

**THIRD APPENDIX TO THE  
SIXTH EDITION OF DANA'S  
SYSTEM OF MINERALOGY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649437849

Third Appendix to the Sixth Edition of Dana's System of Mineralogy by William E. Ford

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.  
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

[www.triestepublishing.com](http://www.triestepublishing.com)

**WILLIAM E. FORD**

**THIRD APPENDIX TO THE  
SIXTH EDITION OF DANA'S  
SYSTEM OF MINERALOGY**



## DANA'S SERIES OF MINERALOGIES.

### New "System of Mineralogy."

Embodying the results of the last twenty-four years of active progress. Containing more than half more matter than the former edition, and the page increased one-fifth in size. Not merely revised, but entirely rewritten. Sixth edition, 1892. With Appendices I and II, completing the work to 1909. lxiii+1333 pages, 6½ by 10, over 1400 figures, Half leather, \$12.50 net.

### A Text-book of Mineralogy.

With an extended Treatise on Crystallography and Physical Mineralogy. By Edward Salisbury Dana, Professor of Physics and Curator of Mineralogy, Yale University. New edition, entirely rewritten and reset. With nearly 1000 figures and a colored plate, viii+593 pages, 6 by 9. Cloth, \$3.50 net.

### Minerals, and How to Study Them.

A book for beginners in Mineralogy. By Prof. E. S. Dana. vi+380 pages, 319 figures. Cloth, \$1.50 net.

ALSO

### A Text-book of Elementary Mechanics.

For the use of Colleges and Schools. By Prof. E. S. Dana. xiv+291 pages, 5 by 7½, 190 figures. Cloth, \$1.50 net.

BY DANA AND FORD:

### Manual of Mineralogy.

For the Student of Elementary Mineralogy, the Mining Engineer, the Geologist, the Prospector, the Collector, etc. Thirteenth edition, entirely revised and rewritten, by William E. Ford. viii+460 pages, 5 by 7½, 357 figures, and 10 plates. Cloth, \$2.00 net.

BY WILLIAM E. FORD:

### Third Appendix to the Sixth Edition of Dana's System of Mineralogy.

Completing the Work to 1915. By William E. Ford, Assistant Professor of Mineralogy, Sheffield Scientific School of Yale University. xiii+87 pages, 6½ by 10. Cloth, \$1.50 net.

THIRD APPENDIX  
TO THE  
SIXTH EDITION  
OF  
DANA'S SYSTEM OF MINERALOGY

BY  
WILLIAM E. FORD  
ASSISTANT PROFESSOR OF MINERALOGY, SHEFFIELD SCIENTIFIC SCHOOL OF  
YALE UNIVERSITY

YALE UNIVERSITY LIBRARY

COMPLETING THE WORK TO 1915

NEW YORK  
JOHN WILEY & SONS, INC.  
LONDON: CHAPMAN & HALL, LIMITED  
1915

228664

COPYRIGHT, 1915,  
BY  
EDWARD S. DANA

STANFORD LIBRARY

THE SCIENTIFIC PRESS  
ROBERT DRUMMOND AND COMPANY  
BROOKLYN, N. Y.

## PREFATORY NOTE.

THE Sixth Edition of the System of Mineralogy was published in 1892; the First Appendix appeared in 1899 and the Second Appendix in 1909. The present issue, which is the Third Appendix, covers as far as possible the period between Jan. 1, 1909, and Jan. 1, 1915, or six years in all. The fact that since August, 1914, the European war has materially affected the mail service from foreign countries, makes it probable that some publications appearing after that date have not been received. All of the important Journals, however, have been obtained for this period and their contents reviewed.

That investigators in mineralogy have been active during the last six years is evidenced by the size of this Appendix as well as by the fact that about one hundred and eighty new mineral names have been proposed. Of these minerals which have received new names about one-third are apparently well established species. The others are clearly to be considered as varieties of already well-known species or, because of their incomplete investigation, must for the present be considered of somewhat doubtful authenticity. The division of the new names into the three classes, (1) of varieties, (2) of doubtful species, (3) of established species, is indicated by the three kinds of type used in the Classified List to be found on pages ix-xiii.

In general the present Appendix follows closely in its character and arrangement the precedents established by the two previous issues. As in the Second Appendix, no attempt has been made to recalculate angles, ratios, etc.; the author's figures being accepted in each case as published. In order to limit the size of the volume as far as possible it has been found necessary to treat the material very briefly and concisely. With the increased activity in crystallographic investigations the number of new forms observed upon the crystals of established species has become very large. It was found impracticable to properly list all of these new forms and, after careful consideration of the matter, it was decided to omit them entirely whenever the mineral in question was one whose crystal character and habit were already well understood. In all cases, however, where an article described a new crystal form, that fact is noted in the reference to it.

The most important single new development in mineralogical investigation during the period covered by this Appendix has been the use of the X-Ray as a means of studying the molecular structure of crystals. The first paper on this new line of attack was published in 1912 and since then a number of investigators have been active in this field. While only a beginning has been made, the results already achieved have been of great interest and show that much may be expected in the future from this method of investigation. While the work, so far, has been largely physical in character, it has so large a bearing on future crystallographic work that it has seemed advisable to give a short bibliography of the more important papers that have appeared. This will be found at the end of the usual bibliography on p. vi. The list has been largely compiled from references given by W. H. Bragg and W. L. Bragg in "X-Rays and Crystal Structure", a book which summarizes the work already done in this field.

During the period covered by this Appendix the following new Journals have appeared; the abbreviations adopted in referring to them are indicated after the titles:

Fortschritte der Mineralogie, Kristallographie und Petrographie. G. Linck. Vol. 1. 1911. (Fortschr. Min.).

Beiträge zur Krystallographie und Mineralogie. Victor Goldschmidt. Vol. 1, 1914 (Beitr. Kr.).



Chemie der Erde. K. Linck. Vol. 1, 1914. (Chem. Erde.)

For the explanation of the other *Abbreviations* made use of in the case of periodicals, also of the crystallographical, optical and chemical symbols employed, reference is made to the Introduction to the System (1892), pp. xlv-li and pp. xiii-xl. General abbreviations are explained on pp. lxi-lxiii.

The bibliography, while not intended to be exhaustive, contains, it is thought, the titles of all important volumes published between 1909 and 1915.

YALE UNIVERSITY,  
NEW HAVEN, CONN., June 1, 1915.

## INTRODUCTION.

### BIBLIOGRAPHY.

- ARTINI, E. *I Minerali*. 422 pp. Milan, 1914.
- BAYLEY, W. S. *Elementary Crystallography*. 241 pp. New York, 1910.
- BEALE, W. P. *An Amateur's Introduction to Crystallography*. 220 pp. London, 1915.
- BECKENKAMP, J. *Statische und kinetische Kristalltheorien. Erster Teil: Geometrische Eigenschaften der Kristalle und deren Veranschaulichung durch geometrische Struktur-bilder*. Berlin, 1913.
- BLAKE, W. P. *Minerals of Arizona*. 64 pp. Tucson, 1909.
- BOEKE, H. E. *Die Anwendung der stereographischen Projektion bei kristallographischen Untersuchungen*. 58 pp. Berlin, 1911.
- *Die gnomonische Projektion in ihrer Anwendung auf kristallographische Aufgaben*. 54 pp. Berlin, 1913.
- BRAUNS, R. *The Mineral Kingdom*. Translated by L. J. Spencer. 432 pp. London, 1912.
- BRENDLER, W. *Mineraliensammlungen. II. Teil*. 699 pp. Leipzig, 1912.
- BUCHWALD, E. *Einführung in die Kristalloptik*. 124 pp. Berlin, 1912.
- CATTELLE, W. R. *The Diamond*. 429 pp. London, 1911.
- CLARKE, F. W. *The Constitution of the Natural Silicates*. U. S. G. S. Bull. 588. 128 pp. Washington, 1914.
- DALT, R. A. *Igneous Rocks and their Origin*. 563 pp. New York, 1914.
- DAMMER, B. and TIETZE, O. *Die Nutzbaren Mineralien*. 2 vols. 501, 539 pp. Stuttgart, 1913.
- DESSUBISSONS, L. *La Vallée de Binn (Valais)*. 324 pp. Lausanne, 1909.
- DOELTER, C. *Das Radium und die Farben*. 133 pp. Dresden, 1910.
- *Handbuch der Mineralchemie*. Issued in parts commencing in 1911. Dresden.
- DUPARC, L. and MONNIER, A. *Traité de Technique Minéralogique et Pétrographique. Deuxième Partie. Tome I. Les méthodes chimiques qualitatives*. 372 pp. Leipzig, 1913.
- EAKLE, A. S. *Minerals of California*. 226 pp. San Francisco, 1914.
- EPPLER, A. *Die Schmucksteine und die Schmucksteinindustrie*. 83 pp. Leipzig, 1912.
- *Die Schmuck- und Edelsteine*. 464 pp. Stuttgart, 1912.
- FERSMANN, VON A. and GOLDSCHMIDT, V. *Der Diamant*. 206 pp. Heidelberg, 1911.
- FORD, W. E. *Dana's Manual of Mineralogy. New Edition*. 460 pp. New York, 1912.
- FRANKE, H. *Die Umrisse der Kristallflächen und die Anfertigung von Kristallmodellen*. 112 pp. Stuttgart, 1913.
- FRIEDEL, G. *Leçons de Cristallographie*. 310 pp. Paris, 1911.
- GASER, S. *Die Mineralien Tirols einschliesslich Vorarlbergs und der Hohen Tauern*. 548 pp. Innsbruck, 1913.
- GOLDSCHMIDT, V. *Atlas der Kristallformen. Vols. 1 and 2*. Heidelberg, 1913.
- GOSNER, B. *Kristallberechnung und Kristallzeichnung*. 128 pp. Leipzig, 1914.
- GRATACAP, L. P. *A Popular Guide to Minerals*. 330 pp. New York, 1912.
- GROTH, F. *The Optical Properties of Crystals*. Translated by B. H. Jackson. 309 pp. New York, 1910.
- GUILD, F. N. *The Mineralogy of Arizona*. 99 pp. Easton, Pa., 1910.
- IDINGS, J. P. *Igneous Rocks. Vol. 2*. 685 pp. New York, 1913.
- JOHANNSEN, A. *Manual of Petrographic Methods*. 649 pp. New York, 1914.

- JOHNSEN, A. Wachstum und Auflösung der Kristalle. 27 pp. Leipzig, 1910.
- KRAUS, E. H. Descriptive Mineralogy. 334 pp. Ann Arbor, 1911.
- KRAUS, E. H. and HUNT, W. F. Tables for the Determination of Minerals by means of their Physical Properties, Occurrences and Associates. 254 pp. New York, 1911.
- KUNZ, G. F. The Curious Lore of Precious Stones. 406 pp. Philadelphia, 1913.
- LACROIX, A. Minéralogie de la France et de ses Colonies. Vol. 4. 924 pp. Vol. 5. 501 pp. Paris, 1910, 1913.
- LEHMANN, O. Das Kristallisationsmikroskop und die damit gemachten Entdeckungen, insbesondere die flüssigen Kristalle. 112 pp. Braunschweig, 1910.
- Die neue Welt der flüssigen Kristalle und deren Bedeutung für Physik, Chemie, Technik und Biologie. 388 pp. Leipzig.
- LEWIS, J. V. Determinative Mineralogy. 151 pp. New York, 1913.
- MICHEL, H. Die künstlichen Edelsteine. 109 pp. Leipzig, 1914.
- NIKITIN, W. W. La Méthode Universelle de Fedoroff. Translated by L. Duparc and V. de Dervies. 2 vols. 516 pp. Paris and Liège, 1914.
- PETTERD, W. F. Catalogue of the Minerals of Tasmania. 221 pp. Hobart, 1910.
- PHILLIPS, A. H. Mineralogy. 699 pp. New York, 1912.
- POGUE, J. E. The Turquoise. 162 pp. Mem. Nat. Ac. Sc., Washington, 1915.
- ROGERS, A. F. Introduction to the Study of Minerals. 522 pp. New York, 1912.
- ROWE, J. P. Practical Mineralogy Simplified for Mining Students, Miners and Prospectors. 162 pp. New York, 1911.
- STGMUND, A. Die Minerale Niederösterreichs. 194 pp. Vienna, 1909.
- SOMMERFELDT, E. Die Kristallgruppen nebst ihren Beziehungen zu den Raumgittern. 79 pp. Dresden, 1911.
- Praktikum der experimentellen Mineralogie. 192 pp. Berlin, 1911.
- TUTTON, A. E. H. Crystalline Structure and Chemical Constitution. 204 pp. London, 1910.
- Crystallography and Practical Crystal Measurement. 946 pp. London, 1911.
- VOIGT, W. Lehrbuch der Krystallophysik. 964 pp. Leipzig, 1913.
- WADSWORTH, M. E. Crystallography. 299 pp. Philadelphia, 1909.
- WALKER, T. L. Crystallography. 204 pp. New York, 1914.
- WEINSCHEK, E. Anleitung zum Gebrauch des Polarisationsmikroskops. 164 pp. Freiburg, 1910.
- Petrographic Methods. Translated by R. W. Clark. 396 pp. New York, 1912.
- WODISKA, J. A Book of Precious Stones. 365 pp. New York, 1910.
- WRIGHT, F. E. The Methods of Petrographic Research. 204 pp. Washington, 1912.
- WÜLFING, E. A. Die 32 kristallographischen Symmetrieklassen und ihre einfachen Formen. 48 pp. Berlin, 1914.
- ZIEGLER, V. The Minerals of the Black Hills. 250 pp. Rapid City, South Dakota, 1914.

## LITERATURE ON X-RAYS AND CRYSTAL STRUCTURE.

- W. FRIEDRICH, P. KNIPPING and M. LAUE. Interferenzerscheinungen bei Röntgenstrahlen; Ber. Ak. Wiss. München, 303, 1912; Ann. Phys., 41, 971, 1913; Le Radium, 10, 47, 1913.
- W. FRIEDRICH. Interferenzerscheinungen bei Röntgenstrahlen und die Raumgitter der Kristalle; Zs. Kr., 52, 58, 1913.
- G. WULFF. Über die kristallographische Bedeutung der Richtungen der durch eine Kristallplatte gebeuten Röntgenstrahlen; Zs. Kr., 52, 65, 1913.
- W. H. BRAGG. The Influence of the Constituents of the Crystal on the Form of the Spectrum in the X-ray Spectrometer; Proc. Roy. Soc., 89, 430, 1913; The X-ray Spectra given by Crystals of Sulphur and Quartz, *ibid.*, 575, 1914; The Intensity of Reflection of X-rays by Crystals; Phil. Mag., 27, 881, 1914.
- W. L. BRAGG. The Structure of Some Crystals as Indicated by their Diffraction of X-rays; Proc. Roy. Soc., 89, 248, 1913; The Analysis of Crystals by the X-ray Spectrometer, *ibid.*, 468, 1913; The Diffraction of Short Electromagnetic Waves by a Crystal; Proc.