It is the engineer's duty in design to plan not only for the present, but for the future; he is coming to see that the structure of his professional organization, while adequate for the past, is being overloaded, and must be reconstructed to take care of future loads; he is about to design a new structure. Engineering college faculties must recognize this and so plan their curricula that the foundations shall include not only the principles of physics and chemistry and methods of mathematics, but those of the basic nature of the human institutions by whose agency and through whose processes the service which the engineer has to offer may be made to bear fruit. The student of engineering must realize this; he must know that his task is to be a more serious one than that which his predecessors faced.

Teachers Should Work "Outside"

The engineers of this country are now beginning to realize their lack of unity. A number of experiences have brought it home. It is perfectly apparent that when a desirable public improvement, either in political method or in application of method to any particular object is to be made. that the advocates of it will have a greater chance of success when their case is well studied and prepared, and when their forces are marshalled so that at the opportune time the final blow can be given with the concentrated power of all. So in the administration and conduct of an educational institution it is important that the members of the faculty agree as to their aim and methods, and can concentrate their force upon their common object. This involves the question of teachers, their organization, and the spirit which drives them on. Some colleges, often for very good reasons, take their own graduates in as instructors, thus losing the advantage of minds with a new viewpoint. Other colleges discourage professional practice among the faculty and thereby tend to divorce the college from the world of action. The most vital requirement of a technical college is that the members of its faculty have at least a sympathetic appreciation of the character of the practising engineers' problems even if it is not possible for them to personally engage in practice themselves. Certain teachers of applied science should be required to do some professional engineering work. It is often forgotten that a large percentage of the teachers of engineering students, in language, rhetoric, physics, mathematics and mechanics and drawing, have little or no connection with or knowledge of engineering methods or engineering organization. A still larger percentage are entirely beyond the reach of the renaissance of spirit now manifest among engineers. This problem of keeping the teacher in close connection with the developments of engineering, not only technically, but socially, is fundamental. Every teacher of engineers should be affiliated with at least one national engineering association, the ideals and activities of which are not bounded by too narrow an outlook.

Students Benefited by Discipline

In spite of all that may be done to lead the student to self-help aroused by interest, there must still be some work done because the teacher orders that it shall be done. There must still be some things taken on faith. For this there must be discipline. No system of education can be devised which can rely wholly upon the student's own initiative to maintain order and progress. The statements already made should not be construed to mean that the standard of work, both in quantity and quality should be determined and maintained by the student's interest and not by the teacher; that is the teacher's first duty. A brief period of experience with the Students' Army Training Corps, in which the writer had 900 students in surveying, convinced him of the desirability of a stricter system of discipline among students. The average college student will not map out his time so that it may be usefully employed; the army discipline did that for him. He will not generally show the regard for property and persons that is required of students at West Point. There was a noticeable improvement in this respect during and immediately after the recent military training period. While the writer is not willing to see military training in such a concentrated dose again administered to the colleges, he does heartily believe that the average college student would be immensely benefited personally by a strict discipline, not only while under it in college, but afterward. There would be taught the value of courtesy and perhaps of the deeper meaning of courtesy, which is understanding and tolerance of and respect for other people as well as himself. We all recognize the results of it in the splendid officers of the United States army and the navy.

There has been considerable discussion lately in regard to marking systems. Psychological tests for various reactions have been suggested as a substitute for numerical grading of scholastic work. While the writer has only a reading acquaintance with such tests, he believes that after a teacher has come to know the individuals in his class, he unconsciously treats them according to their mental constitution, and as long as his final grades do not entirely depend upon answers to formal questions, they will represent a fair rating. It is not to be doubted, however, that an analysis of the men in a class according to a correct psychological score card, would assist any teacher in a mere accurate estimate of each student's personality and the rate at which he is developing his powers.

A Threatening Development

To summarize here the points which have been mentioned: First, the engineering student must have an ideal which offers an opportunity of realization and which is worthy of the effort of the highest type of man; this ideal must be set for him by the engineers in practice. Second, the engineering curriculum must provide the student with a thorough grounding both in the fundamental principles of natural law and of human institutions. Third, the school must have a faculty in sympathy with the great body of practising engineers, organized themselves with a common purpose to develop every student so far as possible, and to make of him a master of what little he can compass in his college course. Fourth, a certain discipline which shall demand a high standard of personal conduct. With a high ideal, an adequate curriculum, a well organized faculty in touch with the profession and sufficient discipline, the school can perform its duties.

There is one development which threatens the engineering school. Colleges of arts and sciences and of commerce are beginning to recognize the need of the business man and the man of general education for a more definite purpose in his courses of study, a need for those departments of knowledge of which the world is going to demand much; among these, the fundamentals of engineering. If engineering colleges do not meet the demand for a broader fundamental training, we may expect to see men choose the courses in the colleges of arts and sciences in which engineering principles are taught, and the engineering colleges continue to hold only the men who wish to confine their interest to strict technical details. If such a development attains any considerable volume and momentum, there will be many college graduates wth insufficient engineering training, attempting to enter engineering practice, men whose teachers have still less sympathy with and knowledge of conditions of practice than those of engineering colleges, and who can be reached and influenced by engineering organizations only with the greatest difficulty.

Committee on Engineering Education

The whole future of engineering education lies with the profession. When engineers have formed an inclusive national organization that can speak as the voice and authority of a great profession, whose mission is to create and conserve wealth and to demand a higher type of human accomplishment and civilization, the public will listen; financiers, farm ers, skilled and unskilled labor will give ear, and order and justice will more and more prevail in the affairs of men Engineers must first set their own house in order. Only by intense and prolonged study and planning can they do that first task and only by ceaseless vigilance can they maintain it. The labor involved is great and must be divided; it must be done by well chosen committees fully cognizant of the portent of their work. Among these the writer would wish to see a committee on engineering education, well provided with funds to diligently prosecute its labors.