and the best teacher will make for himself the best selection. The derivation and elucidation of mathematical principles, facility in their use and application, and an understanding of the basis on which principles and methods rest are all essential. A good text-book—one properly proportioned—aids greatly in the work of instruction. However, it is the teacher on whom reliance is placed in the end, and for the student of average mathematical ability the teacher's influence constitutes a large element. It is highly advantageous for the teacher to have a fair knowledge of the applications of mathematics which the student will make in later work and to have sympathy and interest in such work. Let us also emphasize the importance of having the best of teachers for mathematical instruction.

Let me add to this that it is my belief, growing stronger after many years of observation, that the average engineering student gets relatively little from lectures on mathematical subjects; that many instructors talk too much themselves; that the student must have the opportunity to express himself and must be required to use the mathematical language and to try his own skill, and this in other than formal quizzes; and that recitation and drill work are essential factors in giving training to this average student.

Little can be said in the time at my disposal on the ground which should be covered in mathematical instruction. Two classes of matter are studied: (1) fundamental principles forming the skeleton of the work, and (2) the more complicated topics, involving further detail and insight. There will be little difference of opinion on the first class. There will be more on the second. I have found in the teaching of mechanics and of various engineering subjects that certain topics and methods not ordinarily given in mathematical instruction may advantageously be used in the presentation of the work. The teacher of thermo-dynamics or of electro-dynamics has other topics to suggest, and still other topics will come from other sources. Not all of these may be allowed. In fact, it makes little difference what particular topics are included so long as the student has thorough training in some of the more complex work. The difficulty of giving instruction in complex work lies not so much in the time required, as in the obstacle that the concepts lie beyond the student's experience and that he is not ready to comprehend their meaning. If he had the opportunity to study these topics after he has reached the subject in which they are to be used, or if he could go back over a part of mathematics after his study has taken him into their field of application, as indeed his instructor has done for himself, the result would be more satisfactory. All these limitations must be considered in choosing the ground to be covered in mathematical instruction.

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GRADUATE SCHOOL OF HOME ECONOMICS

The Graduate School of Home Economics held its second session at Cornell University, July 13–24. Representatives were present from eleven states and Canada. It is the purpose of this school to consider some of the results of the latest investigations in science, economics and art with their applications to work in home economics; the program, therefore, covered a wide range of subjects.

Practical demonstrations of household appliances were given by Misses Van Rensselaer and Rose, of the department of home economics in Cornell University. "Biology in its Relation to Home Economics" was discussed by Dr. J. G. Needham, of Cornell University; "Political Economy in its Relation to Home Economics" was discussed by Professor Fetter and Professor Kemmerer, of the

department of political economy of Cornell University. "The Cost of Efficiency" was the topic of a series of lectures by Mrs. Ellen H. Richards, of the Institute of Technology, Boston, Mass. Some original work on "The Digestibility of Starch as affected by Cooking" was presented by Miss Edna D. Day, professor of home economics, University of Missouri; "Public Work for the Home" was discussed by Miss Caroline L. Hunt; "Some Problems in the Teaching of Dietetics" were presented by Miss Isabel Bevier, professor of household science in the University of Illinois; "Illustrative Material for Teaching Dietetics" was the subject of a lecture by Dr. C. F. Langworthy of the department of agriculture; "Dairy Bacteriology" and "Some of the Milk Products" were the topics treated by Dean Russell, of the College of Agriculture of Wisconsin, and Professor Stocking, of Cornell University. Moreover, the school enjoyed the privilege of a lecture by Professor L. B. Mendel, Sheffield Scientific School, on "Foods and Dietary Standards" and one by Professor N. Zuntz, of the Royal Agricultural College, of Berlin, on "Food Values."

Another feature which added to the profit and interest of the session was the fact that the members were able to avail themselves of the lectures given to the Graduate School in Agriculture then in session at Cornell. Those of particular interest to the members of the Home Economics Conference were those given by Professor Mendel, Dr. H. P. Armsby and Professor Zuntz, on the general subject of nutrition. Excursions to the hills and lakes in the immediate vicinity of Ithaca contributed much in the way of recreation and pleasure.

CAVERNS IN THE OZARKS

EARLY in May, the department of archeology, Phillips Academy, Andover, Mass., sent an expedition to Benton and Madison Counties, Arkansas, to explore certain caverns. These had been seen by Mr. E. H. Jacobs, who had been sent on a preliminary trip through the White River country. Mr. Jacobs reported more than thirty caverns in an extent of country eighty by forty miles.

Dr. Peabody, the director, and W. K. Moorehead, the curator, took the field for five weeks. From Fayetteville, Ark., they examined the country south and east through a region never before visited by archeologists. Four caverns were explored, one of these being in limestone and the rest in sandstone. The largest, Kelley Cavern, is about seventy meters in extent, with an overhang of thirty meters. The bluff is about fifteen meters high. The ashes range from one to three meters in depth. A force of twelve to fifteen men was employed for more than two weeks in removing the ashes from Kelley Cavern.

The character of the cave material differs essentially from that found on the surface of the surrounding village sites. Shallow metates are very numerous in the ashes of the cavern, thirty-seven having been found in Kelley Cavern alone. The peculiar character of the artifacts of the region deserves mention. There are no grooved axes—save one or two—no celts, no slate ornaments or problematical forms, no grooved hammers, no hematite implements, none of the spades and hoes common east and north, and only two pipes have been discovered in the entire region. These facts present an archeological problem of interest and importance to be solved at some future time.

The country is difficult of access, most of the caverns lying twenty to thirty miles from the railway. The elevation ranges from 1,300 to 1,600 or 1,700 feet. The collection brought to Andover totals about 1,200 specimens. On the fields throughout the entire region are great quantities of chips, spalls, hammerstones, knives and projectile points—a larger quantity than either Dr. Peabody or Mr. Moorehead ever saw in other portions of the United States.

Judging from the reports brought in by the mountaineers, there are large numbers of caverns in the region. These will be explored by Phillips Academy from time to time, permission having been secured from the Granger Kelley Lumber Company which controls upwards of 30,000 acres of land in the cavern country.