

moral training we shall see that its influences for good are not less far-reaching or less profound.

It could be shown that through its study man's reasoning powers are developed, his memory strengthened, his powers of imagination increased, his sympathy with his fellowmen enlarged, and that through its study he is taught to properly observe and appreciate the wondrous works of nature, something which is worth while for all to try to do, since, as has been truly said, "God has written only two books, the Bible and the geological record."

Professor Wm. Nicol then read an interesting address on "Representative Mining Schools." The famous Freiberg School was taken as a European representative, while the Houghton School in Michigan was taken as an American representative.

These two schools were chosen because the speaker had a thorough acquaintance with them, having enjoyed the privileges of studying at them. The *Bergakademie* at Freiberg, Saxony, is one of the oldest schools of its kind and owes much of its greatness to its being situated in a mining district, where students may become familiar with the practical side of mining and smelting. Four large buildings are there required for the accommodation of the students; thirteen laboratories and as many storerooms for rocks, minerals and metallurgical products, provide abundant opportunity for students to do practical work. A staff of seventeen professors and nine assistants is employed to train 160 students. More than half the students are foreigners, yet the little kingdom of Saxony finds it to its advantage to maintain such a school to train men to aid in developing its mineral resources.

On the staff are found many learned men, such as Dr. Stelzner, Dr. Winkler, the discoverer of germanium, and Dr. Richter, the discoverer of indium.

Students may take as a regular part of the course, practical work in the mining and smelting works of the district. In this work the students are placed in charge of the regular foreman of the works and perform all kinds of work in turn. Students in Metallurgy are taken, by the professor in that subject, to representative smelting works in the district, where he is able to show them the various metallurgical operations in progress. Similar excursions are led by the professors of mining, geology, mechanical and electrical engineering.

The course includes four winter and four summer sessions. The degrees conferred are, Metallurgical Engineer, Civil Engineer, and Mining Engineer. The average annual expenditure for such students is about \$500—foreigners pay a poll tax of \$25.

The Michigan Mining School at Houghton is one of the youngest schools of its kind. Houghton is the county seat of Houghton county, and is situated at the base of Keewenaw Peninsula, on the south

shore of Lake Superior. Within a few miles of Houghton are the great copper and iron mining districts of North Michigan. Up to 1890 the copper mines of that district had produced nearly two hundred and forty-four million dollars' worth of copper, while nearly eight million tons of iron ore were taken from the iron mines during 1890. The Calumet and Hecla Copper Mine is two-thirds of a mile deep and about two-and-a-half miles long. The Tamarack Mine has two shafts, each nearly a mile deep.

Though the surroundings are very practical and abundant opportunity is given for practical work, yet an effort is made to give such courses of instruction as give the student a grasp of the principles of mining subjects.

A large and beautiful building has so far been sufficient to accommodate the eighty students in attendance, but more accommodation is being provided. The staff consists of six professors and seven assistant professors. The officers of instruction are employed in connection with the State Geological Survey.

In connection with the School is a well equipped stamp mill, in which the students are given practical instruction in the treatment of ores and the winning of the precious metals. Each student must in his turn perform the duties of ore carrier, fireman, engineer, stamp-feeder, amalgamator, assayer, in short he must put himself in the position of each hand employed in the stamp mill from the lowest to the highest. The professor of surveying gives his students practical instruction, first in making plans of the grounds, then of the country in the vicinity of the School. Gradually the more difficult work of laying out mining claims, running a railway survey, and underground mine surveying is taken up.

In the stamp mill and smelting works in the vicinity the professor of metallurgy has good opportunity of demonstrating the principles taught in the lecture room. The professor of mechanical and electrical engineering is provided with two well equipped shops in which the students are taught wood working and iron working. Excellent courses of assaying are given during the summer session. The course of study extends over four years, at the end of which time the degree of E. M., Engineer of Mining, is obtained. At the end of three years candidates may obtain the degree of S. B., Bachelor of Science.

Instruction is free to students of every land. All are received on the same conditions. Students must pay for materials, and conduct themselves as gentlemen. Average annual expense of each student is \$450.

Rev. Dr. Williamson, of Queen's, spoke of the great mineral wealth of the district in the vicinity of the new School of Mining, and urged the necessity of training men specially for the intelligent examination and operation of these mineral deposits. The