BOOK REVIEWS

VSESOIVZNOE MINERALOGICHESKOE OBSHCHESTVO I EGO ROL B RAZVITII GEOLOGICHESKIKH NAUK (THE ALL-UNION MINERALOGICAL SOCIETY AND ITS ROLE IN THE DEVELOPMENT OF GEOLOGICAL SCIENCE). By S. P. Solov'ev. Izdat. Nauka, Leningrad, 1967, 232 p., 1 r. 43k. [in Russian].

This volume was issued in commemoration of the 150th anniversary of the founding of the Society, and it is timely and interesting to review it on the occasion of our own more modest celebration.

The 33 scientists who gathered to organize the Society on 7 January, 1817, in the quarters of Dr. Laurentia Ivanovich Pansner in St. Petersburg, are all unfamiliar names, at least to this reviewer. But the milieu which fostered this development is the well-known tradition of science that developed in Petersburg during the 18th century under the sponsorship of Peter I and the wide ranging scientific leadership of M. V. Lomonosov (1711–1765). In St. Petersburg the Akademiia Nauk was established in 1724, the famous Gorni Institut in 1773, and Peter's *Kunstkamera,* like other royal collections throughout Europe, had been a focal point of discussions on natural history (eventually it developed into the Mineralogical Museum of the Academy of Sciences in the USSR.)

It is important in understanding this history that the *Sankt-Peterburgskogo Mineralogicheskogo Obshchestva,* as it was first called, was organized to encompass "mineralogy in the widest sense of the word", including nearly every phase of earth science. For most of the nineteenth century, it was not only *the* geological society of Russia, but also a principal sponsor of geological exploration and research in the vast areas when opening up on its frontiers, in Siberia, Central Asia and the Arctic.

Beginning in 1866 their Geological Committee organized the systematic geological mapping of Russia, with expeditions ranging from Finland to the Krimea, the Urals, and Astrakhan, until the new geological survey (VSEGEI) was organized in 1882. N. P. Barbot de Marni and N. I. Kohscharov were two of the famous names involved in this effort.

The record of publication by the Society reflects both the wide aspect and pioneering effort of its program. Financial difficulties at first allowed only sporadic publications, beginning in 1819 with G. F. Strangveis' *Strata des environs de St. Petersbourg en ordre de position geologiques.* Even when their serial publications started with the *Trudy Mineralogicheskogo Obshchestva* in 1830, a second volume was not possible until 1842. From that time nearly a volume a year has appeared, 16 volumes of the *Verhandlungen der Russisch-Kaiserlichen Mineralogischen Gesellschaft zu St. Petersburg,* 1842–1863, and 95 volumes of the *Zapiski,* under various society names, from 1866 to 1966. To 1863, 200 papers were published in all fields of geology, including about 60 on aspects of mineralogy and crystallography. The Society also published under the editorship of N. I. Kokscharov, the survey *Materialy dlia Geologii Rosii,* in 26 volumes from 1869 to 1928. All the famous names of Russian geology and mineralogy in the nineteenth century are to be found in these papers —Roger Murchison, D. I. Mendeleev, N. I. Kokscharov, A. V. Gadolin, S. S. Kutorga, V. V. Nikitin, P. V. Eremeev, E. S. Fedorov, N. S. Kurnakova.

During the twentieth century, and particularly after the October Revolution, contributions on stratigraphy, tectonics, paleontology and other disciplines declined, and after World War II the *Zapiski* was restricted generally to the fields of mineralogy and petrology, in line with the meetings of the Society. In recent years it has averaged 200 major articles per yearly volume.

The initial serial of the Society, the *Trudy* mentioned above, was published in Russian, and in fact included a Russian translation of Strangveis' classical work on the geology of St. Petersburg, that had already appeared in French, English and German! In 1842 the single volume of their *Schriften* and then the following volumes of the *Verhandlungen,* were entirely in German. The present history notes this, "with regret", and does not explain further, although it is well known that Peter I's boost to Russian science had depended strongly on German scientists and training in Germany for Russians. But apparently many members became dissatisfied with a situation in which they were not allowed to publish in their native language. After several years of debate, the 1865 meeting, acting on a proposal by the Director, N. I. Kokscharov, reversed the policy. The new *Zapiski* was established, to publish in the language of the author's choice, which was Russian in most cases. A prize was established for the best paper published in the Russian language. One wonders how things might have turned out if this policy had not been changed. Perhaps the ideas of Fedorov, Vernadski and Fersman would have received earlier and wider recognition in Europe and America, where German was known to most scientists. But of course, the sheer size and productivity of the scientific establishment that blossomed later in the Soviet Union, made it inevitable that the Russian language, along with English, would eventually dominate science.

The Society suffered with the rest of the country the upheavals of war and revolution. They had to suspend publication from 1919 to 1923, and were severely short of funds for several years after that. The membership was 142 in 1830, built up over the years, was less than 200 in 1945, and ten times that twenty years later. With the changes of political climate the Society several times underwent reorganization and changed its name. Much credit for the continuity in its operations through all these changes surely is due to A. P. Karpinsky, who became Director in 1899 and President from 1917 until his death in 1936. Furthermore, the Society, which began in the center of Russian culture of the time, at St. Petersburg, continued on in Leningrad, while the center of scientific gravity shifted gradually to Moscow, and now seems headed for Novosibirsk. Only as recently as 1949 did the Society organize regional sections, and these now number 16, not only in Moscow, but scattered from Murmansk to Tashkent. During the period 1957–1963, 1500 papers were presented in the meetings of these sections. In 1947, the somewhat anomalous position of the Society in the Soviet scientific administration was regularized by placing it under the *Akademiia Nauk*.

A useful aspect of this volume is some 16 scientific biographies of prominent Russian mineralogists, scattered through the text. Although Russian interest in the history of science has already produced full biographies and collected works of most of these scientists, the two- or three-page summaries given here are in some respects more useful to the foreign reader. A final note of interest is the list of foreign members that have been honored by the Society over the years, although this custom seems to have gone out of style—the most recent were N. L. Bowen and R. A. Daly, elected in 1937 at the time of the IGC meeting in Moscow. The list is an international honor roll of mineralogy, including Berzeluis and Goethein in 1842, Elie de Beaumont and Wilhelm Haidinger in 1867, J. D. Dana in 1885, Paul Groth, Ernst Mallard and Carl Rammelsberg in 1890, Max von Lane, William Bragg, J. J. Sederholm, and Frank Clark in 1916.

The Society and its Vice-President Dr. Solov'ev are to be congratulated on a memorial volume that reflects their illustrious history.

William T. Holser

THE AMERICAN MINERALOGICAL JOURNAL, vol. 1, 1810–1814. Reprinted with an introduction by John C. Greene. Hafner Publishing Co. New York, xvii+272 p., 1968, $18.00.

THE MONTHLY AMERICAN JOURNAL OF GEOLOGY AND NATURAL SCIENCE, vol. 1, 1831–1832. Reprinted with an introduction by George W. White. Hafner Publishing Co., New York, xx+576 p., 1968, $25.00.

On the occasion of this anniversary of the MSA, it is interesting to look back on some early American attempts at serial publication in mineralogy. The efforts of George White, Editor, and The Hafner Publishing Co., with these volumes 1 and 3 respectively of their *Contributions to the History of Geology* just now make this possible, as this material was previously nearly inaccessible.

The *American Mineralogical Journal* was considered by Archibald Bruce, who like many another M.D. of the time was an amateur scientist. His background in mineralogy, acquired from the Count de Bournon, the Abbé Haüy, and Heinrich Struve, led to a joint appointment as Professor of Mineralogy and Materia Medica at the College of Physicians and Surgeons in New York. In association with Samuel Latham Mitchell, Colonel George Gibbs and Professor Benjamin Silliman, Bruce organized the journal to "elucidate the mineralogy and geology of the United States" in every practical as well as theoretical way. It started auspiciously with much cooperative reprinting, in both directions, with the venerable *Journal des Mines* in Paris and the *Philosophical Transactions*. In addition to geological descriptions of such areas as Long Island, New Haven and the coals of Rhode Island, the volume is particularly interesting for notices concerning mineralogical finds at many classical localities in the eastern United States: Chesterfield and Northampton, Mass.; Haddam, Conn.; Chester Pa., Franklin, N.V., Baltimore, Md., Warren Co., Tenn. and of course Manhattan Island. Some of these finds were sent to such savants as the Abbé Haüy for determination. Bruce himself wrote on such subjects *Description of some of the combinations of titanium occurring in the United States*. The volume also contains the first description of the Tri-State lead district.

J. C. Green's Introduction presents many interesting sidelights on the publishing project, gleaned from contemporary correspondence. Although Bruce's efforts as editor were applauded both in the United States and abroad, number 5 of his journal never appeared. He was failing in health, and died in 1818. His associates did not give up however, and already in September, 1817, Parker Cleveland wrote to Benjamin Silliman

"... This Journal *must not* be discontinued—the honor of our country and more especially the interests of mineralogy forbid ... The American Mineralogical Journal must be transferred to *New Haven* and Professor Silliman *must* consent to become Editor." And he did indeed, in 1819 under the title, *The American Journal of Science, More Especially of Mineralogy, Geology and the Other Branches of Natural History; Including also Agriculture and the Ornamental as well as Useful Arts.*

The Monthly American Journal of Geology was conducted in Philadelphia by George W. Featherstonhaugh, a man who made his mark equally as scientist, diplomat, and entrepreneur. In some respects it was in competition with the new *American Journal of Science*, and especially with Silliman, for whom Featherstonhaugh had little use. The *Monthly Journal* also lasted only one volume, but covered a wide range of geological subjects. Of particular interest in the history of mineralogy are the contributions of Andres Manuel del Rio, who in 1793 was the first professor of mineralogy in America, at the Real Seminario de Mineria in Mexico City. When the new government exiled all Spaniards in 1829, del Rio went to Philadelphia, where he took a prominent part in the scientific life of the community, and published a new edition of his *Elementos de Orictognosia*. In the *Monthly Journal* he was still trying, somewhat pathetically, to recover his priority for the discovery of Vanadium, which in 1802 he had cleverly characterized from lead ore at Zimpan and called *erithrome*. He gave his specimens and results to Baron von Humboldt, when he visited Mexico, who gave them to Collet Descotils, who decided the metal was chromium. Sefstrom named *vanadium* in Sweden in 1830, and Wohler correlated this with the Zimpan material. Featherstonhaugh was sympathetic, and suggested that both names be dropped in favor of *rionium.*

There is much of general interest in this volume, including fascinating accounts of early scientific meetings from the *Geological Society of Philadelphia* to the *Deutscher Naturforscher Versammlumg.*

William T. Holser

ELEMENTS OF MINERALOGY. By Brian Mason and L. G. Berry. W. H. Freeman and Co., San Francisco. 1968. 550 pages, 233 illustrations. $9.50.

Elements of Mineralogy is a slightly shortened and revised version of the authors' *Mineralogy, Concepts, Descriptions, Determinations* (1959). It is intended to be a text for one semester or one quarter courses in introductory mineralogy.

A comparison of the amounts of coverage of the principal areas in the two versions is as follows. Part I, Concepts: cyrstallography (53 pages versus 138 pages in the earlier book); chemistry of minerals (34 pages in both); physics of minerals (26 pages in both); genesis of minerals (42 pages versus 41); methods of determination (28 versus 20 in the earlier); and systematics of mineralogy (5 pages in both). Part II, Descriptions: native elements and sulfides (71 pages versus 67); oxides, hydroxides, and halides (55 pages versus 52); oxysalts (67 pages versus 62); and silicates (104 veruss 105). Part III, Determinations, contains 24 pages versus 26 of determinative tables. The Selected Readings at the ends of most chapters have been added to and brought up to date. There is no appendix as against 19 pages of appendix material in the earlier book.

The principal difference between the versions is the chapter (2) on crystallography. The new chapter is not only much shorter, it is restricted to classical, macroscopic crystallography and is presented in a wholly traditional fashion. Whereas the chapter in the earlier version began with a rather abstract (for students generally having almost no knowledge of or experience with the underlyng phenomenology or with mental strategy in general) introduction to some aspects of pattern theory, the new one omits the subject altogether. Beyond a cursory mention of some very old ideas about the nature of crystals, there is no consideration of microcrystallography. I was unable to find even the wordi lattice or space group in the chapter on crystallography; nor are they listed in the index. The authors apparently chose the deep blue sea the first time—this time, apparently, the devil (via the insidious voices of some vocal teacher-users of the first version). The authors should not have let themselves to be beguiled to the "easy path" just because some people do not appreciate how fundamental and essential pattern theory is to an understanding of crystalline solids, including minerals. To make sure that I am not misunderstood, I want to make (crystal) clear thay my criticism about the coverage of pattern theory in the first version is not concerned with the amount or depth but with the fact that it is presented in the book before students can have the background to appreciate it.

Along the same line, it should be noted that the chapter on crystallography still begins with the sentence "A crystal is a solid body *bounded by plane natural surfaces* (my emphasis), which are the external expression of a regular internal arrangement of constituent atoms or ions." This is a surprising type of definition to be found in the two books which are, in general, the most fundamentally oriented of the widely used beginning texts in this country. This illustrates, no doubt, something about the difficulties of reshaping many of our concepts from the macroscopic and largely empirical attitudes of the recent past.

The other main difference is the welcome addition of the use of optical properties in mineral identification. Four and a half pages on optical methods have been added to Chapter 6, Determinative Mineralogy. A section, "optical properties", is now included in the description of each non-opaque mineral. There are also diagrams relating optical properties to composition for most of the major mineral groups and series showing solid solution. Optical properties, however, are not utilized in the determinative tables.

The former Appendix A devoted to a concise survey (17 pages) of X-ray diffraction has been deleted. This is less than compensated for by addition in Chapter 6 of a three and a half page description of mineral identification by means of X-ray powder diffraction.

The features of *Elements* are those of its predecessor: a compact, well organized, useful text-lab manual; good coverage and balance, by and large; straight forward, clear and accurate presentation; a solid and useful body of information; and reasonably good development of important ideas. Whatever their deficiencies, *Elements* and its forerunner are the best available (in English) for mature beginning students. They are also the best for later use after completion of a course.

One point I would like to see improved in *Elements*, *Mineralogy*, and all other beginning books is the usual definition of the concept of a mineral and its implementation in the body of the text. Although Mason and Berry very properly emphasize in the Preface (p. *v*) to *Elements* that minerals are phases in the crust, their traditional form of phrasing the definition (pp. 3–5) and subsequent implicit use of the concept in many places are not likely to give students the attitude that they need towards minerals as phases. If this criticism is true of *Elements* and *Minerlaogy*, it is even more so for their competitors.

I have used, and probably will continue to use, *Elements* in my year course in which the crystallography-mineralogy part occupies about one and a third semesters (roughly two quarters). I had used the earlier version until the appearance of the new one. I chose the new version mainly on account of the inclusion of optical properties. Using either book, we get whatever additional crystallographic material is needed from various other sources.

The perfect textbook in beginning mineralogy probably is even less likely of attainment than the perfect crystal. For the time being, therefore, we shall have to be satisfied with the *Elements of Mineralogy* or with *Mineralogy*.

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GEOCHEMISTRY OF NIOBIUM AND TANTALUM, BY RAYMOND L. PARKER AND MICHAEL FLEISCHER, U. S. Geol. Surv. Prof. Pap. 612, U. S. Govt. Print. Off., Washington, D. C., 43 p., $0.50.

The purpose of this paper is to update Rankama's works on the distribution and geochemical affinities of Nb and Ta. This is done by summarizing the available data, and grouping it in various ways into 25 tables. This is a valuable summary, not only because it brings together the analytical results of workers in many countries, but also for its detailed list of niobium- and tantalum-bearing minerals. Except for the lack of geochemical data on carbonatites (the principal economic source of niobium concentrates), I judge the paper to be unusually complete.

Estimates by various authors of crustal abundance of Nb and Ta and in the main rock types are listed in tables 1 and 3 respectively. Table 2 contains the analytical data of Nb and Ta in G-1 and W-1. In tables 4 to 14 the Nb and Ta content are compiled and averaged for the following major rock types: granites, various magmatic rocks, alkali granites, syenites, nepheline syenite and phonolites, syenites and trachytes, feldspathoidal rocks of the ijolite group, basaltic rocks, ultramafic rocks, sedimentary rocks, meteorites and tektites.

The behavior of Nb and Ta in a magma is inferred using Ringwood's modification (involving electronegativity and ionic potential) of Goldschmidt's rules. The formation of tetrahedral complexes of NbO_4^{-3}, and octahedral complexes of NbO_6^{-7}, in different melts are discussed in the light of whether they form discrete minerals in the late differentiate, post-magmatic products such as pegmatites, aplites, greisens, and carbonatites, or be camouflaged in earlier minerals (mainly Ti and Zr minerals), or be incorporated in silicate minerals such as pyroxenes, micas, amphiboles, and sphene. Certain relationships are noted, *e.g.*, high alumina granites commonly have accessory columbite, euxenite, and fergusonite; pyrochlore occurs in high alkali granites; normal allanite-sphenebiotite granite rarely has discrete Nb and Ta minerals; independent Nb and Ta minerals are associated with miaskitic nepheline syenites; in agpaitic nepheline syenites they are fixed with Ti and Zr minerals.

The partitioning of Nb and Ta between certain co-existing minerals are listed according to rock types in tables 17 and 21. In the alkali-ultramafic massifs, Nb and Ta are camouflaged with pyroxene in the early rocks, and occur as discrete minerals in the late carbonate-rich differentiates, with a relative enrichment of Nb over Ta. The distribution in minerals according to paragenesis of the ultramafic massifs is listed in tables 23 and 24. In the weathering cycle Nb and Ta tend to be concentrated in the hydrolyzates—clays, laterites, and bauxite: some Nb reaches the ocean and is fixed with clays and manganese nodules. Clays formed in a humid environment contain more Nb and Ta than those from arid conditions. Due to the greater mobility of Nb, the Nb/Ta ratio is higher in theard clays.

The types of Nb and Ta concentrations are listed in Table 25, according to process (magmatic, pegmatitic, pheumatolitic-hydrothermal, contact metasomatic, exogenic), and major rock types, with a brief summary of examples by locality. The concluding section on future work pinpoints an important unanswered question concerning a mantle or crustal source of Nb and Ta.

The breadth of this compilation can be judged from the 117 references, 45 of them Russian, in the main reference list. A glossary of niobium and tantalum minerals of some 8-1/2 pages, with its own list of references (74, of which 33 are of Russian papers) will be of value to the mineralogist. In part I, the minerals are classified according to chemical type: part II is an alphabetical list with formula, crystal system, Nb_2O_5 and Ta_2O_5 content, occurrence, and references, plus the varieties of names used synonymously for the main type. Minerals containing 1–5% Nb+Ta are listed in part III, those containing less than 1% in part IV.

This paper is timely, especially in view of the rapidly expanding economic use of niobium under the trade name of columbium concentrates and ferrocolumbium products. Perhaps columbium, the synonym for niobium should have been mentioned.

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