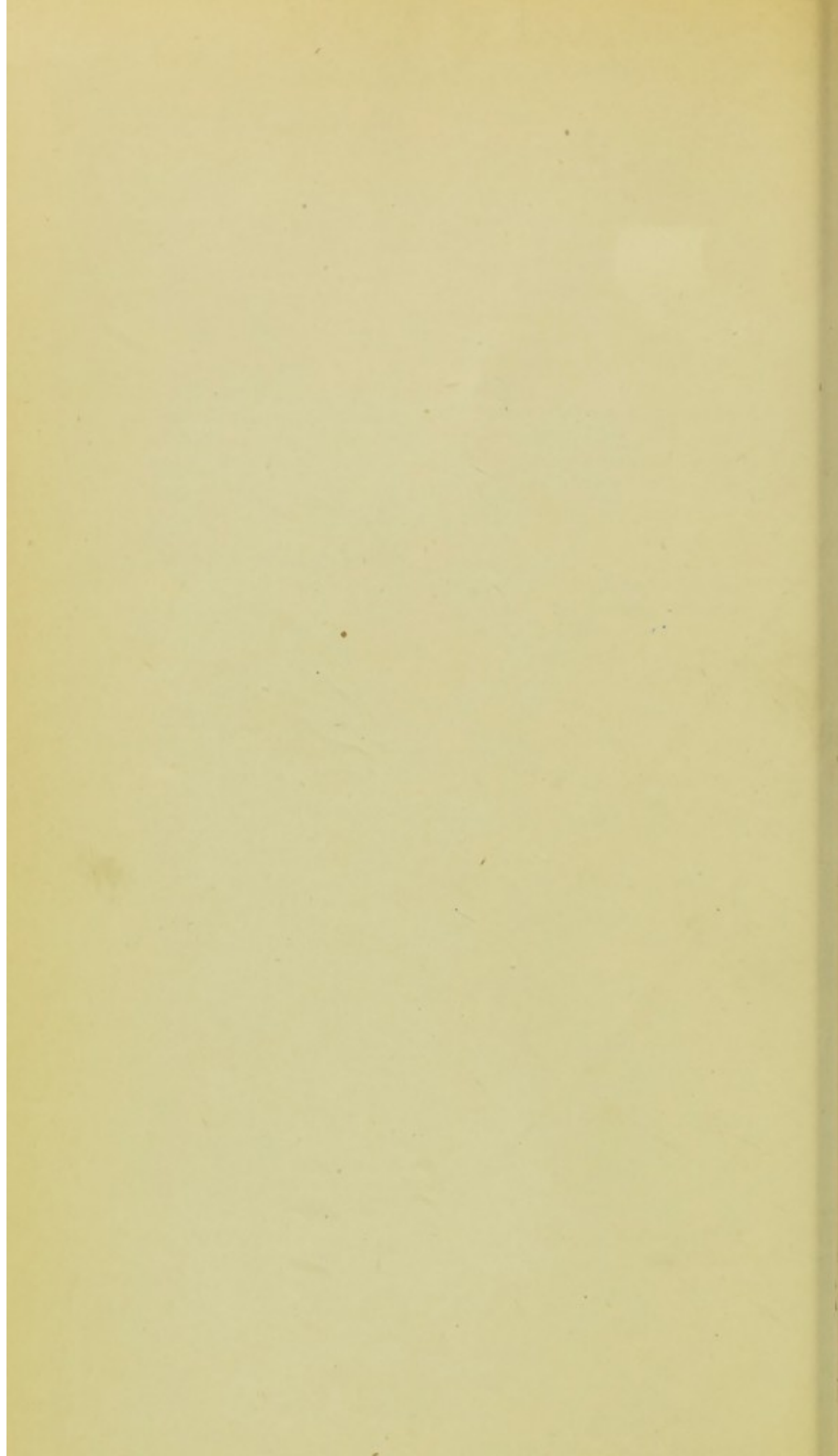
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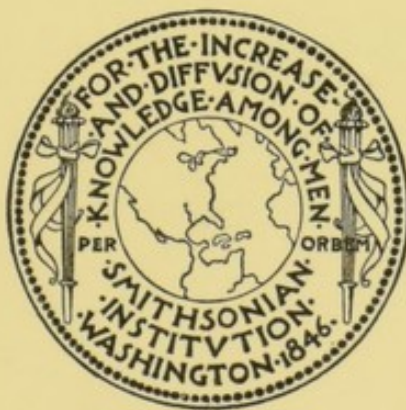
TO THE

LITERATURE OF DIDYMIUM

1842-1893

BY

A. C. LANGMUIR, PH. D.



CITY OF WASHINGTON

PUBLISHED BY THE SMITHSONIAN INSTITUTION

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## LETTER OF TRANSMITTAL.

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NEW YORK, JULY 24, 1894.

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the three following Indexes :—

AN INDEX TO THE LITERATURE OF CERIUM.<sup>1</sup>

AN INDEX TO THE LITERATURE OF LANTHANUM.<sup>1</sup>

Both by W. H. Magee, Ph. D.

AN INDEX TO THE LITERATURE OF DIDYMIUM.

By A. C. Langmuir, Ph. D.

The latter has already appeared in the *School of Mines Quarterly*, No. 1, Vol. XV.

H. CARRINGTON BOLTON,  
*Chairman.*

To the SECRETARY of the SMITHSONIAN INSTITUTION.

<sup>1</sup> These Indexes are printed as Smithsonian Publication No. 971.





# INDEX TO THE LITERATURE OF DIDYMIUM — 1842-1893.

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By A. C. LANGMUIR, PH. D.

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THE following paper is offered to chemists with the hope that it may be of some value to them in their researches on an element of great theoretical and scientific interest, particularly as an example of the wonderful results accomplished by the use of the spectroscope in modern chemistry. The voluminous literature of didymium affords a striking illustration of the pursuit of science for its own sake, and with no reward beyond the satisfaction of having advanced the cause of truth.

Original work, at the present time, must always be preceded by a long and painstaking search through the literature, which consumes no inconsiderable amount of time. Anything which can lighten the labors of the investigator in this direction is sure to be a welcome addition to the literature.

In 1882 Dr. H. Carrington Bolton originated the idea of indexing the literature of each of the chemical elements, and a Committee on Indexing Chemical Literature was appointed by the American Association for the Advancement of Science. The committee annually reports the progress made during the year, the reports being published in the *Chemical News* and in American journals.

The following elements have been indexed : —

*Columbium*. — Index to the literature of, 1801-1887, by Frank W. Traphagen, Smithsonian Miscellaneous Collections, No. 663, Washington, 1888.



*Iridium*.—Bibliography of the metal, 1803–1885, by N. W. Perry, in Mineral Resources of the United States, 1883–1884, p. 588; School of Mines Quarterly, 1885, p. 114; Chem. News, 1885, 51, p. 32.

*Manganese*.—Index to the literature of, 1596–1874, by H. C. Bolton, Annals of the Lyceum of Natural History, New York, Vol. II., Nov., 1875.

*Titanium*.—Index to the literature of, 1783–1876, by E. J. Hallock, Annals of the New York Academy of Sciences, Vol. I., Nos. 2 and 3, 1877.

*Uranium*.—Index to the literature of, by H. C. Bolton, 1789–1885, Smithsonian Reports for 1885, Washington, 1885, p. 919–946.

*Vanadium*.—Index to the literature of, 1801–1876, by G. Jewett Rockwell, Annals of the New York Academy of Sciences, Vol. I., No. 5, 1877.

The general plan of the following index corresponds with that of the others published. The indexes at the end of every volume of each journal were consulted, unless an index covering a series of years was available. The French journals proved to be very troublesome in this respect, as indexes at the end of the volume are often omitted, and the general indexes are seldom detailed enough to be of much value. This was especially true of the *Bull. Soc. Chim.* and the *Ann. Chim. Phys.*

The abbreviations used are those given by H. Carrington Bolton in his "Select Bibliography of Chemistry, 1492–1892," Smithsonian Miscellaneous Collections, No. 840, Washington, 1893.

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INDEX TO THE LITERATURE  
OF  
ZIRCONIUM.

BY

A. C. LANGMUIR, PH.D.,

AND

CHARLES BASKERVILLE, PH.D.



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## LETTER OF TRANSMITTAL.

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WASHINGTON, MAY 10th, 1899.

The Committee on Indexing Chemical Literature, appointed in 1882 by the American Association for the Advancement of Science, unanimously recommends for publication by the Smithsonian Institution the following :

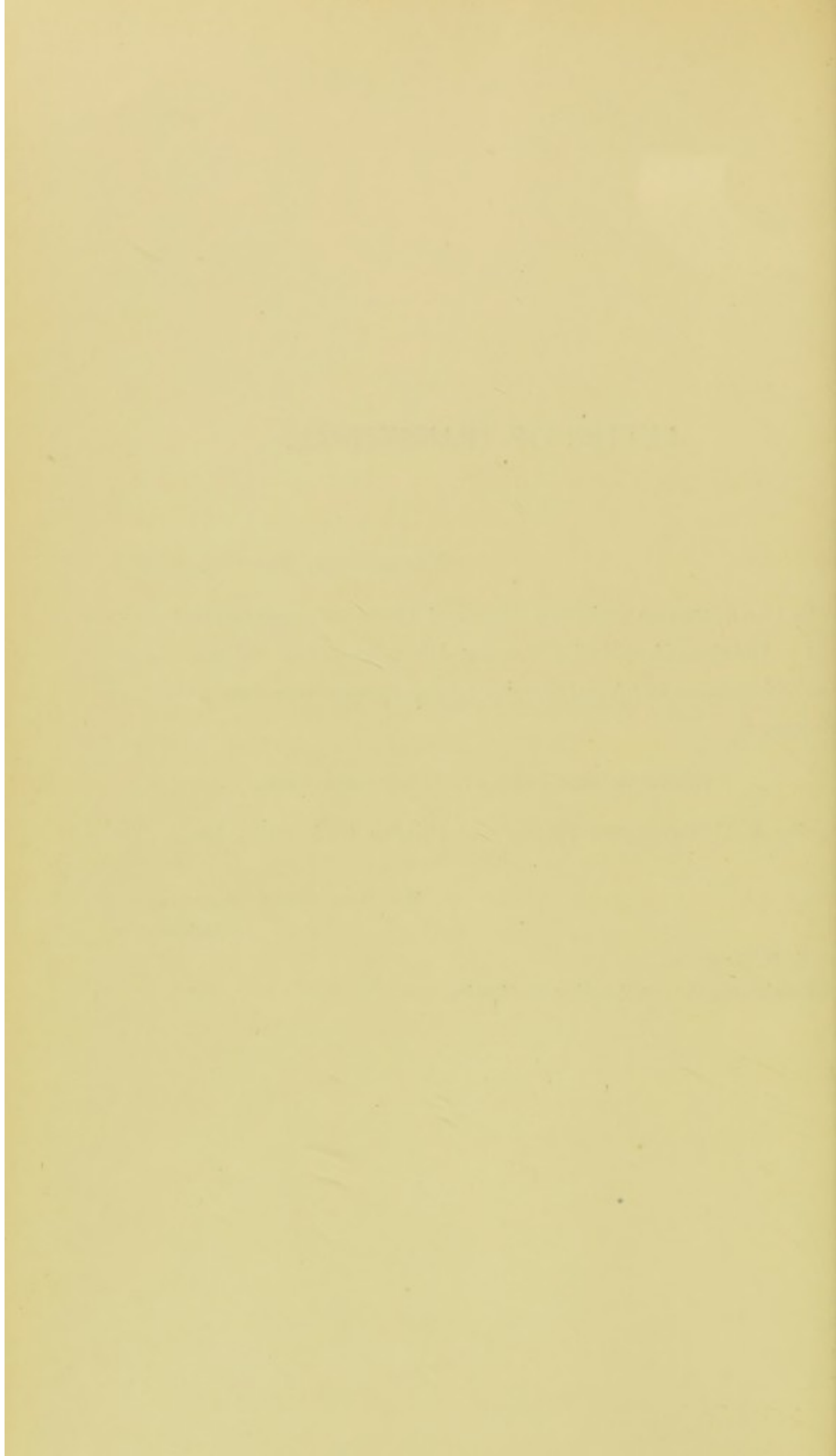
INDEX TO THE LITERATURE OF ZIRCONIUM,

by A. C. Langmuir, Ph.D., and Charles Baskerville, Ph.D.

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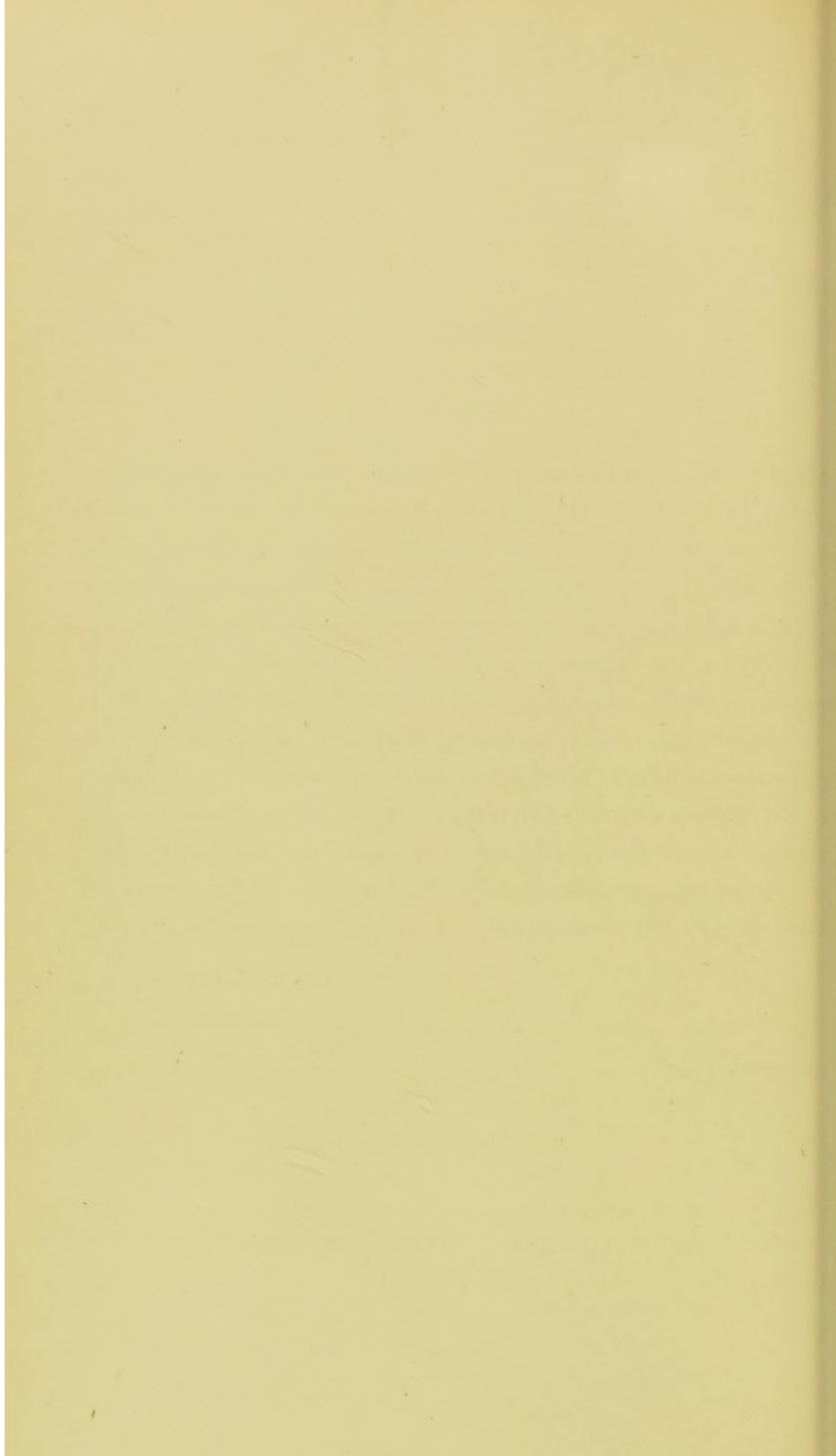
An "Index to the Literature of Zirconium" was begun independently by the two authors. Learning of this, and in order to avoid further unnecessary duplication, it was decided to combine the references then on hand and to divide the remaining labor. The resulting product is thought to contain most of the important references to the element, and is offered to the Committee of the American Association for the Advancement of Science on Indexing Chemical Literature in hopes of its proving of value. The references are brought up to January 1st, 1899.

Besides our private libraries, we have sought references to the subject in the libraries of Columbia, Johns Hopkins, and the North Carolina Universities and the North Carolina Geological Survey. To the gentlemen in charge of these libraries we wish to extend our thanks for their courtesy and co-operation.

A. C. LANGMUIR,  
C. BASKERVILLE.

APRIL, 1899.





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- 1869 : 98. PAYEN. (Zirconia light.)  
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- 1869 : 101. THALÉN. (Spectrum.)  
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- 1869 : 102. SORBY. (A new element, jargonium, in Zircon.)  
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- 1869 : 104. SORBY. (Spectrum of mixtures of Zirconium and uranium.)  
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- 1869 : 105. CHURCH. (Idem.)  
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- 1870 : 106. MELLISS. (Metal. Salts.)  
Bull. Soc. chim. (Paris), 14, 204 ; Ber., 4, 57 ; Chem. News, 22, 23 ;  
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- 1870 : 107. HUGGINS. (Spectrum.)  
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- 1870 : 108. FRANZ. (Metal. Preparation of pure salts.)  
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468 ; Chem. Centrbl., 1870, 131 ; Wagner's Jsb., 16, 1, 2 ; Jsb.,  
1870, 329.
- 1870 : 109. WUNDER. (Isomorphism with titanite and stannic oxides.)  
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Centrbl., 1870, 663.
- 1871 : 110. MENDELÉJEFF. (Fluoride.)  
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- 1871 : 111. RATH. (Occurrence in diorite.)  
Ann. der Phys. (Pogg.), 144, 250.
- 1871 : 112. KNOP. (Artificial production of crystals.)  
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190 ; Ztschr. Chem., 1871, 397 ; J. Chem. Soc. (Lond.), 24, 805 ; Jsb.,  
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- 1871 : 113. TROOST and HAUTEFEUILLE. (Oxychloride.)  
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Bull. Soc. chim. (Paris), 16, 240 ; J. Chem. Soc. (Lond.), 24, 1000 ;  
Gazz. chim. ital., 1, 628 ; Jsb., 1871, 293.
- 1871 : 114. TROOST and HAUTEFEUILLE. (Spectrum.)  
Compt. rend., 73, 620 ; Instit., 1871, 77 ; Arch. ph. nat., 42, 178 ;  
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- 1871 : 115. RAMMELSBERG. (Separation from niobic and tantalic acids.)  
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- 1872 : 116. RAMMELSBERG. (Action of heat on amorphous oxide.)  
Ber., 5, 1006.
- 1872 : 117. RAMMELSBERG. (Sulphate.)  
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- 1872 : 118. TROOST and HAUTEFEUILLE. (Action of silicon chloride on oxide.)  
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- 1872 : 119. NORDENSKJÖLD. (Occurrence in noblite.)  
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- 1873 : 120. MALLARD. (Behavior of oxide with sodium carbonate.)  
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- 1873 : 121. HANNAY. (Zirconia.)  
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- 1873 : 123. PAYKULL. (Compounds: Hydroxide, oxychloride, double chlorides, sulphate, arsenate, and ortho-phosphate.)  
Oefvers. Sv. Vetensk. Akad. Förh., 1873, 22; Ber., 1873, 1467; Jsb. rein. Chem., 1, 73; Bull. Soc. chim. (Paris), 20, 65; Chem. News, 28, 45; J. Chem. Soc. (Lond.), 26, 1105; Chem. Centrbl., 1873, 594; Gazz. chim. ital., 3, 484; Am. Chemist, 4, 393; Jsb., 1873, 263.
- 1873 : 124. JANNETTAZ. (Propagation of heat by Zirconia.)  
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- 1874 : 125. TROOST and HAUTEFEUILLE. (Spectrum.)  
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- 1875 : 126. ENDEMANN. (Soluble basic salts.)  
Am. Chemist, 5, 326-7; Bull. Soc. chim. (Paris), 24, 466; J. prakt. Chem. [2], 11, 219; Jsb. rein. Chem., 3, 84; J. Chem. Soc. (Lond.), 28, 1162; Gazz. chim. ital., 6, 428; Chem. Centrbl., 1875, 339; Jsb., 1875, 219.
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- 1876 : 128. NILSON. (Platinate.)  
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- 1877 : 131. DRAPER. (Zirconia cylinders for oxyhydrogen light.)  
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- 1877 : 132. VINCENT. (Behavior towards trimethylaniline.)  
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- 1880 : 137. ÄNGSTRÖM. (Oxide, diamagnetic.)  
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- 1880 : 138. SORET. (Spectrum.)  
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- 1880 : 139. NILSON and PETTERSSON. (Specific heat.)  
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- 1880 : 140. VINCENT. (Behavior towards dimethylaniline.)  
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- 1883 : 147. DONATH and MAYRHOFER. (Affinity.)  
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- 1884 : 148. CLARKE. (Atomic weight.)  
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- 1884 : 149. STOLBA. (Opening up Zircons.)  
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- 1885 : 150. GROSHAUS. (Density.)  
Rev. Trav. chim. pays bas., 4, 236 ; Jsb., 1885, 53.
- 1885 : 151. CROOKES. (Spectrum when samarium is present.)  
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- 1885 : 152. DEMARÇAY. (Separation from titanium.)  
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- 1885 : 154. LINNEMANN. (Qualitative composition. Opening up Zircons.)  
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Compt. rend., 102, 1017-1019 ; Ber., 19, c, 387 ; J. Chem. Soc. (Lond.), 50, 670 ; Chem. News, 53, 252 ; Chem. Centrbl., 57, 468 ; Jsb., 1886, 447.
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- 1887 : 162. MEYER and WILKINS. (Action of carbon tetrachloride on oxide.)  
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- 1887 : 163. DITTE. (Behavior towards sulphuric acid. Selenate.)  
Compt. rend., 104, 172 ; Jsb., 1887 [1], 547, 549 ; Dammer. II, 1, 622.
- 1887 : 164. RAMMELSBERG. (Separation from thorium, cerium, etc.)  
Sitzber. Akad. Wissin., Berlin, 1886, 441 ; Ber., 20, c, 413.
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- 1887 : 167. WILLGERODT. (Action as a chloridizing agent.)  
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- 1887 : 168. WEIBULL. (Crystalline forms of Zirconyl chloride and bromide ; also sulphate.)  
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- 1887 : 172. WELSBACH. (Welsbach burners.)  
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- 1888 : 173. HAUTEFEUILLE and PERREY. (Artificial preparation of Zircon.)  
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- 1888 : 175. KEEPORT. (Application in gold metallurgy.)  
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- 1888 : 176. CARNELLEY and WALKER. (Action of heat on hydrate.)  
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- 1888 : 177. SCHMIDT and HAENSCH. (Emissive power of Linnemann's light.)  
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- 1889 : 179. WELSBACH. (Preparation of pure nitrate.)  
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- 1889 : 180. STOLBA. (Opening up Zircon.)  
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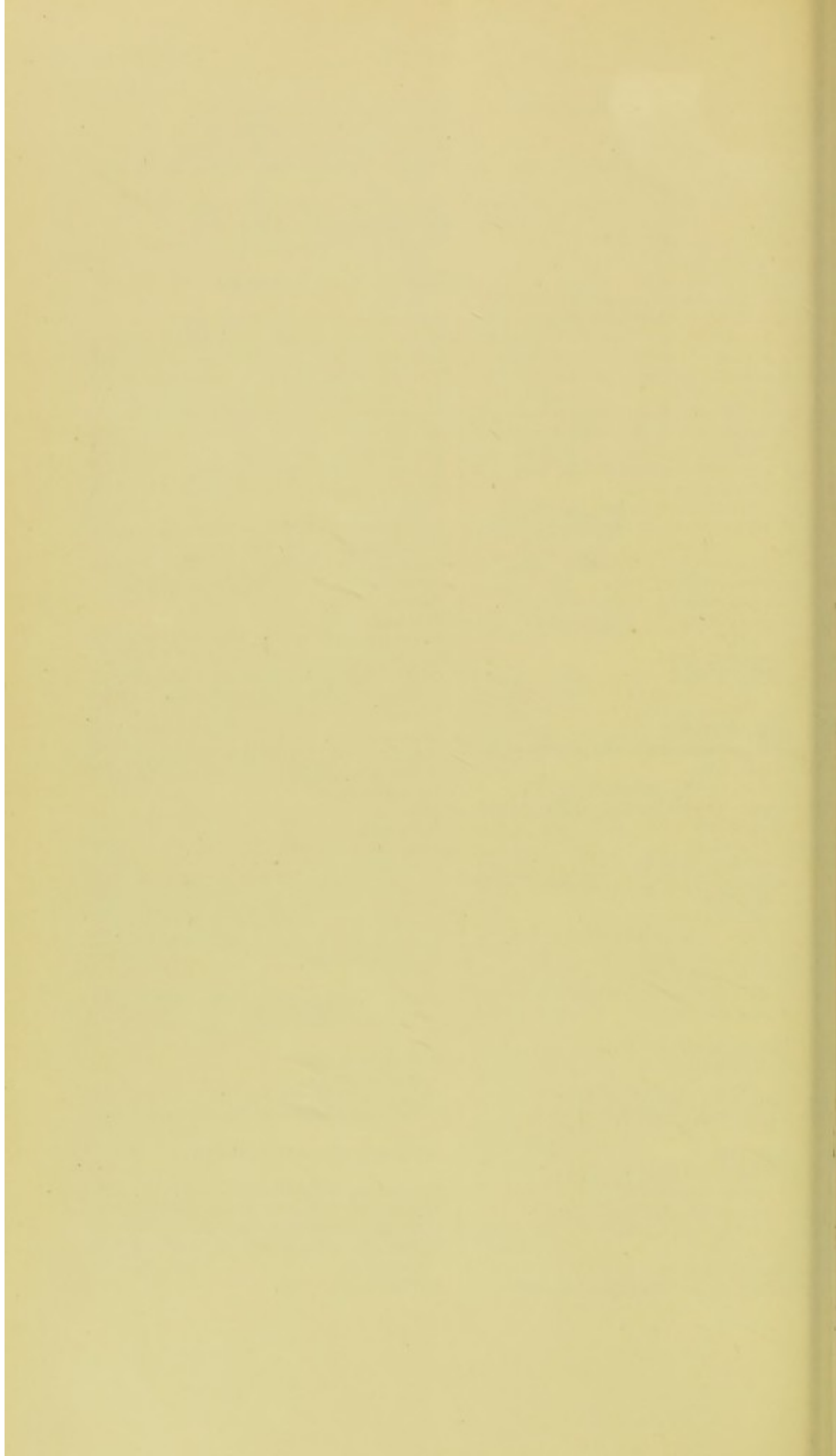
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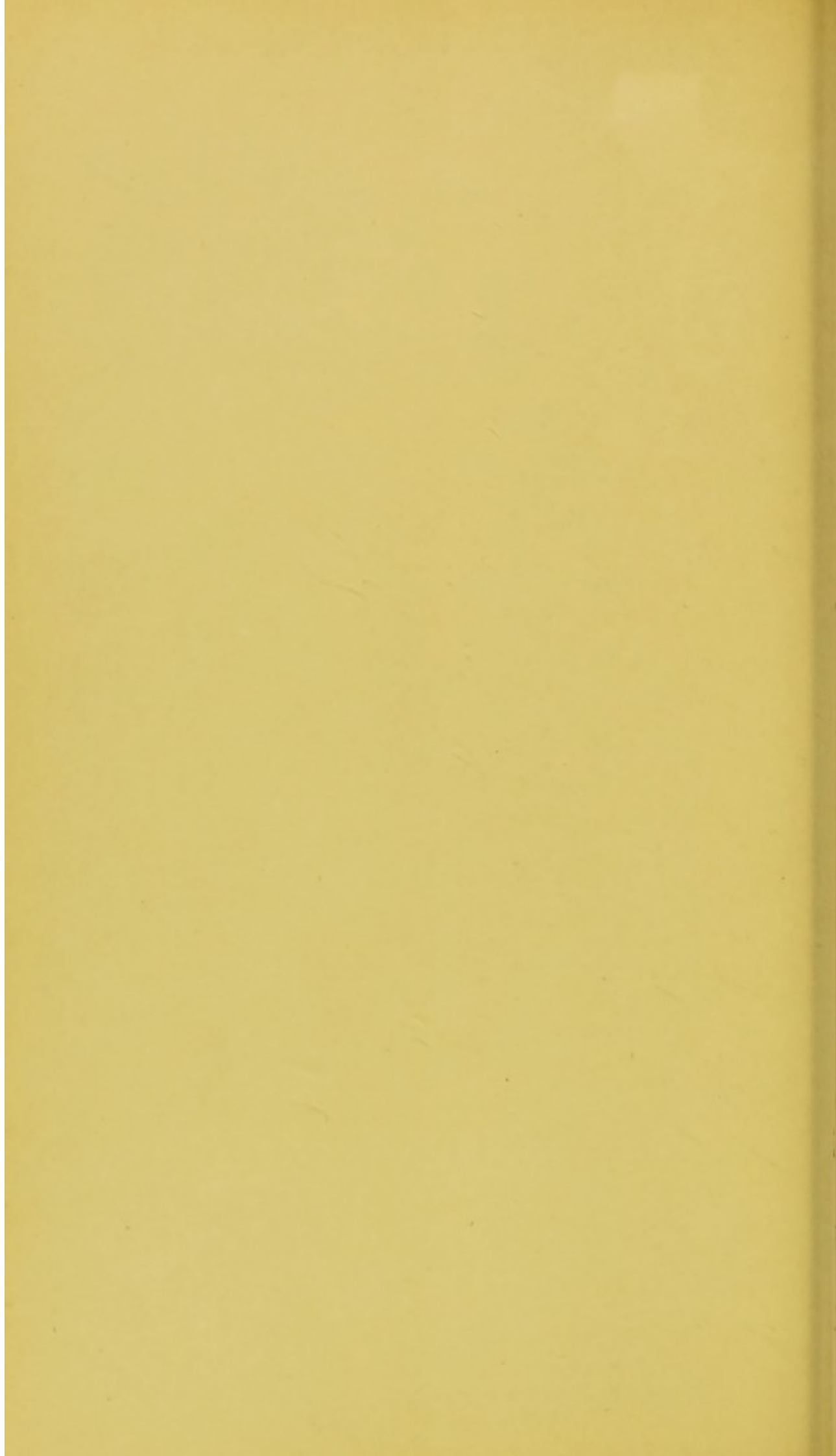
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INDEXES

TO THE

LITERATURES OF CERIUM  
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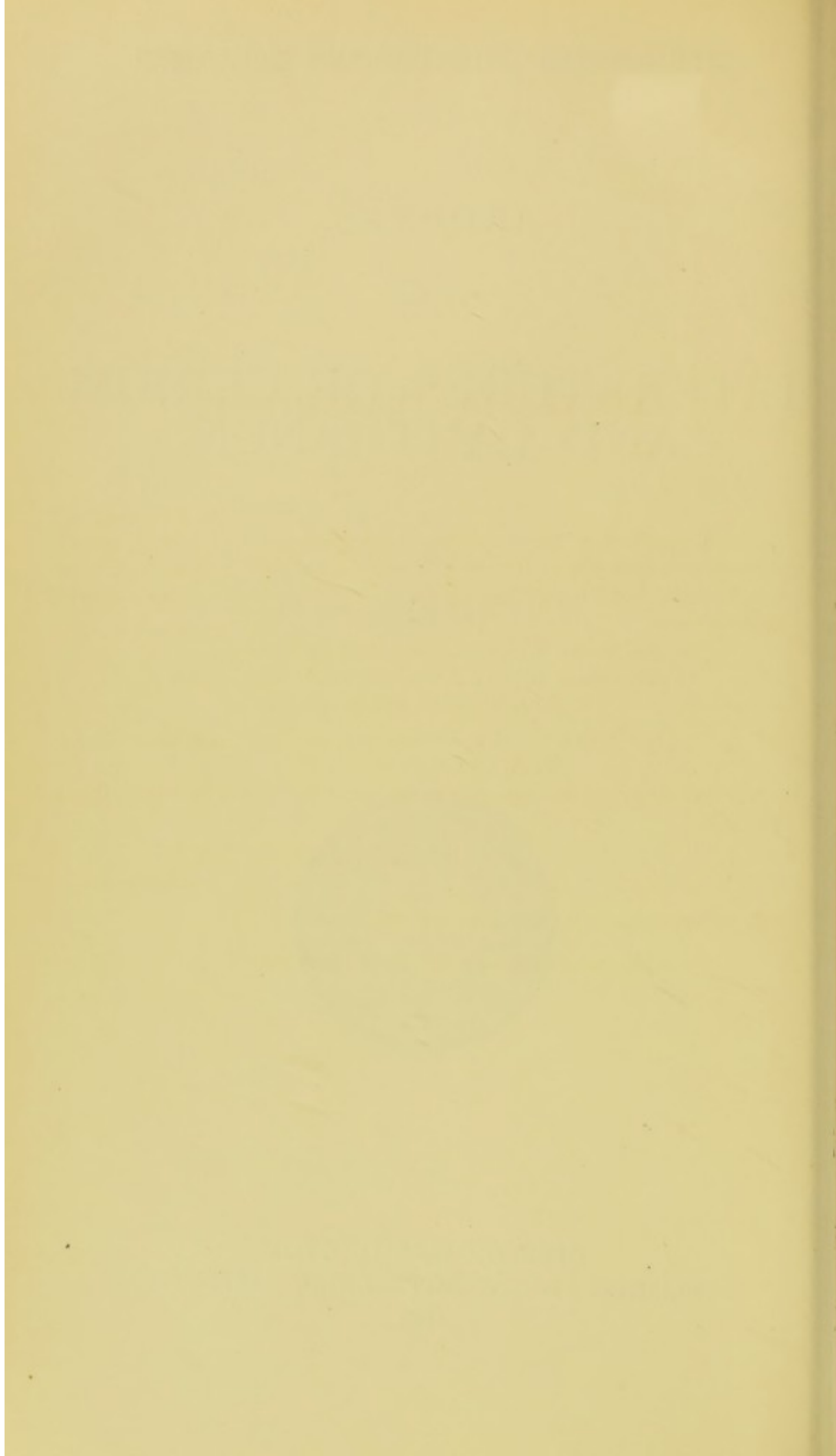
W. H. MAGEE, PH. D.



CITY OF WASHINGTON  
PUBLISHED BY THE SMITHSONIAN INSTITUTION

1895





## LETTER OF TRANSMITTAL.

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NEW YORK, JULY 24, 1894.

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the three following Indexes:—

AN INDEX TO THE LITERATURE OF CERIUM.

AN INDEX TO THE LITERATURE OF LANTHANUM.

Both by W. H. Magee, Ph. D.

AN INDEX TO THE LITERATURE OF DIDYMIUM.<sup>1</sup>

By A. C. Langmuir, Ph. D.

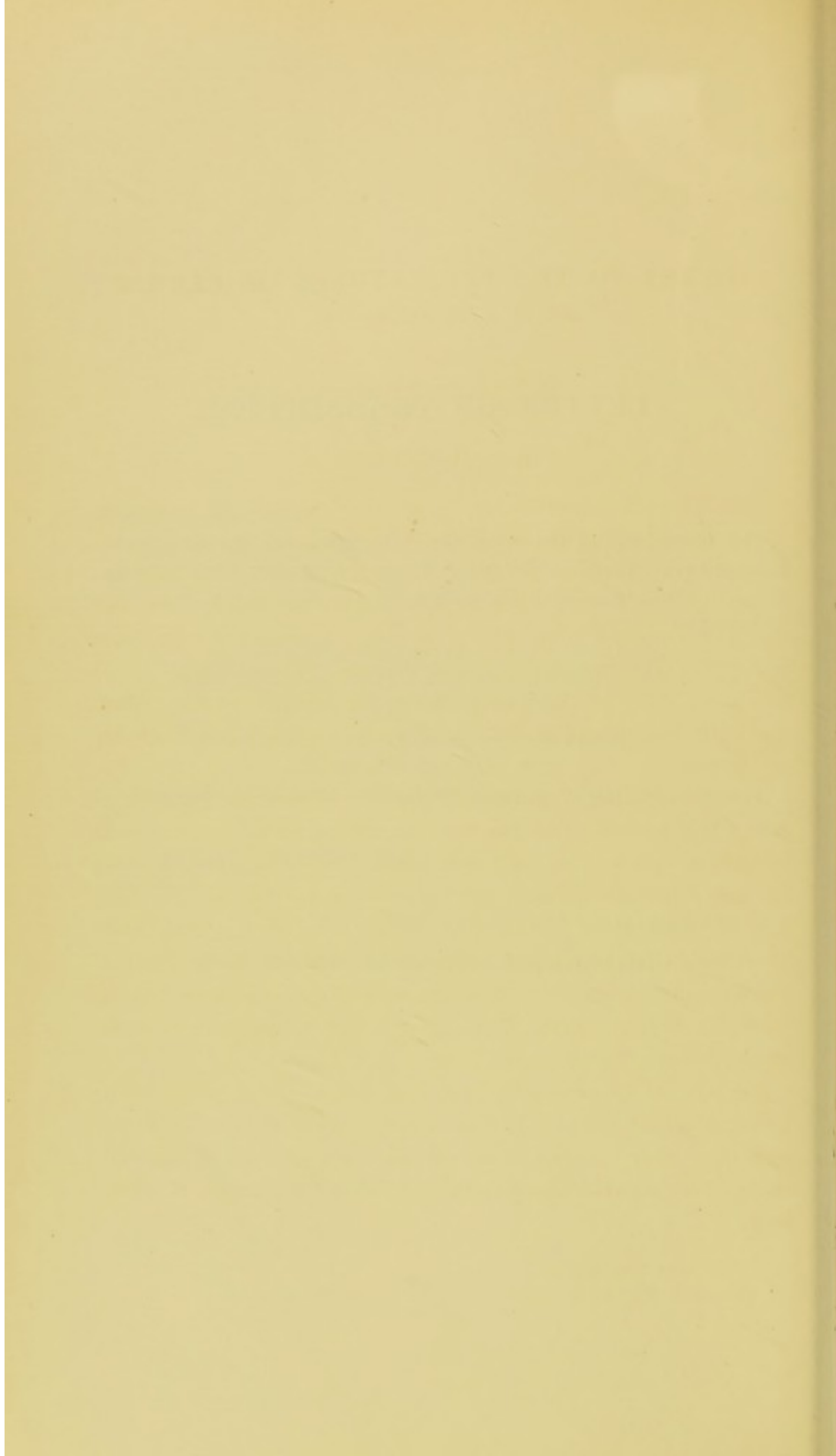
The latter has already appeared in the *School of Mines Quarterly*, No. 1, Vol. XV.

H. CARRINGTON BOLTON,  
*Chairman.*

To the SECRETARY of the SMITHSONIAN INSTITUTION.

<sup>1</sup> This Index is printed as Smithsonian Publication No. 972.





# INDEXES TO THE LITERATURES OF CERIUM AND LANTHANUM.

BY W. H. MAGEE, PH. D.

## INTRODUCTION.

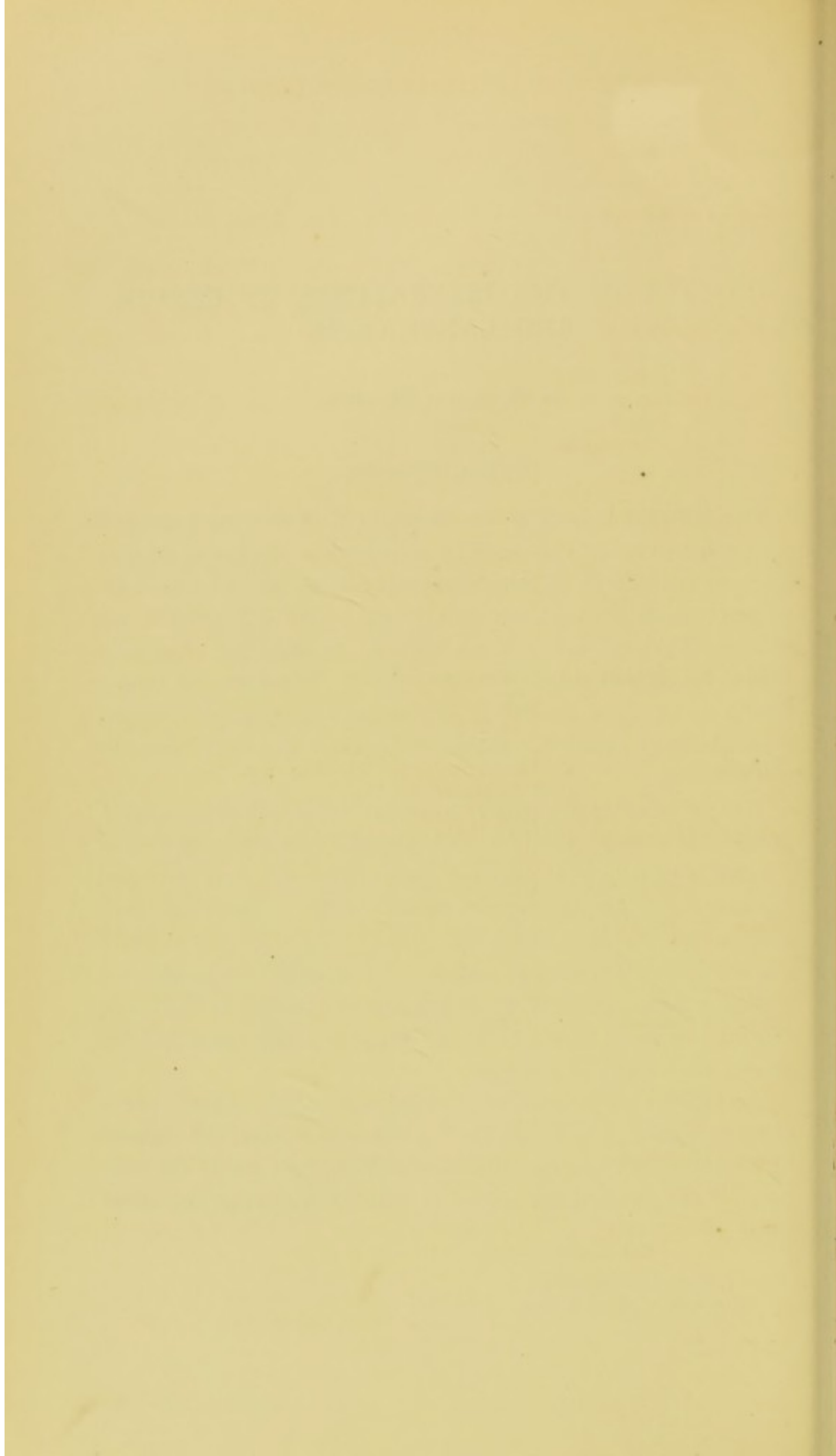
THE following indexes to the literatures of cerium and lanthanum were prepared during the course of some work on the former element. They are not offered as being absolutely correct, but all the more important articles bearing upon the elements are certainly indexed, and usually the original article heads the list. In some few cases, however, it was difficult to determine the original. Whenever the journal was to be found on the library shelves the references were verified. No single library, however, contains all the journals to which references will be found.

That the indexing of chemical literature is of great and growing importance is evident; that the work should be as nearly perfect as possible is equally true. Yet few except those who have attempted the task realize the difficulty and labor involved. I would ask, therefore, as regards these indexes, that any one using them, and all chemists interested in the study of cerium and lanthanum, should send corrections and addenda to W. H. Magee, care of Professor L. M. Dennis, Cornell University, Ithaca, N. Y., so that after a few years perfectly correct indexes may be prepared.

The Indexes are arranged on the same plan as that of the Index to Uranium, published by Dr. H. Carrington Bolton in 1870, and followed by several other chemists. The abbreviations used are in the main those of the standard list printed in Bolton's Bibliography of Chemistry.

CORNELL UNIVERSITY,  
ITHACA, N. Y., July 21, 1894.





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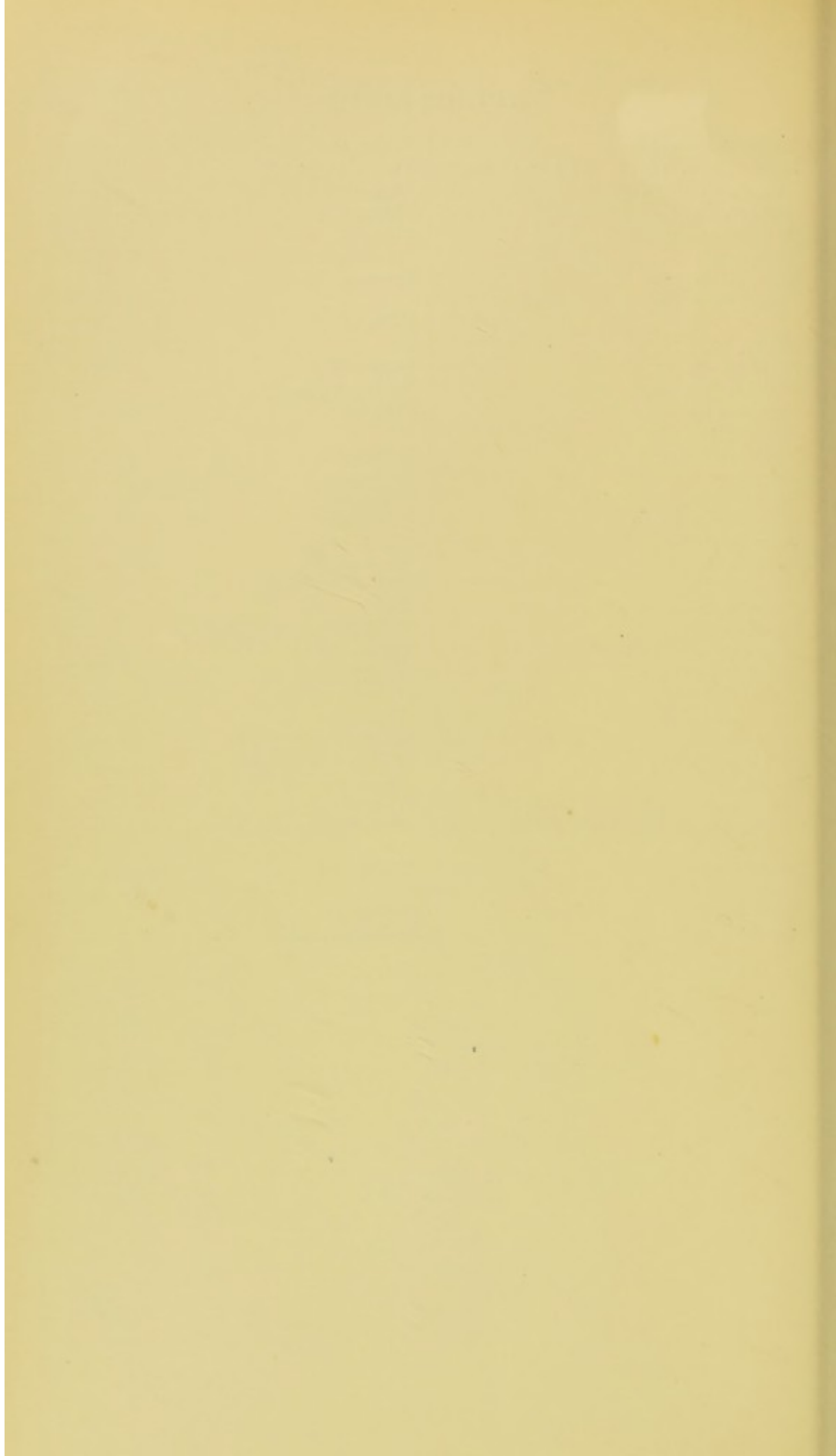
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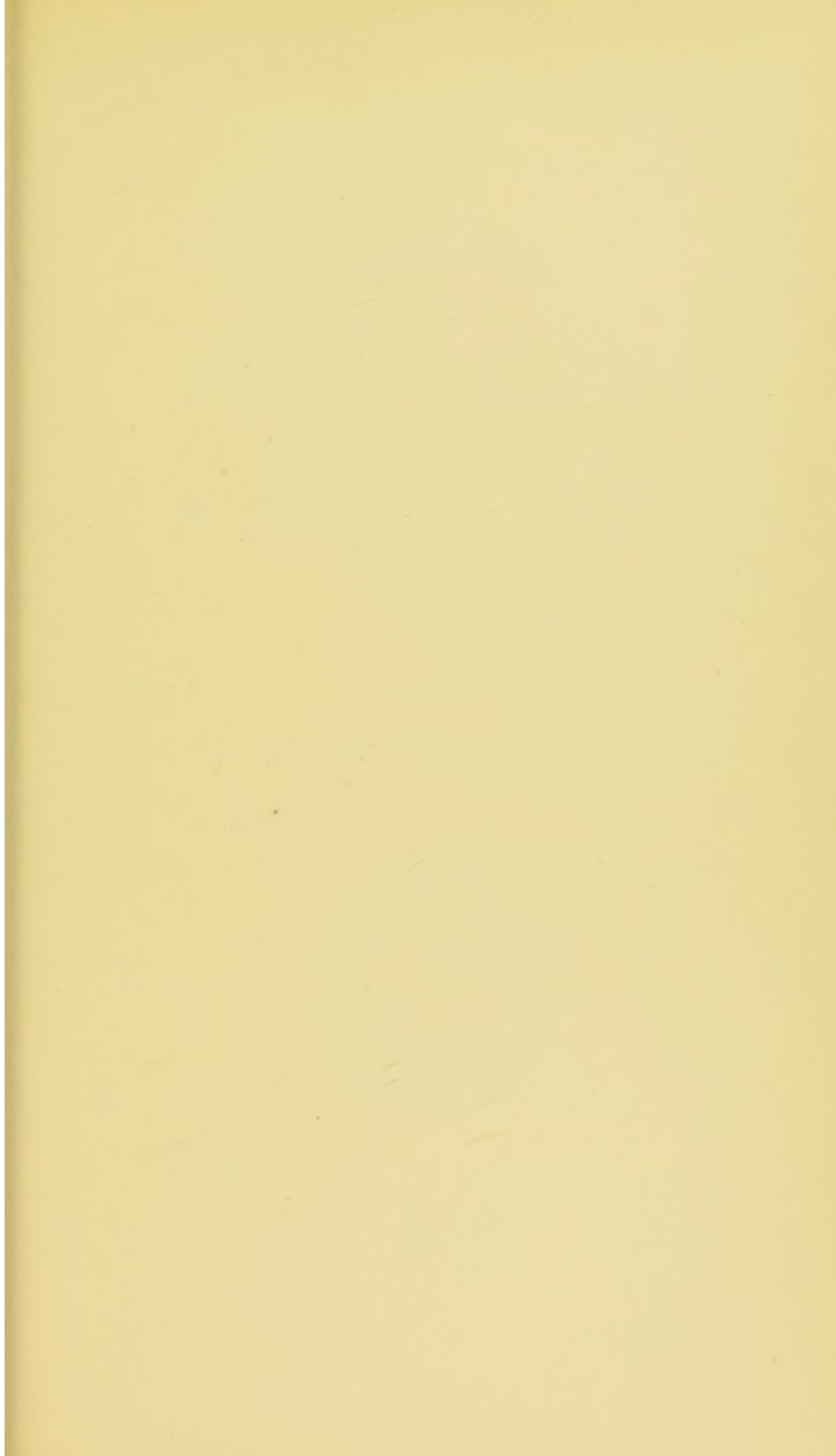


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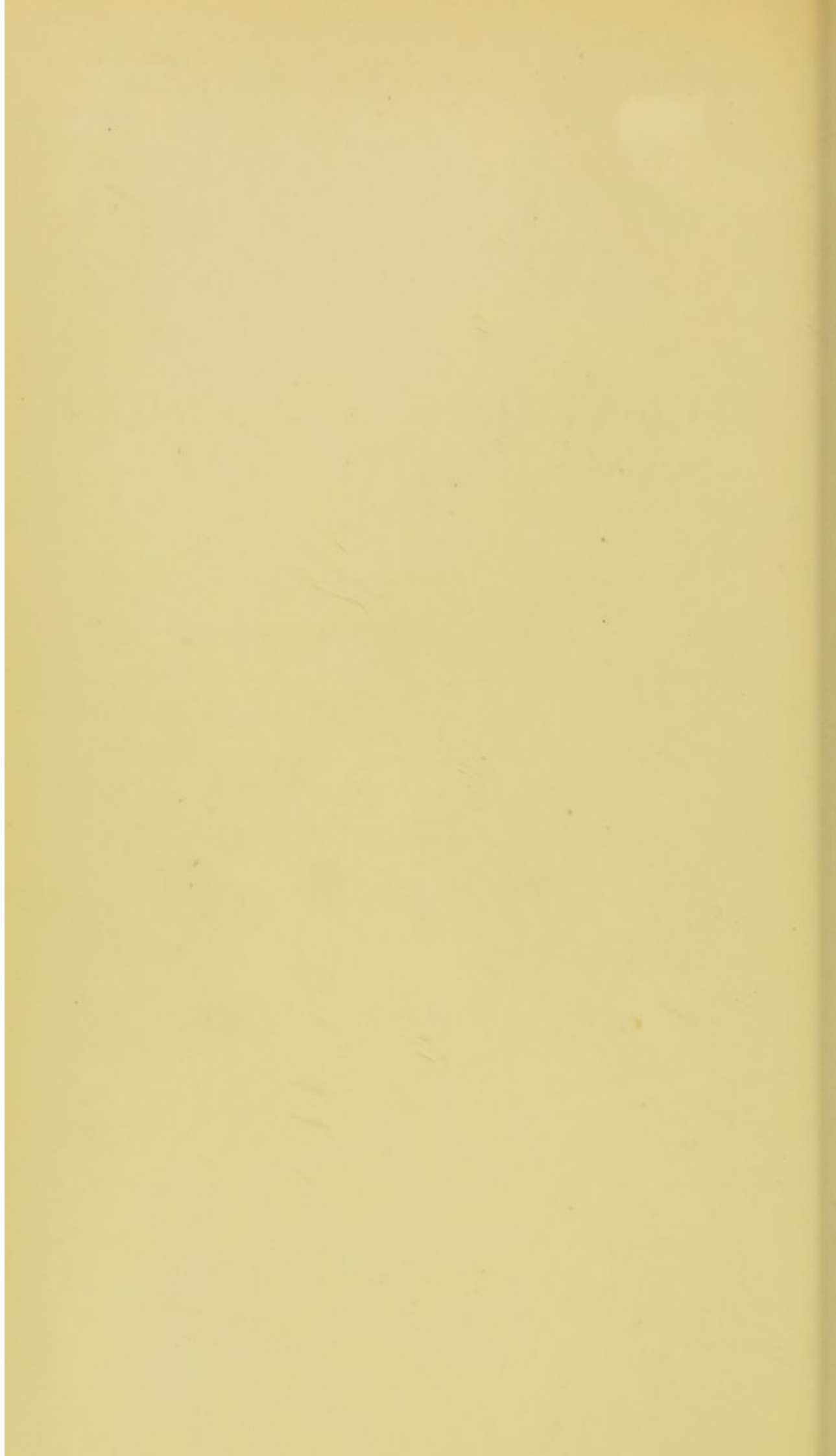
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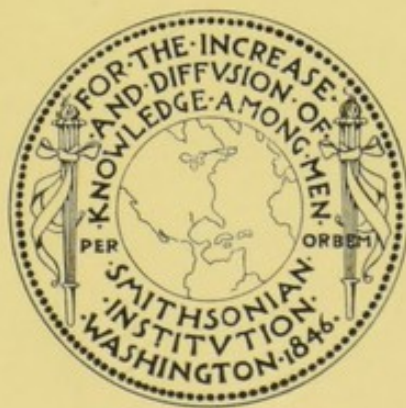


10  
SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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A BIBLIOGRAPHY  
OF THE  
ANALYTICAL CHEMISTRY  
OF  
MANGANESE.  
1785-1900.

BY  
HENRY P. TALBOT AND JOHN W. BROWN.



CITY OF WASHINGTON:  
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1902.



The Knickerbocker Press, New York

## LETTER OF TRANSMITTAL.

WASHINGTON, May 11th, 1901.

The Committee on Indexing Chemical Literature, appointed in 1882 by the American Association for the Advancement of Science, has voted to recommend to the Smithsonian Institution for publication the following:

"A Bibliography of the Analytical Chemistry of Manganese, 1785-1900," by Henry P. Talbot and John W. Brown.

This forms one of the following series:

Index to the Literature of Uranium, 1785-1885, by Henry Carrington Bolton, 1885.

Index to the Literature of Columbium, 1801-1887, by Frank W. Traphagen, 1888.

Index to the Literature of the Spectroscope, by Alfred Tuckerman, 1888.

Index to the Literature of Thermodynamics, by Alfred Tuckerman, 1890.

A Bibliography of the Chemical Influence of Light, by Alfred Tuckerman, 1891.

A Bibliography of Aceto-Acetic Ester, by Paul H. Seymour, 1894.

Index to the Literature of Didymium, 1842-1893, by A. C. Langmuir, 1895.

Indexes to the Literature of Cerium and Lanthanum, by W. H. Magee, 1895.

A Bibliography of the Metals of the Platinum Group, by Jas. Lewis Howe, 1897.

Review and Bibliography of the Metallic Carbides, by J. A. Mathews, 1898.

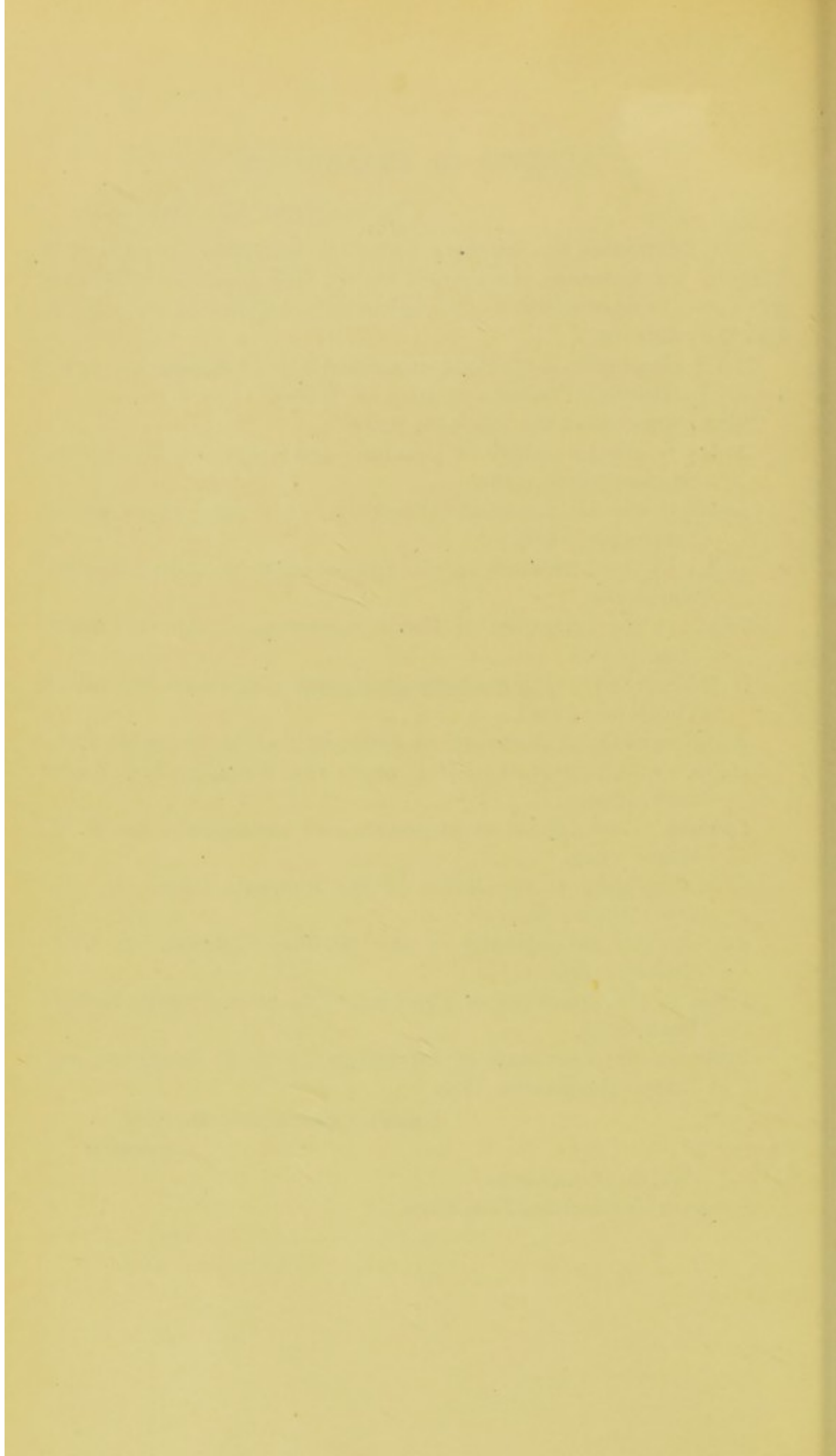
Index to the Literature of Thallium, 1861-1897, by Miss Martha Doan, 1898.

Index to the Literature of Zirconium, by A. C. Langmuir and Charles Baskerville, 1899.

HENRY CARRINGTON BOLTON,  
*Chairman.*

MR. S. P. LANGLEY,  
*Secretary Smithsonian Institution.*





## PREFACE.

In 1875 Dr. H. Carrington Bolton published an "Index to the Literature of Manganese, 1596-1874," comprising the references to the entire available journal literature relating to manganese and its compounds which had appeared before the latter date. The general plan of his index did not, however, provide for the separate classification of the articles containing analytical data, and as the journal literature since 1874 has increased so enormously in volume as to render the search for such data very laborious, it was deemed worth while to compile a separate bibliography bearing upon the qualitative detection and quantitative separation and determination of manganese, for the use of analytical chemists. For this purpose Dr. Bolton's work has been reviewed almost from its beginning, and while we are in part indebted to his "Index" for the references from 1785 to about 1830 (having received his permission to make use of them), yet a number of these early journals were independently examined by us as indicated in our list. From 1830 the compilation is practically independent, although we desire to express our obligation to the Bolton "Index" for the opportunity afforded for the verification of a portion of our work. All the originals of the references have been examined except those marked with an asterisk.

The compilation of material for this Bibliography was practically completed when the "Bibliography of Steel-Works Analysis," published by Brearley in the *Chemical News*, 1899, came to our attention. We are indebted to this Bibliography for an opportunity to verify a portion of our later references and for some four or five references which we had omitted.

The abbreviations used in this Bibliography are those recommended by the Committee on Indexing Chemical Literature of the American Association for the Advancement of Science. The original reference is placed first, and, in general, articles corresponding to references which follow those to the *Chemisches Centralblatt* or the *Jahresbericht der Chemie* are decidedly briefer than the original papers. It has not been practicable, however, to rigidly maintain this distinction.



The Subject Index has been based upon such an examination of the original articles as was possible with a reasonable expenditure of time, and is based therefore upon the salient points rather than upon minute details, although an attempt has been made to carry the subdivision of subjects as far as possible. Under the heading "Applications of Quantitative Methods" (page III *et seq.*), only those references are, in general, included in which the title of the article specifies the material analyzed. This is particularly true of irons, steels, ferromanganese, and spiegeleisen.

We desire to express our obligation to Dr. H. C. Bolton for the permission to make use of his "Index," as well as for assistance in the examination of a file of journals, and to Mr. A. C. Davis for his valuable assistance in the examination of proof-sheets.

This compilation was made possible by a ready access to the valuable libraries of the Massachusetts Institute of Technology, notably the William Ripley Nichols Chemical Library, but we also wish to express our appreciation of the courtesies extended to us by the Boston Public Library, the Library of the American Academy of Arts and Sciences, the Boston Society of Natural History, the Surgeon-General's Office at Washington, the Library of Congress, the libraries of Yale, Columbia, Lehigh, and Harvard Universities, the Massachusetts College of Pharmacy, and the John Crerar and Astor Libraries. Professor James Lewis Howe's excellent "Bibliography of the Platinum Metals" has served as a model for the arrangement of our data.

HENRY P. TALBOT.

JOHN W. BROWN.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,  
BOSTON

JANUARY, 1902.

# LIST OF JOURNALS EXAMINED IN THE PREPARATION OF THIS BIBLIOGRAPHY.

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1785-1900.

BY HENRY P. TALBOT AND JOHN W. BROWN.

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J. prakt. Chem., 60, 259.  
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Chem. Gaz., 1853, 388 and 411; J. prakt. Chem., 61, 102.  
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 C. R., 50, 610.  
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- 1862: 3. SIMMLER, T. Beiträge zur chemischen Analyse durch Spectralbeobachtungen.  
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- 1865: 6. WARINGTON, R., Jr. On the Presence of Manganese in Oolite and Lias.

J. Chem. Soc. (Lond.), **3**, 206.

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See title.



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- 1868: 3. LUNGE, G. Ueber die analytischen Arbeiten in Sodafabriken.  
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C. R., **66**, 668; Ztschr. Chem., **11**, 337; Chem. News, **13**, 45.  
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Precipitation by means of potassium chlorate, solution by ferrous-ammonium sulphate, and titration for the excess of the latter. Evaporation of nitric-acid solution, heating of residue with phosphoric acid, and titration of the phosphate formed with a solution of ferrous sulphate.

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- 1884: 3. BLOXAM, C. L. Estimation of Manganese in Cast Iron and Spiegeleisen.  
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Chem. News, **49**, 9 and 57; Jsb. Chem., **1884**, 1598.  
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- 1884: 13. MACKINTOSH, J. B. Manganese Methods.  
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- 1884: 14. MAUMENÉ, E. J. Sur l'existence du manganèse dans les animaux et les plantes et sur son rôle dans la vie animale.  
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- 1885: 5. CLASSEN, A. Quantitative Analyse durch Elektrolyse.  
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- 1885: 10. HAMPE, W. Die maassanalytische Bestimmung des Mangans in Legirungen, Mineralien u. s. w. mittelst Kaliumchlorats.  
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- 1885: 11. V. JÜPTNER, H. Eine neue Manganbestimmungsmethode auf gewichtsanalytischem Wege.  
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Chem. News, 51, 230; J. Chem. Soc. (Lond.), 48, 690; Ber., 18, 198, Ref.; Bull. soc. chim. (2), 45, 356; Wagner's Jsb., 31, 17; Monit. scientif., 27, 1205; Oester. Ztschr. Berg- u. Hüttenw., 34, 130; J. Soc. Chem. Ind., 4, 419; Dingl. pol. J., 257, 204; Arch. Pharm., 223, 314; Iron, 25, 516; J. Iron Steel Inst., 1885, 248.

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Ber., 18, 1872; J. Chem. Soc. (Lond.), 48, 1162; Chem. Ind., 8, 255; J. Soc. Chem. Ind., 4, 613; Chem.-techn. Centr. Anz., 1885, 775; Chem.-techn. Rep., 24, b, 248.

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Chem. Ztg., 8, 1777; Ber., 1885, 34, Ref.; Ztschr. anal. Chem., 25, 116; Chem. News, 52, 224; 53, 74; Wagner's Jsb., 31, 18; Monit. scientif., 27, 982.

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Chem. Ztg., 9, 1478 and 1787; Dingl. pol. J., 257, 202; Rep. anal. Chem., 5, 389; Berg- u. hüttenm. Ztg., 45, 35.

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Bull. soc. chim. (2), 43, 66; Chem. Centrbl., 1885, 234; Jsb. Chem., 1885, 1935; J. Iron Steel Inst., 1885, a, 275; J. Chem. Soc. (Lond.), 48, 690; Ztschr. anal. Chem., 25, 552; Ber., 18, 344, Ref.; Chem. Ind., 8, 119; Wagner's Jsb., 31, 15; Dingl. pol. J., 257, 201; Arch. Pharm., 223, 285; Chem.-techn. Rep., 24, 249.

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- 1885: 17. REINHARDT, C. Ueber N. Wolff's gewichtsanalytische Manganbestimmung.

Stahl und Eisen, 5, 81; Ztschr. anal. Chem., 25, 114; Wagner's Jsb., 31, 14; Dingl. pol. J., 257, 201.

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Stahl u. Eisen, **11**, 579; Jsb. Chem., **1891**, 2461; Chem. Centrbl., **1891**, b, 493.

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Ztschr. angew. Chem., **1891**, 476.

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Separation from cobalt and nickel, and determination by precipitation as manganese ammonium phosphate. Determination in commercial copper.

## SUBJECT INDEX.

### QUANTITATIVE DETERMINATION OF MANGANESE.

#### (A) BY GRAVIMETRIC METHODS.

##### I. By precipitation as

###### (a) carbonate.

1819: 1 Brandes  
1830: 2 Fuss  
1836: 2 Thomson  
1851: 1 Laming  
1853: 8 Morfit and Booth  
1867: 2 Forbes  
1867: 4 Tosh  
1869: 8 Prior  
1870: 8 Rowan  
1871: 5 Rowan  
1872: 3 Fresenius  
1872: 10 Tamm  
1886: 16 Müller  
1888: 10 Meineke  
1893: 9 Jean  
1897: 8a Hillebrand  
1898: 1 Austin  
1898: 3 Brearley  
1900: 3 Hillebrand

###### (b) di-oxide, hydrated, by means of

###### (1) bromine.

1862: 1 Abel  
1871: 3 Kammerer  
1874: 3 Piesse  
1874: 6 Willis  
1877: 18 Riley  
1879: 8 Mackintosh  
1879: 14 Volhard  
1880: 4 Dunston  
1880: 9 de Koninck  
1881: 11 Kent  
1881: 17 Troilius  
1882: 2 Cabot

1882: 4 Dewey  
1882: 16 Troilius  
1883: 22 Wolff  
1884: 9 Holthof  
1885: 17 Reinhardt  
1885: 18 Reinhardt  
1886: 1 Atkinson  
1886: 16 Müller  
1886: 22 Reinhardt  
1886: 26 Sprenger  
1886: 27 Wolff  
1887: 18 ———  
1888: 12 Oettel  
1888: 14 v. Reis  
1888: 21 ———  
1889: 1 Alt  
1890: 5 Fresenius and Hintz  
1893: 11 Kosmann  
1893: 13 Parry and Morgan  
1894: 13 Saniter  
1896: 11 Mignot  
1900: 6 Ibbotson and Brearley

1900: 9 McKenna

###### (2) chlorine.

1865: 6 Warington  
1878: 6 Müller

###### (3) electrolysis.

1865: 4 Luckow  
1875: 1 Boussingault  
1877: 17 Riche  
1878: 8 Riche  
1880: 10 Luckow  
1881: 2 Classen  
1881: 3 Classen and v. Reis



(3) electrolysis—*Continued.*

- 1882: 10 Keiser  
 1883: 18 Schucht  
 1884: 4 Classen  
 1884: 17 Wieland  
 1885: 4 Classen  
 1886: 18 Moore  
 1889: 3 Brand  
 1889: 7 Kohn and Woodgate  
 1889: 18 Smith and Fränkel  
 1891: 13 Luckow  
 1892: 18 Rüdorff  
 1892: 21 Warwick  
 1893: 14 Rüdorff  
 1894: 2 Classen  
 1894: 16 Thomälen  
 1895: 5 Engels  
 1895: 6 Engels  
 1895: 16 Neumann  
 1896: 6 Engels  
 1897: 7 Engels  
 1898: 13 Kaeppel  
 1898: 21 Wolman  
 1900: 4 Hiorns

## (4) hydrogen peroxide.

- 1877: 19 Rosenthal  
 1884: 7 Hanowsky  
 1886: 16 Müller  
 1887: 7 Donath and Zeller  
 1888: 11 Moore  
 1889: 15 Radau  
 1890: 4 Carnot  
 1893: 2 Carnot  
 1894: 4 Jones  
 1899: 7 Friedheim and Brühl

## (5) hypochlorites.

- 1866: 4 Reichardt  
 1875: 1 Boussingault  
 1877: 11 Kern

## (6) lead peroxide in neutral solution.

- 1852: 2 Gibbs  
 1853: 9 Parkinson  
 1860: 7 Rose  
 1879: 14 Volhard

## (7) potassium chlorate.

- 1877: 10 Hannay  
 1879: 1 Beilstein and Jawein  
 1881: 1 Beilstein and Jawein

- 1881: 8 Ford  
 1882: 16 Troilius  
 1884: 9 Holthof  
 1887: 18 ———  
 1893: 9 Jean  
 1895: 7 Forestier  
 1896: 11 Mignot  
 1896: 17 Viard  
 1900: 8 Joüet  
 1900: 9 McKenna

## (c) manganese ammonium phosphate.

- 1867: 3 Gibbs  
 1870: 11 Talbott  
 1871: 6 Tamm  
 1872: 1 Allen  
 1872: 3 Fresenius  
 1873: 2 Gibbs  
 1877: 1 Bolton  
 1877: 14 Munroe  
 1881: 8 Ford  
 1884: 3 Bloxam  
 1887: 2 Bayley  
 1887: 3 Blair  
 1888: 10 Meineke  
 1890: 3 Boyd  
 1890: 12 McKenna  
 1893: 9 Jean  
 1894: 13 Saniter  
 1896: 5 Dudley  
 1896: 11 Mignot  
 1898: 8 Gooch and Austin  
 1899: 5 Dunnington  
 1900: 1 Böttger  
 1900: 2 Dakin  
 1900: 8 Joüet  
 1900: 12 Truchot

## (d) manganous hydroxide.

- 1856: 1 Gurlt  
 1875: 2 Kern  
 1876: 4 Kern

## (e) oxalate.

- 1870: 2 Gibbs  
 1870: 3 Leison  
 1872: 3 Fresenius  
 1877: 3 Classen  
 1877: 7 Classen

## (f) sulphide.

- 1821: 2 Pfaff

**(f) sulphide—Continued.**

- 1857: 4 Terreil  
 1860: 2 Gorgeu  
 1860: 5 Rose  
 1860: 6 Rose  
 1861: 1 Fresenius  
 1863: 3 Lippert  
 1867: 2 Forbes  
 1867: 4 Tosh  
 1869: 1 Classen  
 1869: 4 How  
 1870: 11 Talbott  
 1872: 3 Fresenius  
 1876: 2 Fresenius  
 1876: 4 Kern  
 1877: 5 Classen  
 1879: 1 Beilstein and Jawein  
 1879: 2 Carnot  
 1879: 7 Ledebur  
 1880: 2 Delffs  
 1883: 23 Zulkowsky  
 1885: 11 v. Jüptner  
 1888: 3 Friedmann  
 1888: 10 Meineke  
 1888: 16 Schürmann  
 1890: 5 Fresenius and Hintz  
 1893: 9 Jean  
 1894: 13 Saniter  
 1897: 8 Granger  
 1898: 15 Murmann  
 1898: 16 Murmann  
 1900: 11 Pattinson

**(g) vanadate.**

- 1887: 6 Carnot

**II. By ignition to****(a) mangano-manganic oxide.**

- 1836: 2 Thomson  
 1856: 1 Gurlt  
 1860: 2 Gorgeu  
 1865: 6 Warington  
 1866: 4 Reichardt  
 1867: 2 Forbes  
 1867: 4 Tosh  
 1870: 8 Rowan  
 1872: 3 Fresenius  
 1874: 3 Piesse  
 1874: 6 Willis  
 1875: 2 Kern  
 1876: 4 Kern

- 1877: 3 Classen  
 1877: 12 Kern  
 1878: 6 Müller  
 1879: 14 Volhard  
 1880: 4 Dunston  
 1881: 17 Troilius  
 1882: 2 Cabot  
 1882: 16 Troilius  
 1883: 22 Wolff  
 1884: 7 Hanowsky  
 1885: 11 v. Jüptner  
 1886: 16 Müller  
 1887: 7 Donath and Zeller  
 1887: 18 ———  
 1888: 12 Oettel  
 1888: 14 v. Reis  
 1888: 21 ———  
 1889: 3 Brand  
 1889: 7 Kohn and Woodgate  
 1891: 21 Pattinson  
 1893: 9 Jean  
 1893: 13 Parry and Morgan  
 1894: 2 Classen  
 1894: 13 Saniter  
 1895: 7 Forestier  
 1896: 14 Rürup  
 1897: 8a Hillebrand  
 1898: 1 Austin  
 1898: 7 Gooch and Austin  
 1900: 4 Hiorns  
 1900: 9 McKenna

**(b) manganous oxide.**

- 1843: 2 Ebelmen  
 1875: 2 Kern

**(c) pyrophosphate.** See "precipitation as manganese-ammonium phosphate."**(d) sulphate.**

- 1879: 14 Volhard  
 1885: 15 Meineke  
 1888: 21 ———  
 1898: 1 Austin  
 1898: 7 Gooch and Austin

**(e) sulphide.**

- 1860: 5 Rose  
 1860: 6 Rose  
 1863: 3 Lippert  
 1876: 2 Fresenius  
 1879: 2 Carnot



## III. By the method of

## (a) Classen (oxalate).

- 1877: 3 Classen  
1877: 7 Classen  
1894: 9 Nass

## (b) Ford.

- 1881: 5 Deshayes  
1881: 8 Ford  
1896: 5 Dudley  
1896: 14 Rürup

## (c) Gibbs (pyrophosphate).

- 1867: 3 Gibbs  
1871: 6 Tamm  
1872: 1 Allen  
1877: 1 Bolton  
1890: 12 McKenna

## (d) Rüdorff.

- 1892: 18 Rüdorff  
1895: 8 Gröger

## (e) Wolff.

- 1883: 22 Wolff  
1885: 14 Mathesius  
1885: 17 Reinhardt  
1885: 18 Reinhardt  
1886: 27 Wolff  
1891: 5 Chemiker - Commission  
1893: 11 Kosman

## IV. By miscellaneous methods.

## (a) by difference.

- 1877: 18 Riley  
1879: 7 Ledebur  
1884: 2 Atkinson  
1884: 8 Holdich  
1885: 7 Diehl  
1888: 21 ———

## (b) by dry assay.

- 1872: 11 Tamm  
1896: 3 Büttgenbach

## (c) from oxygen absorbed by alkaline solutions.

- 1864: 4 Mittenzwey

## (B) BY VOLUMETRIC METHODS.

## I. By titration with potassium permanganate solution.

## (a) Direct titration.

- 1863: 2 Guyard

- 1864: 6 Winkler  
1865: 3 Habich  
1872: 3 Fresenius  
1878: 4 Morawski and Stingl  
1879: 14 Volhard  
1880: 5 Haswell  
1880: 7 v. Jüptner  
1881: 6 Donath  
1881: 7 Emmerton  
1881: 15 Särnström  
1883: 6 v. Jüptner  
1883: 11 Meineke  
1883: 14 Särnström  
1883: 15 Särnström  
1883: 17 Schöffel and Donath  
1883: 23 Zuluskowsky  
1884: 1 Anger  
1884: 6 Gmelin  
1884: 15 Meineke  
1884: 18 Wolff  
1885: 18 Reinhardt  
1885: 20 Wolff  
1886: 23 Reinhardt  
1886: 27 Wolff  
1886: 28 Zimmermann  
1887: 4 Brand  
1887: 9 Jolles  
1888: 4 Ghilian  
1891: 2 Blum  
1891: 4 Brown  
1891: 5 Chemiker - Commission  
1891: 9 Hampe  
1891: 16 Moldenhauer  
1891: 25 Rubricius  
1891: 26 Rürup  
1892: 1 Aller  
1892: 4 Campredon  
1892: 7 Donath  
1892: 12 v. Reis  
1892: 16 Rubricius  
1892: 17 Rubricius  
1893: 1 Carnot  
1893: 6 Gorgeu  
1893: 9 Jean  
1894: 13 Saniter  
1894: 14 Seeliger  
1895: 2 Auchy  
1895: 18 Thomas

(a) Direct titration—*Continued.*

- 1896: 1 Auchy
- 1896: 12 Mixer and Dubois
- 1896: 13 Murkewitsch
- 1896: 14 Rürup
- 1896: 15 Stone
- 1897: 1 Auchy
- 1897: 3 Brearley
- 1897: 6 Devisse
- 1897: 10 Longi and Camilla
- 1898: 4 Campredon
- 1898: 14 Lehnkering
- 1899: 1 Brearley
- 1899: 4 Daw
- 1899: 8 Herting
- 1899: 10 Namias
- 1900: 8 Jouët

## (b) Indirect titration.

- 1883: 10 Meineke
- 1883: 11 Meineke
- 1885: 15 Meineke
- 1886: 15 Meineke
- 1886: 17 Müller
- 1886: 24 Schöffel and Donath
- 1887: 13 Lax
- 1891: 5 Chemiker - Commission
- 1891: 9 Hampe
- 1896: 7 Giorgis
- 1899: 13 Reichard

II.<sup>1</sup> By precipitation as di-oxide, solution with the aid of a reducing agent, and titration for the excess of the latter.

## Precipitation by means of

## (a) bromine.

- 1872: 5 Kessler
- 1872: 6 Kessler
- 1879: 6 Kessler
- 1879: 7 Ledebur
- 1887: 14 Meineke
- 1887: 17 Reinhardt
- 1888: 13 Reinhardt
- 1893: 12 Low

## (b) chlorine.

- 1861: 4 Möller

## (c) hydrogen peroxide.

- 1886: 2 Barlow
- 1888: 2 Carnot

- 1889: 12 McCulloch
- 1890: 2 van Bemmeln
- 1893: 2 Carnot
- 1894: 4 Jones
- 1895: 4 Carnot
- 1895: 7 Forestier
- 1895: 19 Ulzer and Brüll

## (d) hypochlorite.

- 1853: 4 Hempel
- 1854: 2 Streng
- 1855: 1 Mohr
- 1855: 2 Müller
- 1879: 9 Pattinson
- 1879: 10 Pattinson
- 1880: 13 Pattinson
- 1880: 16 Weldon
- 1880: 18 Wright and Menke
- 1884: 11 Ledebur
- 1886: 1 Atkinson
- 1887: 13 Lax
- 1893: 9 Jean

## (e) potassium chlorate.

- 1877: 10 Hannay
- 1881: 18 Williams
- 1883: 4 Hampe
- 1883: 9 Mackintosh
- 1883: 13 Raimond
- 1883: 19 Stone
- 1883: 20 Stone
- 1883: 21 Troilius
- 1884: 11 Ledebur
- 1884: 12 Mackintosh
- 1885: 3 Cheever
- 1885: 10 Hampe
- 1885: 15 Meineke
- 1887: 13 Lax
- 1887: 15 Meineke
- 1888: 7 Julian
- 1888: 13 Reinhardt
- 1891: 4 Brown
- 1891: 5 Chemiker - Commission
- 1891: 9 Hampe
- 1891: 19 Norris
- 1891: 23 v. Reis
- 1891: 28 Ukena
- 1892: 2 Bastin
- 1892: 5 Chemiker - Commission



(e) **potassium chlorate**—*Continued.*

- 1892: 9 Hampe  
 1892: 13 v. Reis  
 1893: 9 Jean  
 1893: 10 Julian  
 1893: 13 Parry and Morgan  
 1894: 5 Jones  
 1895: 2 Auchy  
 1895: 7 Forestier  
 1895: 19 Ulzer and Brüll  
 1896: 5 Dudley  
 1896: 14 Rürup  
 1897: 9 Julian  
 1898: 6 Ford and Bregowsky  
 1898: 14 Lehnkering  
 1899: 16 J. T.  
 1900: 6 Ibbotson and Brearley

(f) **reduction of manganate by alcohol.**

- 1890: 13 Myhlertz

(g) **sodium chlorate.**

- 1898: 9 Gooch and Austin  
 1899: 8 Herting

**Solution of the peroxide with the aid of**(a) **antimonious chloride.**

- 1872: 5 Kessler  
 1872: 6 Kessler  
 1879: 6 Kessler  
 1879: 7 Ledebur

(b) **arsenious oxide.**

- 1898: 9 Gooch and Austin

(c) **ferrous salts or oxalic acid.**

- 1853: 4 Hempel  
 1877: 10 Hannay  
 1879: 9 Pattinson  
 1879: 10 Pattinson  
 1880: 13 Pattinson  
 1880: 16 Weldon  
 1880: 18 Wright and Menke  
 1881: 18 Williams  
 1883: 4 Hampe  
 1883: 9 Mackintosh  
 1883: 13 Raimond  
 1883: 19 Stone  
 1883: 20 Stone  
 1883: 21 Troilius  
 1884: 11 Ledebur

- 1884: 12 Mackintosh  
 1885: 3 Cheever  
 1885: 10 Hampe  
 1885: 15 Meineke  
 1886: 1 Atkinson  
 1887: 13 Lax  
 1887: 14 Meineke  
 1887: 15 Meineke  
 1887: 17 Reinhardt  
 1888: 2 Carnot  
 1888: 7 Julian  
 1888: 13 Reinhardt  
 1889: 12 McCulloch  
 1890: 2 van Bemmeln  
 1890: 13 Myhlertz  
 1891: 4 Brown  
 1891: 5 Chemiker - Commission

- 1891: 9 Hampe  
 1891: 19 Norris  
 1891: 23 v. Reis  
 1891: 28 Ukena  
 1892: 2 Bastin  
 1892: 5 Chemiker - Commission

- 1892: 9 Hampe  
 1892: 13 v. Reis  
 1893: 2 Carnot  
 1893: 9 Jean  
 1893: 12 Low  
 1893: 13 Parry and Morgan  
 1894: 4 Jones, H. C.  
 1894: 5 Jones, J.  
 1895: 2 Auchy  
 1895: 4 Carnot  
 1895: 7 Forestier  
 1895: 18 Thomas  
 1895: 19 Ulzer and Brüll  
 1896: 5 Dudley  
 1896: 14 Rürup  
 1898: 6 Ford and Bregowsky  
 1898: 14 Lehnkering  
 1899: 16 J. T.

(d) **hydrochloric acid (Bunsen).**

- 1861: 4 Möller  
 1886: 2 Barlow

(e) **hydrogen peroxide.**

- 1893: 10 Julian

(e) hydrogen peroxide—*Continued.*

1897: 9 Julian

## (f) potassium iodide.

1898: 9 Gooch and Austin

## (g) stannous chloride.

1854: 2 Streng

1855: 1 Mohr

1855: 2 Müller

III. By titration of permanganic acid,  
after oxidation by means of

## (a) bismuth tetroxide.

1888: 15 Schneider

1889: 17 Schneider

1898: 4 Campredon

1900: 10 Mignot

## (b) lead peroxide.

1871: 2 Chatard

1872: 7 Leclerc

1877: 8 Deby

1878: 2 Deshayes

1878: 7 Prochaska

1881: 9 Forguignon

1885: 19 Schlagdenhauffen

1886: 21 Perillou

1886: 25 Setterwall

1887: 1 Babbitt

1887: 5 Cheever

1887: 19 ———

1888: 17 Stein

1888: 18 Thorpe and Hambly

1888: 19 Thorpe and Hambly

1892: 19 Schneider

1892: 20 Van Grundy

1900: 5 Ibbotson and Brearley

1900: 7 Jervis

## (c) sodium bismuthate.

1895: 17 Reddrop and Ramage

Titration of the permanganic acid  
by means of

## (a) ammonium oxalate.

1871: 2 Chatard

1888: 18 Thorpe and Hambly

1888: 19 Thorpe and Hambly

## (b) arsenious oxide.

1877: 8 Deby

1878: 2 Deshayes

1886: 25 Setterwall

1887: 19 ———

1892: 20 Van Grundy

## (c) ferrous salts.

1878: 7 Prochaska

1886: 21 Perillou

1888: 17 Stein

1900: 7 Jervis

## (d) hydrogen peroxide.

1888: 15 Schneider

1889: 17 Schneider

1892: 19 Schneider

1895: 17 Reddrop and Ramage

1898: 4 Campredon

1900: 10 Mignot

## (e) mercurous nitrate.

1872: 7 Leclerc

1881: 9 Forguignon

1885: 19 Schlagdenhauffen

## IV. By the method of

## (a) Chatard.

1871: 2 Chatard

1888: 18 Thorpe and Hambly

1888: 19 Thorpe and Hambly

1888: 20 Weissmann

## (b) Carnot.

1888: 2 Carnot

1889: 12 McCulloch

1890: 2 van Bemmeln

1890: 4 Carnot

1897: 2 van Bemmeln

## (c) Deshayes.

1878: 2 Deshayes

1887: 19 ———

## (d) Donath.

1881: 6 Donath

1893: 6 Gorgeu

## (e) Guyard.

1863: 2 Guyard

1865: 3 Habich

1882: 6 Dunn

1884: 15 Meineke

1893: 1 Carnot

1893: 6 Gorgeu

1893: 9 Jean

## (f) Hampe.

1883: 4 Hampe

1884: 11 Ledebur

1885: 10 Hampe



- (f) **Hampe**—*Continued.*  
 1886: 23 Reinhardt  
 1886: 24 Schöffel and Donath  
 1887: 13 Lax  
 1887: 15 Meineke  
 1888: 13 Reinhardt  
 1891: 5 Chemiker - Commission  
 1891: 23 v. Reis  
 1892: 5 Chemiker - Commission  
 1892: 9 Hampe  
 1892: 13 v. Reis  
 1894: 5 Jones, J.  
 1895: 19 Ulzer and Brüll  
 1896: 14 Rürup
- (g) **Kessler.**  
 1872: 5 Kessler  
 1872: 6 Kessler  
 1879: 6 Kessler  
 1887: 13 Lax
- (h) **Leclerc.**  
 1872: 7 Leclerc  
 1881: 9 Forguignon  
 1885: 19 Schlagdenhauffen
- (i) **Lenssen.**  
 1860: 3 Lenssen.  
 1864: 2 Fresenius
- (j) **Meineke.**  
 1883: 10 Meineke  
 1883: 11 Meineke  
 1885: 15 Meineke  
 1886: 15 Meineke  
 1886: 17 Müller  
 1886: 23 Reinhardt  
 1887: 13 Lax  
 1891: 5 Chemiker - Commission
- (k) **Morawski and Stingl.**  
 1878: 4 Morawski and Stingl  
 1884: 15 Meineke
- (l) **Pattinson.**  
 1879: 9 Pattinson  
 1880: 18 Wright and Menke  
 1884: 11 Ledebur  
 1886: 1 Atkinson  
 1886: 20 Pattinson  
 1887: 13 Lax  
 1891: 21 Pattinson
- 1893: 9 Jean  
 1894: 13 Saniter
- (m) **Reinhardt.**  
 1888: 13 Reinhardt  
 1891: 5 Chemiker - Commission
- (n) **Rössler.**  
 1879: 13 Rössler  
 1880: 15 Rössler  
 1894: 14 Seeliger
- (o) **Rürup.**  
 1891: 2 Blum  
 1891: 25 Rubricius  
 1891: 26 Rürup
- (p) **Särnström.**  
 1881: 15 Särnström  
 1883: 7 Kerl  
 1883: 15 Särnström  
 1890: 6 Hellman  
 1896: 12 Mixer and Dubois  
 1897: 1 Auchy
- (q) **Schneider.**  
 1889: 17 Schneider  
 1895: 17 Reddrop and Ramage  
 1898: 4 Campredon
- (r) **Schöffel and Donath.**  
 1883: 14 Särnström  
 1883: 17 Schöffel and Donath  
 1886: 24 Schöffel and Donath  
 1887: 13 Lax  
 1891: 5 Chemiker - Commission
- (s) **Volhard.**  
 1879: 14 Volhard  
 1880: 5 Haswell  
 1880: 7 v. Jüptner  
 1881: 7 Emmerton  
 1882: 8 Haswell  
 1883: 6 v. Jüptner  
 1883: 11 Meineke  
 1884: 6 Gmelin  
 1884: 11 Ledebur  
 1884: 15 Meineke  
 1887: 9 Jolles  
 1888: 6 Iles  
 1891: 2 Blum  
 1891: 4 Brown  
 1891: 16 Moldenhauer

**(s) Volhard—Continued**

- 1891: 20 Namias
- 1891: 25 Rubricius
- 1891: 26 Rürup
- 1892: 1 Aller
- 1892: 12 v. Reis
- 1892: 16 Rubricius
- 1892: 17 Rubricius
- 1894: 13 Saniter
- 1895: 2 Auchy
- 1895: 18 Thomas
- 1896: 1 Auchy
- 1896: 13 Murkewitsch
- 1896: 14 Rürup
- 1896: 15 Stone
- 1897: 6 Devisse
- 1897: 10 Longi and Camilla
- 1898: 4 Campredon
- 1898: 14 Lehnkering
- 1899: 1 Brearley
- 1899: 4 Daw
- 1899: 8 Herting
- 1899: 10 Namias
- 1900: 8 Joüet

**(t) Weissmann.**

- 1888: 17 Stein
- 1888: 20 Weissmann
- 1895: 19 Ulzer and Brüll

**(u) Williams.**

- 1881: 18 Williams
- 1883: 9 Mackintosh
- 1883: 21 Troilius
- 1884: 12 Mackintosh
- 1885: 3 Cheever
- 1891: 4 Brown
- 1892: 2 Bastin
- 1893: 13 Parry and Morgan
- 1895: 2 Auchy
- 1896: 5 Dudley
- 1898: 6 Ford and Bregowsky
- 1899: 16 J. T.
- 1900: 6 Ibbotson and Brearley

**V. By miscellaneous methods.****(a) by means of alkali sulphides.**

- 1894: 10 Neumann

**(b) by reduction of potassium ferri-cyanide.**

- 1860: 3 Lenssen

- 1864: 2 Fresenius

**(c) by means of potassium ferro-cyanide.**

- 1889: 13 Moldenhauer
- 1891: 3 Blum
- 1891: 14 Luckow
- 1891: 17 Moldenhauer
- 1897: 12 Miller
- 1897: 13 Miller and Mathews
- 1897: 16 Stone and van Ingen

**(d) by means of tartaric or malic acids.**

- 1868: 2 Juette

**(e) by means of silver nitrate (indirect).**

- 1879: 13 Rössler
- 1880: 15 Rössler
- 1894: 14 Seeliger

**(f) by the titration of manganate.**

- 1881: 10 Iles
- 1885: 12 Kalmann and Smolka
- 1899: 14 Reichard

**(g) by the titration of manganic phosphate.**

- 1883: 4 Hampe.
- 1891: 18 Moore

**(h) by means of iodine (indirect).**

- 1890: 16 Vortmann

**(i) by solution of ignited oxide in reducing agents.**

- 1876: 3 Galbraith
- 1886: 2 Barlow

**(C) BY COLORIMETRIC METHODS.****I. By oxidation to permanganic acid by means of****(a) bismuth tetroxide.**

- 1895: 7 Forestier
- 1896: 11 Mignot

**(b) lead peroxide.**

- 1872: 8 Pichard
- 1876: 5 Peters
- 1881: 5 Deshayes
- 1883: 1 Goetz
- 1882: 11 Ledebur
- 1886: 8 Cheever
- 1886: 13 Hunt



**(b) lead peroxide—Continued.**

- 1887: 5 Cheever  
 1887: 16 Morgan  
 1893: 13 Parry and Morgan  
 1895: 7 Forestier  
 1896: 1 Auchy  
 1896: 11 Mignot  
 1897: 11 Lemaire  
 1897: 15 Schneider  
 1898: 18 Pichard

**II. By the formation of metaphosphate.**

- 1885: 16 Osmond  
 1891: 24 Rossi

**III. By the formation of manganate.**

- 1873: 1 Brünner  
 1874: 1 Koppmayer

**IV. By the liberation of iodine.**

- 1874: 2 Morrell  
 1875: 4 Morrell

**(D) GENERAL DISCUSSION OF METHODS.**

- 1875: 1a Bolton  
 1881: 11 Kent  
 1882: 6 Dunn  
 1882: 15 Tamm  
 1883: 16 Schmitt  
 1884: 13 Mackintosh  
 1884: 16 Stone  
 1885: 19 Schlagdenhauffen  
 1887: 13 Lax  
 1888: 10 Meineke  
 1889: 4 Finkener  
 1891: 21 Pattinson  
 1894: 13 Saniter  
 1895: 15 v. Jüptner  
 1895: 16 Neumann  
 1896: 1 Auchy  
 1896: 4 Dewey  
 1896: 10 v. Jüptner  
 1896: 14 Rürup  
 1897: 15 Schneider  
 1898: 13 Kaepfel (electro-lytic)  
 1898: 21 Wolman (electro-lytic)  
 1899: 3 Brearley

**(E) SEPARATION FROM OTHER ELEMENTS.****(a) from alkaline earths.**

- 1852: 2 Gibbs  
 1853: 9 Parkinson  
 1861: 4 Möller  
 1886: 2 Barlow

**(b) from aluminum.**

- 1860: 6 Rose  
 1865: 2 Gibbs  
 1865: 5 Rube  
 1879: 4 Classen  
 1879: 14 Volhard  
 1881: 3 Classen  
 1899: 9 Hess and Campbell

**(c) from arsenic.**

- 1837: 4 Sheerer  
 1895: 13 Jannasch and Kammerer

**(d) from cadmium.**

- 1889: 3 Brand  
 1891: 27 Smith  
 1892: 21 Warwick  
 1895: 14 Jannasch and Röttgen

**(e) from calcium.**

- 1827: 3 Stromeyer  
 1860: 6 Rose  
 1877: 4 Classen  
 1889: 2 Blum  
 1889: 16 Reitmar  
 1892: 14 Riggs

**(f) from cerium.**

- 1864: 3 Gibbs

**(g) from chromium.**

- 1865: 2 Gibbs  
 1884: 5 Classen  
 1894: 6 Kassner  
 1894: 11 Poleck  
 1895: 10 Jannasch and Cloedt  
 1898: 3 Brearley  
 1899: 7 Friedheim and Brühl

**(h) from cobalt by means of****(1) chlorine.**

- 1866: 5 Terreil

**(2) citrates.**

- 1892: 10 Moore

- (3) cyanides.  
 1841: 3 Liebig  
 1853: 2 Flajolot  
 1887: 10 Klobb  
 1889: 11 McCulloch
- (4) electrolysis.  
 1888: 12 Oettel  
 1889: 3 Brand  
 1891: 15 Le Roy  
 1898: 5 Engels
- (5) hydrogen peroxide.  
 1886: 2 Barlow  
 1887: 7 Donath and Zeller  
 1891: 10 Jannasch and Franzek  
 1896: 9 Jannasch and Lehner
- (6) hypochlorite, hydrofluoric acid, and ammonia.  
 1841: 4 Ullgren
- (7) magnesium.  
 1832: 2 Döbereiner
- (8) Mercuric oxide.  
 1835: 2 Persoz
- (9) nitroso- $\beta$ -naphthol.  
 1896: 2 Burgass
- (10) oxalates.  
 1827: 1 Du Menil
- (11) phosphates.  
 1858: 2 Henry  
 1900: 12 Truchot
- (12) potassium permanganate.  
 1866: 5 Terreil
- (13) potassium polysulphide.  
 1845: 1 Cloez
- (14) silver nitrate and ammonia.  
 1839: 3 W.
- (15) sodium peroxide.  
 1893: 5 Clark
- (16) solubility of chlorides in ether.  
 1837: 1 Döbereiner
- (17) the solubilities of the sulphides.  
 1838: 2 Wackenroder  
 1846: 1 Barreswil  
 1847: 3 Rose  
 1847: 4 Strecker  
 1849: 1 Ebelmen
- 1865: 2 Gibbs  
 1866: 3 Frohde  
 1869: 7 Muck  
 1881: 4 Delvaux  
 1886: 26 Sprenger  
 1890: 5 Fresenius and Hintz  
 1897: 8a Hillebrand  
 1900: 3 Hillebrand
- (18) volatility of chloride.  
 1846: 4 Völker
- (i) from copper.  
 1869: 5 Luckow  
 1884: 5 Classen  
 1887: 11 v. Knorre  
 1887: 12 v. Knorre  
 1889: 3 Brand  
 1893: 14 Rüdorff  
 1895: 14 Jannasch and Röttgen  
 1896: 2 Burgass  
 1896: 8 Jannasch  
 1897: 8a Hillebrand  
 1899: 6 Fernberger and Smith  
 1899: 7 Friedheim and Brühl
- (j) from gallium.  
 1882: 1 de Boisbaudran
- (k) from iron by means of  
 (1) acetates.  
 1841: 2 Henry  
 1862: 1 Abel  
 1865: 2 Gibbs  
 1866: 2 Eggertz  
 1866: 4 Reichardt  
 1867: 4 Tosh  
 1869: 2 Damour  
 1870: 8 Rowan  
 1872: 5 Kessler  
 1872: 6 Kessler  
 1874: 3 Piesse  
 1874: 6 Willis  
 1875: 1 Boussingault  
 1875: 4 Morrell  
 1877: 13 Krämer  
 1877: 18 Riley  
 1877: 19 Rosenthal  
 1877: 20 Stöckman  
 1878: 3 Matzurka  
 1878: 6 Müller  
 1879: 8 Mackintosh



(1) acetates—*Continued.*

- 1880: 4 Dunston  
 1880: 6 Jewett  
 1881: 11 Kent  
 1881: 17 Troilius  
 1882: 2 Cabot  
 1882: 4 Dewey  
 1882: 9 Jewett  
 1884: 3 Bloxam  
 1886: 1 Atkinson  
 1886: 12 Deane  
 1886: 16 Müller  
 1886: 22 Reinhardt  
 1886: 26 Sprenger  
 1887: 18 ———  
 1888: 4 Ghilian  
 1888: 10 Meineke  
 1888: 14 v. Reis  
 1888: 21 ———  
 1889: 9 Mayer (qualitative)  
 1892: 4 Campredon  
 1892: 11 Priwoznik  
 1892: 14 Riggs  
 1893: 9 Jean  
 1893: 11 Kosman  
 1893: 13 Parry and Morgan  
 1895: 7 Forestier  
 1897: 3 Brearley  
 1897: 4 Brearley  
 1899: 2 Brearley  
 1900: 8 Joüet  
 1900: 9 McKenna

## (2) ammonia in the presence of ammonium chloride.

- 1813: 1 Hatchett  
 1830: 2 Fuss  
 1876: 4 Kern

## (3) arsenates.

- 1827: 1 Du Menil  
 1827: 2 Quesneville  
 1829: 3 Martini

## (4) benzoic acid.

- 1806: 1 Berzelius  
 1812: 1 Pfaff  
 1829: 3 Martini  
 1836: 2 Thomson  
 1877: 9 Funaro

## (5) camphoric acid.

- 1832: 5 Kastner

## (6) chlorate.

See "precipitation by means of chlorate." See pp. 98 and 101

## (7) chlorides.

- 1797: 1 Kirwan  
 1837: 4 Scheerer  
 1863: 3 Lippert

## (8) chlorine.

- 1853: 12 Schiel  
 1861: 4 Möller

## (9) electrolysis.

- 1830: 1 Becquerel  
 1881: 2 Classen  
 1881: 3 Classen and v. Reis  
 1882: 10 Keiser  
 1885: 5 Classen  
 1886: 10 Classen  
 1886: 11 Classen  
 1888: 12 Oettel  
 1889: 7 Kohn and Woodgate  
 1891: 15 Le Roy  
 1896: 6 Engels  
 1898: 5 Engel

## (10) ether.

- 1892: 15 Rothe

## (11) fusion with alkali and nitrate.

- 1833: 2 Planiawa  
 1894: 14 Seeliger

## (12) ferrocyanide.

- 1886: 5 Blum

## (13) hydrogen peroxide.

- 1888: 11 Moore

## (14) iodine.

- 1879: 1 Beilstein and Jawein  
 1881: 1 Beilstein and Jawein

## (15) a magnet after ignition in hydrogen.

- 1875: 2 Kern

## (16) neutralization with carbonates.

- 1799: 1 Vauquelin  
 1812: 1 Pfaff  
 1821: 1 Herschell  
 1831: 1 Fuchs  
 1831: 2 Liebig  
 1832: 2 Döbereiner  
 1832: 6 Liebig  
 1834: 1 Demarçay

(16) neutralization with carbonates—*Continued.*

- 1853: 8 Morfit and Booth  
 1856: 1 Gurlt  
 1867: 2 Forbes  
 1885: 11 v. Jüptner  
 1888: 1 Campbell  
 1888: 4 Ghilian  
 1888: 10 Meineke  
 1890: 5 Fresenius and Hintz

## (17) neutralization with metallic oxides.

- 1835: 2 Persoz  
 1857: 3 Field  
 1860: 1 Field  
 1865: 5 Rube  
 1872: 9 de Rezende  
 1879: 14 Volhard  
 1888: 10 Meineke  
 1894: 15 Smith and Heyl  
 See also (27).

(18) nitroso- $\beta$ -naphthol.

- 1887: 11 v. Knorre  
 1887: 12 v. Knorre  
 1888: 10 Meineke  
 1890: 8 de Koninck  
 1896: 2 Burgass

## (19) oxalates.

- 1806: 2 John  
 1811: 1 Bucholz  
 1827: 1 Du Menil  
 1829: 2 Lassaigne  
 1877: 6 Classen  
 1879: 4 Classen  
 1879: 5 Classen

## (20) potassium "anthrazothionate"

- 1817: 1 Grotthuss

## (21) suberic acid.

- 1832: 5 Kastner

## (22) succinic acid.

- 1806: 1 Berzelius  
 1806: 2 John  
 1812: 1 Pfaff  
 1827: 2 Quesneville  
 1829: 3 Martini  
 1872: 10 Tamm  
 1877: 9 Funaro  
 1886: 4 Bein

- 1888: 4 Ghilian

- 1896: 11 Mignot

## (23) sulphates.

- 1827: 2 Quesneville  
 1837: 4 Scheerer  
 1872: 5 Kessler  
 1872: 6 Kessler  
 1879: 6 Kessler  
 1888: 10 Meineke  
 1896: 14 Rürup

## (24) solubilities of the sulphides.

- 1838: 2 Wackenroder  
 1886: 6 Carnot

## (25) tartrates.

- 1792: 1 Hermbstädt  
 1796: 1 Richter  
 1812: 1 Pfaff

## (26) volatilization of ferric chloride.

- 1814: 1 Davy  
 1819: 1 Brandes  
 1877: 12 Kern  
 1880: 3 Drown and Shimer  
 1888: 3 Friedmann

## (27) zinc oxide.

- 1879: 14 Volhard  
 1880: 5 Haswell  
 1880: 7 v. Jüptner  
 1881: 7 Emmerton  
 1883: 10 Meineke  
 1884: 6 Gmelin  
 1884: 18 Wolff  
 1885: 14 Mathesius  
 1885: 20 Wolff  
 1887: 9 Jolles  
 1887: 14 Meineke  
 1887: 17 Reinhardt  
 1888: 10 Meineke  
 1895: 7 Forestier  
 1895: 19 Ulzer and Brüll

## (28) (method not indicated.)

- 1786: 1 Rinmann  
 1819: 2 Faraday  
 1819: 3 Pfaff

## (l) from lead.

- 1896: 13a Neumann

## (m) from magnesium.

- 1827: 3 Stromeyer  
 1860: 6 Rose



- (m) **from magnesium**—*Continued.*  
 1868: 4 Terreil  
 1869: 2 Damour
- (n) **from mercury.**  
 1886: 11 Classen and Ludwig  
 1889: 3 Brand  
 1894: 12 Rüdorff  
 1895: 9 Jannasch and Cloedt  
 1898: 12 Jannasch and Alfiers
- (o) **nickel, by means of**  
 (1) ammonium carbonate.  
 1872: 10 Tamm  
 (2) atmospheric oxygen.  
 1881: 4 Delvaux  
 (3) chlorine.  
 1853: 12 Schiel  
 1866: 5 Terreil  
 (4) electrolysis  
 1886: 14 Langbein  
 1886: 19 Moore  
 1889: 3 Brand  
 1891: 15 Le Roy  
 1896: 6 Engels  
 1898: 5 Engels  
 (5) hypochlorites, hydrofluoric acid, and ammonia.  
 1841: 4 Ullgren  
 (6) mercuric oxide.  
 1835: 2 Persoz  
 (7) peroxides.  
 1852: 2 Gibbs  
 1853: 9 Parkinson  
 1860: 7 Rose  
 1886: 2 Barlow  
 1887: 7 Donath and Zeller  
 1891: 10 Jannasch and Franzek  
 1893: 5 Clark  
 1896: 9 Jannasch and Lehnert  
 1899: 7 Friedheim and Brühl  
 (8) phosphates.  
 1858: 2 Henry  
 1900: 12 Truchot  
 (9) potassium permanganate.  
 1866: 5 Terreil  
 (10) through the solubilities of the sulphides.  
 1838: 2 Wackenroder  
 1847: 3 Rose  
 1849: 1 Ebelmen  
 1863: 3 Lippert  
 1865: 2 Gibbs  
 1866: 3 Frohde  
 1886: 6 Carnot  
 1886: 26 Sprenger  
 1888: 11 Moore  
 1890: 5 Fresenius and Hintz  
 1894: 3 Fleitmann  
 1897: 8a Hillebrand  
 1900: 3 Hillebrand  
 (11) (method not indicated.)  
 1882: 14 Mills and Becket
- (p) **from phosphoric acid.**  
 1881: 2 Classen
- (q) **from silica.**  
 1886: 12 Deane  
 1898: 6 Ford and Bregowsky
- (r) **from silver.**  
 1895: 12 Jannasch and Kammerer
- (s) **from thallium.**  
 1864: 1 Crookes
- (t) **from tin.**  
 1853: 7 Löwenthal.  
 1861: 6 Rose
- (u) **from tungstic acid.**  
 1896: 16 Taggart and Smith
- (v) **from vanadium.**  
 1889: 15 Radau
- (w) **from zinc by means of**  
 (1) carbonate.  
 1872: 10 Tamm  
 1879: 3 Classen  
 (2) acetic acid.  
 1788: 1 Porcel  
 1837: 3 Richter  
 1886: 4 Bein  
 (3) ammonium sulphocarbonate  
 1882: 7 Guyard  
 (4) ammonium sulphocyanate.  
 1880: 20 Zimmermann  
 (5) bromine  
 1869: 3 Galetti  
 1892: 3 Blum  
 (6) cyanides.  
 1853: 2 Flajalot  
 (7) electrolysis.  
 1830: 1 Becquerel.

- (7) electrolysis—*Continued.*  
 1889: 3 Brand  
 1891: 21 Warwick  
 1899: 15 Riederer
- (8) peroxides.  
 1852: 2 Gibbs  
 1853: 9 Parkinson  
 1860: 7 Rose  
 1886: 2 Barlow  
 1887: 7 Donath and Zeller  
 1890: 7 Jensch  
 1891: 7 Donath  
 1891: 11 Jannasch and MacGregory  
 1891: 12 Jannasch and Niederhofheim  
 1893: 5 Clark  
 1895: 11 Jannasch and Cloedt  
 1897: 8a Hillebrand  
 1899: 7 Friedheim and Brühl  
 1900: 3 Hillebrand
- (9) phosphates.  
 1869: 9 Renard  
 1886: 14a Lösekann and Meyer
- (10) solubilities of the sulphides.  
 1838: 2 Wackenroder  
 1842: 3 Otto  
 1849: 1 Ebelmen  
 1863: 3 Lippert  
 1865: 2 Gibbs  
 1868: 4 Terreil  
 1885: 9 Hampe  
 1887: 2 Bayley  
 1889: 14 Neumann  
 1890: 5 Fresenius and Hintz  
 1890: 14 Riban
- (3) commercial aluminum.  
 1891: 22 Regelsberger
- (4) commercial copper.  
 1882: 13 Löwe  
 1900: 12 Truchot
- (5) commercial nickel.  
 1894: 3 Fleitmann
- (6) ferromanganese.  
 1870: 8 Rowan  
 1877: 12 Kern  
 1878: 2 Deshayes.  
 1879: 6 Kessler  
 1885: 12 Kalmann and Smolka  
 1891: 21 Pattinson  
 1895: 15 v. Jüptner  
 1896: 10 v. Jüptner
- (7) flue deposits.  
 1890: 7 Jensch
- (8) food stuffs.  
 1888: 17 Stein
- (9) German silver.  
 1888: 12 Oettel
- (10) glass.  
 1846: 3 Rowney
- (11) irons.  
 1853: 8 Morfit and Booth  
 1862: 1 Abel  
 1863: 3 Lippert  
 1866: 2 Eggertz  
 1867: 4 Tosh  
 1872: 8 Pichard  
 1873: 1 Brünner  
 1874: 1 Koppmayer  
 1874: 3 Piesse  
 1874: 6 Willis  
 1875: 2 Kern  
 1876: 4 Kern  
 1876: 5 Peters  
 1877: 8 Deby  
 1878: 2 Deshayes  
 1879: 7 Ledebur  
 1881: 8 Ford  
 1881: 18 Williams  
 1882: 10 Keiser  
 1883: 1 Goetz  
 1883: 17 Schoeffel and Donath  
 1884: 3 Bloxam  
 1885: 3 Cheever  
 1886: 12 Deane
- (F) APPLICATIONS OF QUANTITATIVE METHODS.
- Determination in
- (1) chromite.  
 1890: 5 Fresenius and Hintz
- (2) chromium alloys.  
 1877: 11 Kern  
 1892: 19 Schneider  
 1899: 16 J. T.  
 1900: 5 Ibbotson and Brearley  
 1900: 9 McKenna



(11) *irons—Continued.*

- 1886: 26 Sprenger  
 1887: 1 Babbitt  
 1887: 16 Morgan  
 1887: 18 ———  
 1887: 19 ———  
 1888: 13 Reinhardt  
 1888: 20 Weismann  
 1888: 21 ———  
 1890: 6 Hellman  
 1891: 2 Blum  
 1891: 4 Brown  
 1891: 24 Rossi  
 1891: 25 Rubricius  
 1892: 12 v. Reis  
 1892: 17 Rubricius  
 1893: 10 Julian  
 1895: 7 Forestier  
 1895: 19 Ulzer and Brüll  
 1896: 11 Mignot  
 1896: 13 Murkewitsch  
 1896: 14 Rürup  
 1898: 6 Ford and Bregowsky  
 1898: 16 Murmann  
 1899: 8 Herting  
 1900: 10 Mignot

(12) *iron ores.*

- 1866: 2 Eggertz  
 1872: 8 Pichard  
 1873: 1 Brünner  
 1874: 1 Koppmayer  
 1878: 9 Funaro  
 1877: 9 Ledebur  
 1879: 9 Pattinson  
 1879: 10 Pattinson  
 1883: 23 Zulkowsky  
 1885: 12 Kalmann and Smolka  
 1886: 1 Atkinson  
 1887: 3 Blair  
 1890: 13 Myhlertz  
 1891: 19 Norris  
 1891: 21 Pattinson  
 1897: 1 Auchy  
 1898: 6 Ford and Bregowsky

(13) *manganese bronze.*

- 1894: 5 Jones

(14) *manganese phosphides.*

- 1897: 8 Granger

(15) *manganic acid.*

- 1824: 1 Frommherz

(16) *meteorites.*

- 1879: 12 Pellitz

(17) *mineral or sea waters.*

- 1841: 2 Henry  
 1876: 2 Fresenius  
 1889: 5a Gooch and Whitfield  
 1899: 11 Natterer

(18) *plants.*

- 1897: 11 Lemaire  
 1898: 18 Pichard

(19) *Pyrolusite (and other manganese ores). See "Quantitative Determination of Manganese Peroxide."*(20) *slags or silicates.*

- 1881: 10 Iles  
 1883: 8 Knop  
 1884: 10 Iles  
 1888: 6 Iles  
 1889: 5 Friedburg  
 1890: 13 Myhlertz  
 1891: 19 Norris  
 1891: 20 Namias  
 1900: 3 Hillebrand

(21) *soils.*

- 1890: 2 van Benmeln  
 1897: 2 van Benmeln  
 1898: 18 Pichard

(22) *spiegeleisen.*

- 1870: 4 Parker  
 1870: 8 Rowan  
 1874: 4 Parry  
 1874: 6 Willis  
 1875: 2 Kern  
 1875: 4 Morrell  
 1876: 3 Galbraith  
 1877: 8 Deby  
 1877: 12 Kern  
 1877: 18 Riley  
 1877: 20 Stöckmann  
 1878: 2 Deshayes  
 1879: 6 Kessler  
 1879: 9 Pattinson  
 1879: 10 Pattinson  
 1881: 8 Ford  
 1883: 19 Stone  
 1884: 2 Atkinson  
 1884: 3 Bloxam

**(22) spiegeleisen—Continued.**

- 1884: 8 Holdich  
 1884: 16 Stone  
 1885: 12 Kalmann and Smolka  
 1891: 21 Pattinson  
 1893: 9 Jean  
 1897: 3 Brearley

**(23) steels.**

- 1867: 2 Forbes  
 1872: 8 Pichard  
 1873: 1 Brünner  
 1874: 1 Koppmayer  
 1875: 1 Boussingault  
 1875: 2 Kern  
 1876: 5 Peters  
 1877: 8 Deby  
 1878: 2 Deshayes  
 1878: 6 Müller  
 1878: 7 Prochaska  
 1879: 9 Pattinson  
 1879: 10 Pattinson  
 1879: 14 Volhard  
 1880: 4 Dunston  
 1881: 7 Emmerton  
 1881: 9 Forguignon  
 1881: 11 Kent  
 1881: 17 Troilius  
 1881: 18 Williams  
 1882: 4 Dewey  
 1882: 10 Keiser  
 1883: 17 Schoeffel and Donath  
 1885: 3 Cheever  
 1886: 26 Sprenger  
 1887: 1 Babbitt  
 1887: 16 Morgan  
 1887: 18 ———  
 1887: 19 L'Assemblée Rep.  
                 Fab. Rails.  
 1888: 7 Julian  
 1888: 20 Weissmann  
 1888: 21 ———  
 1891: 2 Blum  
 1891: 24 Rossi  
 1891: 25 Rubricius  
 1895: 7 Forestier  
 1896: 7 Giorgis  
 1896: 11 Mignot  
 1896: 13 Murkewitsch  
 1896: 14 Rürup

1900: 6 Ibbotson and Brearley

1900: 7 Jervis

1900: 10 Mignot

**(24) tungsten alloys.**

1890: 18 Ziegler

1900: 5 Ibbotson and Brearley

1900: 7 Jervis

1900: 9 McKenna

**(25) Weldon mud.**

1874: 5 Pouchet

1875: 3 Lunge

1880: 8 Jurisch

1880: 11 Lunge

1880: 14 Post

1881: 12 Lunge

1889: 10 McKellar

**(26) wolframite.**

1890: 15 Sellik

**(G) MISCELLANEOUS NOTES.****(a) Determination of the state of oxidation of manganese.**

1841: 1 Berzelius

1842: 1 Lea

1861: 3 Mohr

1876: 6 Phipson

**(b) Study of the oxides of manganese.**

1878: 9 Wright and Luff

1880: 17 Wright and Menke

1880: 19 Veley

**(c) Effect of copper on precipitation of manganese.**

1870: 4 Parker

**(d) Effect of organic acids and grape sugar on precipitation of manganese.**

1858: 4 Spiller

1869: 4 How

1882: 12 Lefort and Thiebault

**(e) Use of mercuric chloride to aid filtration of sulphide.**

1898: 15 Murmann

**(f) Use of powdered glass in basic acetate separation from iron.**

1890: 17 Warren



- (g) Filtration aided by addition of a concentrated solution of sodium acetate.

1888: 16 Schürmann

- (h) Destruction of organic matter by means of barium peroxide before titration with permanganate.

1887: 4 Brand

1892: 12 v. Reis

- (i) Determination of moisture in the analysis of pyrolusite.

1855: 3 Fresenius

- (j) Use of hydrofluoric acid to hold silicic acid in solution.

1891: 19 Norris

1898: 6 Ford and Bregowsky

1900: 5 Ibbotson and Brearley.

#### QUANTITATIVE DETERMINATION OF MANGANESE PEROXIDE.

- I. By evolution of chlorine, and absorption in solutions of

- (a) alkaline hydroxides and determination of the hypochlorite formed.

1829: 1 Gay-Lussac

1835: 1 Gay-Lussac

1844: 1 Ettling

1869: 10 Sherer and Rumpf

1870: 10 Sherer and Rumpf

1870: 12 Tissandier

1877: 16 Perrey

- (b) arsenious acid.

1853: 10 Price

1860: 4 Machnea

- (c) ferrous sulphate.

1831: 3 Turner

1842: 4 Otto

1867: 1 Braun

1868: 3 Lunge

1869: 8 Prior

1885: 2 Charpentier

- (d) potassium iodide, and titration of iodine.

1853: 1 Bunsen

1853: 5 Krieger

1861: 4 Möller

1869: 10 Sherer and Rumpf

1870: 1 Fresenius

1870: 5 Pattinson

1870: 10 Sherer and Rumpf

1877: 15 Parreño

1877: 16 Perrey

1879: 11 Pickering

1881: 13 Lunge

1888: 9 de Koninck and Lécrenier

- (e) silver nitrate.

1843: 1 Baumann

- (f) stannous chloride.

1851: 2 Müller

- (g) sulphurous acid (precipitation of barium sulphate).

1832: 3 Duflos

1832: 4 Duflos

1837: 2 Ebelmen

1838: 1 Gieseler

1874: 5 Pouchet

- II. By solution in presence of a reducing agent.

- (a) antimonious chloride.

1872: 5 Kessler

- (b) arsenious acid.

1898: 2 Bialobzieski

- (c) ferrous salts.

1842: 2 Levöl

1847: 2 Levöl

1851: 4 Schabus

1856: 2 Schreiner

1869: 11 Teschenmacher and Smith

1870: 5 Pattinson

1877: 10 Hannay

1880: 11 Lunge

1881: 16 Terreil

1889: 4 Finkener

1889: 10 M'Kellar

- (d) formic acid (with absorption of carbon dioxide).

1833: 1 Göbel

- (e) oxalates (with absorption of carbon dioxide).

1843: 3 Fresenius and Will

1847: 6 De Vry

1861: 2 Kolbe

- (e) **oxalates**—*Continued.*  
 1863: 1 Fresenius  
 1869: 6 Mohr  
 1869: 10 Sherer and Rumpf  
 1869: 11 Teschenmacher and Smith  
 1870: 5 Pattinson  
 1870: 10 Sherer and Rumpf  
 1871: 4 Luck  
 1877: 16 Perry  
 1881: 13 Lunge  
 1882: 3 Darton  
 1890: 1 Baumann
- (f) **oxalic acid (volumetric).**  
 1870: 6 Paul  
 1889: 4 Finkener
- (g) **potassium iodide and acid.**  
 1858: 1 Hempel  
 1882: 5 Diehl  
 1883: 5 Hempel
- (h) **stannous chloride.**  
 1865: 1 Alfraise  
 1883: 3 Harvey
- III. By gasometric methods.      **Measurement of**
- (a) **carbon dioxide.**  
 1832: 1 Berthier  
 1833: 3 Zenneck
- (b) **nitrogen.**  
 1832: 1 Berthier  
 1833: 3 Zenneck  
 1897: 14 Purgotti
- (c) **oxygen evolved from hydrogen peroxide.**  
 1885: 13 Lunge  
 1890: 1 Baumann  
 1890: 9 Lunge  
 1890: 10 Lunge  
 1890: 11 Lunge  
 1893: 3 Carnot  
 1893: 4 Carnot  
 1894: 7 Kippenberger  
 1894: 8 Lunge  
 1895: 3 Bodländer
- (d) **oxygen expelled on ignition.**  
 1833: 3 Zenneck
- IV. By loss of weight of metallic copper.  
 1839: 1 Fikentscher  
 1839: 2 Fuchs  
 1851: 3 Personne and Lhermite  
 1859: 1 Fikentscher  
 1859: 2 Nolté  
 1861: 5 Quadrat  
 1864: 5 ———
- V. By fusion with chromic oxide and alkali.  
 1882: 17 Wagner
- VI. By the method of
- (a) **Bunsen.**  
 1853: 1 Bunsen  
 1853: 5 Krieger  
 1861: 4 Möller  
 1869: 10 Sherer and Rumpf  
 1870: 1 Fresenius  
 1870: 5 Pattinson  
 1870: 9 Sherer  
 1870: 10 Sherer and Rumpf  
 1874: 5 Pouchet  
 1877: 16 Perrey  
 1880: 13 Pattinson  
 1881: 13 Lunge  
 1889: 4 Finkener
- (b) **Fresenius and Will.**  
 1843: 8 Fresenius and Will  
 1847: 6 De Vry  
 1862: 2 Röhr  
 1863: 1 Fresenius  
 1869: 6 Mohr  
 1869: 10 Sherer and Rumpf  
 1869: 11 Teschenmacher and Smith  
 1870: 5 Pattinson  
 1870: 9 Sherer  
 1870: 10 Sherer and Rumpf  
 1871: 4 Luck  
 1874: 5 Pouchet  
 1877: 16 Perry  
 1881: 13 Lunge  
 1890: 1 Baumann
- (c) **Gay-Lussac.**  
 1829: 1 Gay-Lussac  
 1836: 3 Wittstein  
 1844: 1 Ettling  
 1860: 4 Machnea  
 1877: 16 Perry  
 1893: 9 Jean



## (d) Lunge (gasometric).

- 1885: 13 Lunge  
 1890: 1 Baumann  
 1890: 9 Lunge  
 1890: 10 Lunge  
 1890: 11 Lunge  
 1893: 3 Carnot  
 1893: 4 Carnot  
 1894: 8 Lunge

## (e) Nolté.

- 1859: 2 Nolté  
 1864: 5 ———

## VII. Modification of apparatus for the method of

## (a) Bunsen.

- 1888: 5 de la Harpe and Réverdin  
 1894: 1 Christomanos  
 1894: 17 Ullmann

## (b) Gay-Lussac.

- 1847: 1 Bobierre  
 1878: 5 Morawski and Stingl

## (c) Lunge.

- 1890: 11 Lunge  
 1894: 7 Kippenberger

## (d) loss of weight on evolution of carbon dioxide from oxalic acid.

- 1898: 17 Northomb

## QUALITATIVE DETECTION OF MANGANESE.

## Detection by means of

## (a) ammonium thiosulphate.

- 1883: 12 Orlowski

## (b) fusion with alkalies.

- 1785: 1 Hjelm  
 1836: 1 Kraskowitz  
 1836: 2 Thomson  
 1852: 1 Chapman  
 1854: 1 Davy  
 1877: 2 Chapman  
 1889: 19 Wells and Vulté

## (c) fusion with silica and the alkalies.

- 1878: 1 Bong

## (d) blow-pipe bead tests.

- 1820: 1 Gahn

## (e) blow-pipe reactions.

- 1866: 1 Bunsen  
 1877: 2 Chapman

## (f) bromate or bromine.

- 1897: 5 Cushman  
 1898: 20 Vitali

## (g) hydrogen peroxide.

- 1888: 8 Klein  
 1889: 6 Klein

## (h) formation of metaphosphate.

- 1815: 1 John

## (i) microchemical tests.

- 1886: 3 Behrens  
 1887: 8 Haushofer  
 1891: 1 Behrens  
 1892: 8 Frey  
 1899: 12 Pozzi-Escot

## (j) oxidation to permanganic acid.

- 1845: 2 Crum  
 1852: 2 Gibbs  
 1853: 3 Heizel  
 1853: 6 Löwe  
 1858: 3 Rose  
 1870: 7 Polacci  
 1883: 2 Guyard  
 1884: 14 Maumené  
 1886: 7 Christensen  
 1895: 1 Alvarez and Jean  
 1898: 19 Pichard

## (k) ozone.

- 1847: 5 Schönbein

## (l) phosphoric acid.

- 1846: 2 Phillips  
 1857: 1 Barreswil  
 1859: 3 Von Kobell  
 1867: 1 Braun  
 1876: 1 Campani  
 1881: 14 v. Reis  
 1885: 1 Bloxam

## (m) fusion with potassium chlorate.

- 1857: 2 Böttger  
 1872: 2 Böttger  
 1880: 1 Böttger

## (n) potassium ferricyanide.

- 1885: 6 Dean  
 1885: 8 Draper

## (o) potassium ferrocyanide.

- 1850: 1 Davy

- (o) potassium ferrocyanide—*Continued.*  
1854: 1 Davy
- (p) sodium hypobromite.  
1892: 6 Deniges
- (q) sodium peroxide.  
1893: 7 Hempel
- (r) spectrum analysis.  
1862: 3 Simmler
- 1872: 4 Horner  
1875: 5 Vogel  
1880: 12 Parry and Tucker  
1898: 10 de Gramont
- (s) lead peroxide.  
1889: 8 de Koninck
- (t) separation from iron by means  
of nitrites.  
1897: 17 Wynkoop



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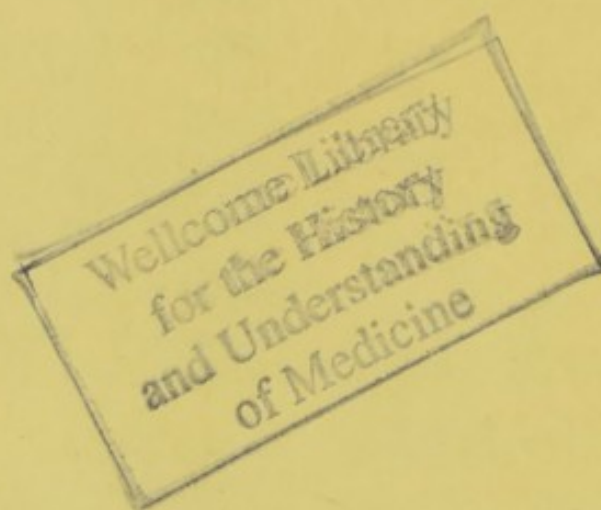


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