be expended in developing agricultural experiments in the field, barn, orchard, shop and garden. The Tishomingo School has 120 acres of land and the Warner School, 160 acres. These and the other similar schools in the state will be under the supervision of the state commission of agricultural and industrial education, which consists of the state superintendent of public instruction, the president of the state board of agriculture and the president of the Agricultural and Mechanical College. The Murray School will open this fall and will be in session eight months.

DR. ALBERT ROSS HILL will be inaugurated as president of the University of Missouri on December 10. The principal speaker will be Dr. J. G. Schurman, president of Cornell University.

MR. R. J. H. DELOACH, botanist to the Georgia Experiment Station, has resigned to accept a professorship of cotton industry in the State Agricultural College at Athens.

THE following appointments have been made in the philosophical department of the University of Michigan: DeWitt H. Parker, Ph.D. (Harvard) to be instructor in philosophy; F. C. Dockeray, A.B. (Mich.), and Elmer C. Adams, A.B. (Mich.), to be assistants in psychology.

INSTRUCTORS at the University of Cincinnati have been appointed as follows: Harry Louis Wieman, biology; Charles N. Moore, mathematics; Taylor S. Carter, physics; Joseph Eugene Root, civil engineering; Howard A. Dorsey, mechanical engineering, and Murrell Edwards, physical education.

MR. A. R. BROWN, who recently returned from an anthropological expedition to the Andaman Islands, has been elected to a fellowship at Trinity College, Cambridge.

DISCUSSION AND CORRESPONDENCE

THE TEACHING OF MATHEMATICS TO ENGINEERS

TO THE EDITOR OF SCIENCE: Doubtless many physics teachers in our technical schools and universities have followed with great interest the spirited discussion on the teaching of mathematics to students of engineering, recently published in SCIENCE, and I have been wondering if any of them had the same uncomfortable feeling which I had while listening to some of the criticisms. Again and again I could not help but think of a well-known biblical quotation about the mote and the beam. Professor Franklin's letter, October 2, shows that I do not stand alone in this matter.

Aside from actual deficiencies in the knowledge of mathematics depending upon local conditions and personal aptitude, it is apparent that our students beginning engineering subjects show often a deplorable lack of ability to express practical problems in mathematical form and to properly interpret the results after the formal operations upon the mathematical equations have been completed. As Professor Slichter says: "They very generally lack the power to do anything with the mathematics they have been taught." The statement that mathematics is nothing but a tool for the future engineer means that it is only the teaching of the mere mechanical operations enabling the student to solve certain equations. Whoever uses the phrase in this sense confounds the tools *of* mathematics which he borrows from it, with the science itself, and it would be better for him to study a little more real mathematics.

I believe, however, that we all agree that it is highly desirable that our students in engineering should obtain a greater skill in handling these tools, falsely called mathematics. But who is responsible for their lack of skill? Considering the small amount of time allotted to mathematics in many of our schools, the blame can not well be placed upon the teachers of this science alone; it is a severe impeachment of the teachers of engineering and—of the teachers of physics.

It seems remarkable that only in a few instances during the whole discussion was any mention made of physics. Do the students pass directly from mathematics to the purely engineering courses? If so, it is a grave mistake. Students taking elementary mathematics have very little knowledge of physical facts and it was well said: "To illustrate a new mathematical principle by an application to a science with which a student

is not familiar is to befog and not to illumine the subject."

The transition from mathematics which "develops the quantitative reasoning power and ability to think mathematically" to the application of this power to concrete problems is one of the hardest steps to take and—in spite of the Perry movement—it is the province of physics to help the student to make this step. Realizing this difficulty we have introduced in the course of physics for engineering students of the University of Iowa "problem hours," *i. e.*, the class is divided into small sections spending under the supervision of an instructor one afternoon a week in the solution of concrete problems. The results are highly satisfactory. Of course there are always some "abstract" thinkers who are unable to grasp the meaning of the problems, and the sooner they are made to see that they were not meant for engineers the better.

The only objection to the introduction of the problem hours is that too little time will be left for experimentation and recitations. The engineering courses are so overcrowded with "practical" subjects that the fundamentals, mathematics and physics, are more and more crowded into the background. Make the foundation broad enough to build upon it the increased number of technical courses. Give us more time and, if necessary, lengthen the engineering course. The University of Minnesota has already done so and its good example should be followed in other institutions.

The time given to physics should be one and one half years. Where the entrance requirements are sufficiently high the study of mechanics in physics may well be taken up in the second half of the first year, after the course in trigonometry has been completed and before the students have forgotten what they have learned in it. The whole semester should be devoted to this subject, while the whole of the second year is given to the remaining part of physics, taking advantage, during the latter part of the course, of the training in calculus.

Thus in closely correlating the two necessary elements, (1) the teaching of methods and principles of mathematical thinking, in the courses in mathematics and (2) the application of these methods to concrete problems, in physics, the student will be properly prepared to take the last step, namely, to obtain technical results, in his engineering courses.

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Concerning the Real Unicorn

In a certain issue of Science (February 2, 1906, Vol. XXIII., p. 195) Mr. C. R. Eastman contributed an exceedingly interesting article under "Notes on the History of Natural Science," on "The Real Unicorn." In setting forth the facts as to the origin of this fabulous animal, brought to the notice of the western world by Ctesias, Mr. Eastman concludes that the source of this strange creature of the medieval mind is to be traced to certain relief profiles described by Ctesias as graven on the walls of the Persian court at Persepolis and figuring some "Asiatic ruminant new to the Greeks, with the two horns appearing in side-view as one." To the animal so depicted Ctesias gave the name of "unicorn" or "monoceros."

Unquestionably Mr. Eastman's view as to the unicorn's zoological position is probably close to the real facts. It remains to determine, if possible, what species of "Asiatic ruminant" can stand sponsor for the fabulous creature. Some horned beast known to the ancient Persians, the horns of which would appear as a single horn in profile and would point forward when the animal's muzzle was held downward as in the defensive attitude or when grazing, could be the only one so pictured as to give rise to the idea of a "unicorn" or "monoceros." Such a beast, I think, may be seen in the male Nilghai (*Boselaphus tragocamelus*), an Indian antelope, ranging at present from the southern foothills of the Himalaya to beyond Mysore, though most abundant in the central parts of Hindustan. Any one standing alongside