A NOTABLE CENTENNIAL IN AMERICAN MINERALOGY*

EDWARD H. KRAUS,
University of Michigan, Ann Arbor, Michigan.

Centennials of notable scientific achievements by Americans have not been frequent. This, in some measure, is due to the relative youth of our civilization. It must also be remembered that during the development periods of the United States and Canada our educational and scientific facilities were very meager. But the period of the 1830's may well be designated as one of emergent science. During those years some really significant contributions were made by our scientists. Such a contribution was the first edition of J. D. Dana's *System of Mineralogy*, which was published one hundred years ago in 1837. During the past century this remarkable volume has constantly grown in strength and influence. Today it occupies a unique place in world science.

It was at the beginning of the 1830's that Joseph Henry made his discoveries of self and mutual induction of electrical currents. In the field of chemistry Robert Hare was active. He was constantly adding to his already long list of important and fundamental observations. Asa Gray, the botanist, was just embarking upon a notable career as one of our foremost scientists. His *Elements of Botany*, published in 1836, marked the beginning of a remarkable series of books. John James Audubon was at work on his famous *Birds of America* and the accompanying *Ornithological Biography*. Both were finished before the close of the decade. Moreover, in 1833 William Beaumont published his observations on the processes and laws of digestion.

It was in this interesting period that James Hall began his long and brilliant career with the Geological Survey of the State of New York. As we all know, this survey was destined to play a most significant role in the development of American geology. The centennial of its founding was commemorated by this Society two years ago, when Dr. Rudolf Ruedemann reviewed its work at the annual dinner in New York. As surveys were also being organized in other states, Merrill has well characterized the decade of the Thirties as an era of public or state surveys.

In mineralogy, Parker Cleaveland of Bowdoin College was active. As early as 1816, he had published his *Elementary Treatise on Mineralogy and Geology*. It was a sizeable book of 668 pages with many crystal drawings and a colored geological map. It was revised in 1822. Cleave-

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land planned a third edition, which could not be finished because of ill health. This pioneer text was followed by Charles U. Shepard's *Mineralogy*, which appeared in two parts, in 1832 and 1835. Shepard wrote his book while serving as an assistant to the great Benjamin Silliman at Yale University. These were the only important American books on the subject. Naturally they aroused much interest.

As mineralogy in Europe was much more advanced than in this country, Cleaveland and Shepard had obviously been obliged to draw freely upon the writings of English, French, and German crystallographers, mineralogists, and chemists. Among the European stalwarts who were laying the foundations of crystallography and mineralogy during this period, mention may be made of Mohs at Vienna, Naumann and Breithaupt at Freiberg, C. S. Weiss and Gustav Rose at Berlin, Whewell and Miller at Cambridge, Brewster at Edinburgh, Berzelius at Stockholm and Von Kobell at Munich. The French crystallographers, Rome de L'Isle and Haüy were of an earlier generation. At Yale University, where the *American Journal of Science* had been founded by Silliman in 1818 and was being issued by him, the publications of American and foreign scientists were, of course, being closely followed.

Such, in brief, was the general situation in science, and particularly in mineralogy, in this country, when James Dwight Dana, at the age of seventeen, entered Yale University as a sophomore in 1830. He was able to graduate three years later. During his college course he naturally came under the influence of Silliman, by whom his early interest in minerals and geology was greatly stimulated. In his senior year, Dana received an appointment as instructor of mathematics to Midshipmen of the United States Navy. This took him on a cruise to the Mediterranean. Although he had no access to minerals, he used his leisure hours on the trip working on difficult problems in mathematical crystallography.

In 1835 Dana returned to Yale and began the preparation of his *System of Mineralogy*. It seems almost incredible that a youth of but twenty-two, whose whole experience was limited to that which he had received at Yale and on a Mediterranean cruise, should undertake the writing of so important a text. But Yale was the center of mineralogy at that time, and Silliman's extensive library, which included all the important texts and scientific journals, was at Dana's disposal. Accordingly, he was familiar with the writings of the European leaders already referred to. The book went to press in December 1836, and was published in the spring of 1837. It was a volume of 586 pages with many crystal drawings.

An examination of this remarkable contribution reveals at once that young Dana was fired with an intense ambition to advance mineralogy in this country. Witness the following excerpts from the preface: "The tardy progress of mineralogy in this country, and in England, presents a striking contrast with its rapid advancement in continental Europe. . . . The hope of filling up, in some degree, the existing blank in these departments of American Mineralogical Science, and of contributing to its advancement, by combining the various excellencies from the most valuable works on this Science, has induced the author to offer the following Treatise to the American public." Although Dana frankly admitted that he had drawn heavily upon earlier writers, especially Haüy, Mohs, and Naumann, much original material was included.

This volume, completed at the age of twenty-four, immediately received most favorable comment. Thus the extensive review published in the *American Journal of Science*, late in 1837 includes the following statements, "We see here how little this nation has, until recently, done for the advancement of a science, a knowledge of which is so important to the full development of the resources of the country. This cause of reproach is now, however, fast disappearing. . . . The industry, research and scientific attainment, evinced in the execution of this work, afford satisfactory evidence of the ability of the writer. . . . We believe this to be decidedly among the best treatises upon this subject that have ever been circulated in the United States, and we are of the opinion that even a slight examination of it, will be sufficient to commend it to the favor of every cultivator and lover of Mineralogy."

That the book commended itself to mineralogists is evidenced by the rapid succession of revised editions. The second came in 1844, the third in 1850, the fourth in 1854, the fifth in 1866, and the sixth in 1892, followed by appendixes in 1899, 1909, and 1915. Professor G. F. Brush assisted with the fifth edition. The sixth edition and the first appendix were by his son, Edward S. Dana. Professor W. E. Ford collaborated with the younger Dana in the preparation of the second appendix, and was entirely responsible for the third. More than fifteen hundred pages are included in the sixth edition and the three appendixes. They are packed with facts and information that every serious student of mineralogy must have. Accordingly, Dana's *System* is to be found in scientific laboratories and libraries the world over. It is referred to in mineralogical literature more frequently than any other reference work. It has been well characterized as the mineralogist's bible.

The seventh edition has been in preparation for some time under the direction of Professors W. E. Ford and Charles Palache. Mineralogists

the world over rejoice that the Geological Society of America has made a substantial grant so that the new edition may be speedily completed. They also consider it most appropriate that during this centennial year our foremost mineralogist, who is one of the editors of the new edition, should have served as President of this Society.

This remarkable contribution of one hundred years ago by a young man of but twenty-four has constantly grown in vitality and influence. Today it is used more than ever before. It is a world authority. That this status will be continued well into a second century is assured by the very able leadership being given by Professors Palache and Ford to the preparation of the seventh edition. In this respect I believe that Dana's *System of Mineralogy* is unique among American scientific publications. Accordingly, it is eminently fitting that upon this occasion a brief reference should have been made to what may be termed "A notable centennial in American mineralogy."