a continuing program. It will provide constructive work for college people, and, as it is work which must be done in any event, the cost will be much lower than during prosperous times. The college will cooperate with all existing agencies, including the University of Michigan, the Michigan State College and the geological division of the Department of Conservation.

The program calls for investigation of mineral resources, methods of exploiting them and means of providing permanent industrial activity in the field. Among the general projects there are thirteen in the mining, metallurgical and geological fields and three in the electrical field. Research on copper and iron ore already in progress at the college will be continued.

In connection with iron ore research, attention is called to the fact that Michigan produces approximately 16,000,000 tons annually and now has a reserve estimated by the state appraiser of mines of about 175,000,000 tons of high-grade, merchantable ore. The reserve, which varies from range to range, will not last much over a decade.

There is, in addition to the merchantable ore, an enormous tonnage, now non-merchantable, of low grade iron formation. This has been estimated by various authorities at from three and a half to five billion tons. It contains enough iron to supply the entire demand for many hundreds of years. Like the "high grade" ore, this ore varies with the district. The problem is to make these non-merchantable iron formations acceptable as ore and thereby to add to the natural resources of the nation.

Low grade iron ores from all the ranges have been investigated, thousands of samples assayed and ores classified. The major portion of the work to date has been done on the ores of the Gogebic range, the development of a routine of practice and the invention and testing of machines. The iron formation of the Gogebic range has proven about 85 per cent. amenable to concentration. A machine has been developed which has definite promise of success on the coarsely crystalline ores.

In the work on copper, in the first two years of the formal research program, which has been carried out under the leadership of Dr. W. O. Hotchkiss, president of the college, a saving of 10,000,000 pounds of copper was effected and the practise outlined continues at this time. The companies themselves have inaugurated research programs.

THE UNIVERSITY OF CALIFORNIA AT LOS ANGELES CHAPTER OF THE SOCIETY OF THE SIGMA XI

DURING the past year, the following Sigma Xi Lectures were given at the University of California at Los Angeles:

"Space and Time in Atomic Theory," by Dr. Niels Bohr, professor of physics in the University of Copenhagen.

"A Demonstration of Liquid Crystals," by Dr. G. van Iterson, professor of technical botany in the Technical High School of Delft.

"Results of Some Recent Researches," by Dr. R. A. Millikan, director of the Norman Bridge Laboratory of Physics and chairman of the Executive Council of the California Institute of Technology.

"The Molecule in Biological Structures," by Dr. O. L. Sponsler, professor of botany in the University of California at Los Angeles.

"The Realm of the Nebula," by Dr. Edwin P. Hubble, astronomer at the Mount Wilson Observatory of the Carnegie Institution of Washington.

"The Program of Earthquake Study in Southern California," by Dr. H. O. Wood, research associate of the Carnegie Institution of Washington and director of the Seismological Laboratory at Annandale, California.

"The Distances of the Stars," by Dr. W. O. Adams, director of the Mount Wilson Observatory of the Carnegie Institution of Washington.

"Greek Tradition in its Relations to Modern Science," by Dr. E. T. Whittaker, professor of mathematics in the University of Edinburgh and Hitchcock Lecturer at the University of California. Dr. Whittaker also delivered a second lecture on "Mechanism *vs.* a Pan-Mathematical Theory of the Universe."

"A Study of Oceanography of the Pacific," by Dr. T. Wayland Vaughan, professor of oceanography in the University of California and director of the Scripps Institution of Oceanography at La Jolla.

"The Causes and Effects of Earthquakes," by Dr. J. P. Buwalda, professor of geology at the California Institute of Technology.

On June 11 the university chapter initiated one new member and twenty-one new associates. The officers of the chapter for the past year were: Dr. S. J. Barnett, *President;* Dr. B. M. Varney, *Vice-president;* Dr. E. K. Soper, *Secretary,* and Dr. H. W. Stone, *Treasurer.* New officers for the coming year were elected as follows: Dr. B. M. Varney, *President;* Dr. G. Ross Robertson, *Vice-president;* Dr. E. K. Soper, *Secretary,* and Dr. H. W. Stone, *Treasurer.*

E. K. SOPER,
Secretary

SCIENTIFIC NOTES AND NEWS

ON his retirement from the directorship of the Department of Genetics of the Carnegie Institution of Washington, Dr. Charles B. Davenport addressed the members of the department on "Reminiscences of Thirty Years." He was given a purse of over $150 to purchase books and fifteen bookplates, each con-