# A PLEA FOR ECONOMIC MINERALOGY[1]

OLIVER BOWLES, *Bureau of Mines, Washington, D. C.*

The study of mineralogy and crystallography affords a mental discipline, and a training in scientific endeavor that is to be excelled by few, if any, of the natural sciences. No one can question the importance of the position that these subjects hold in the realm of pure science, and no true mineralogist desires to see any tendency toward a recession from the influential position they now maintain in the world of scientific thought. The names of many eminent scientists whose work is historic, and whose influence is perpetual, are linked inseparably with mineralogy, and the expectation is that many other mineralogists, now active in the field of research, and still others who are yet to come will join the ranks of the immortals.

In making a plea for economic mineralogy there is no thought, therefore, of urging the commercialization of a pure science, or in detracting in any way from its value as an avenue of research, for unfolding new and valuable truths that may be added to the sum of human knowledge. The purpose is rather to urge upon teachers of mineralogy that while they lead their students across the threshold of this branch of science, and direct their thought toward the well-defined, though possibly tortuous path of scientific attainment, they at the same time supplement the purely scientific thought with certain economic aspects of mineralogy that are in many instances sadly neglected.

In this age, even the pure scientist cannot fail to be impressed with the fact that all commerce and industry are based on natural resources, and that the practical aspects of these resources should be more generally understood.

It is recognized of course that economic phases of metallic ore deposits are covered more or less completely in courses on economic geology, but in such courses the discussion of the minerals themselves is usually buried beneath a mass of information on the geology and geography of ore deposits. Furthermore, economic geology is a specialized course, and thus students other than specialists are for the most part deprived of this possible avenue of information.

[1] Published by permission of the director of the Bureau of Mines. Presented at the meeting of the Mineralogical Society of America, December 29, 1921.

Books on economic geology are numerous, but economic mineralogy is not so favored. It is encouraging, therefore, to note the recent appearance of a book entitled "Economic Mineralogy" by Thomas Crook of London. Its tendency is to encourage study of the phases of mineralogy emphasized in this paper. While there is room for considerable improvement in its mode of treatment, particularly in its classification into ore minerals, gem minerals, and miscellaneous economic minerals, it is nevertheless a welcome addition to the list of available books on mineralogy.

The writer taught mineralogy and crystallography for a number of years, and subsequently devoted close study to purely economic problems in mining and mineral utilization. An unusual advantage has therefore been afforded to view both aspects of the question, and in looking in retrospect over his academic work, the writer is impressed with a keen realization that emphasis was placed on the mineral occurrences which were best adapted for morphological or chemical study, with consequent neglect of the economic occurrences. It is possible that a careful and unbiased scrutiny would disclose similar tendencies in the work of many other teachers of mineralogy.

A few practical examples will better illustrate the condition which the writer deplores. In introducing students to the mineral calcite, the specimens presented for examination usually consist of transparent cleavage fragments of Iceland spar, together with incrustations of crystal aggregates. If undue emphasis is placed on such specimens the student fails to grasp the fact that Iceland spar and calcite crystals are of negligible importance commercially while limestone and marble, the common forms that occur in nature, are mined to the extent of approximately 55 million dollars each year.

When the subject of gypsum is under discussion, the favorite specimen for illustrative purposes is the swallow-tail twin, while the commercial type of granular or massive gypsum may be given minor attention.

Fluorspar in beautiful purple cubes illustrating interpenetration twins is an attractive hand specimen that never fails to arouse interest and even wonder, but how many lecturers pass around specimens of the commercial gravel spar, which is no more interesting in appearance than any ordinary gravel, and how many of them emphasize the fact that gravel spar is mined to the extent

of thousands of tons every year, while the crystals are of comparatively rare occurrence?

Apatite is usually shown in hexagonal prisms, and in crystalline masses, forms which have little or no commercial importance. Phosphate rock, the commercial type, which bears the same relation to apatite that limestone does to calcite, is commonly not even mentioned.

Other minerals the crystallized forms of which are in many instances allowed to gain undue prominence in the student's mind are garnet, pyrite and quartz.

Most text-books classify minerals on a chemical basis, and while this is justifiable, such a classification throws abundant and rare minerals into the same groups, and tends to confuse the student as to their relative importance. Thus in Dana's System of Mineralogy, more space is given to sternbergite than to chalcocite. Furthermore, of the minerals that are abundant the space devoted to descriptive matter may mislead students as to their relative value. For example in the text to which reference is made above the valuable mineral kaolinite occupies 3 pages, and the practically worthless epidote 5 pages.

From a chemical, physical and morphological standpoint such apparently disproportionate discussion may be fully justified, but if the student is to maintain a well-balanced concept of relative values, some effort should be made to emphasize the economic importance of all minerals studied.

The suggestion is therefore offered that all teachers of mineralogy endeavor to present the subject in such a way that the student will gain a clear idea of the relative economic value of various minerals, that he will not overestimate the importance of crystallized forms, and that he will become familiar with the commercial types.

## BOOK REVIEWS

THE MICROSCOPIC DETERMINATION OF THE NONOPAQUE MINERALS. ESPER S. LARSEN. 294 pages. U. S. Geological Survey *Bulletin* **679**, Washington, 1921. (Obtainable from the Superintendent of Documents, Washington, D. C., for 30 cents.)

Tables for the identification of minerals by the immersion method under the petrographic microscope have been available for some years, but they have covered only the commoner minerals, and some of the data have been inaccurate or contradictory. Realizing the usefulness of this method, Dr. Larsen set out to collect more complete information, not only checking previous work in doubtful cases, but