

## DISCUSSION OF PAPER

By A. E. MARSHALL  
Consulting Chemical Engineer  
New York City

MAKING TOMORROW'S CHEMICAL  
ENGINEERS

We who follow the still young profession of chemical engineering are perhaps fortunate in that the industries we serve have not yet reached the fullness of their development, and therefore our discussions of educational and training needs do not have to be based on preserving whatever professional standing has up to this time been accorded chemical engineers.

Professor Lewis has expressed the view that most of the education and training facilities available to the would-be chemical engineer are hardly adequate for present day requirements and seem quite inadequate for future demands.

Let us take a look at the average newly graduated chemical engineer of the 1937 vintage. He is twenty to twenty-two years old and has a bachelor of science degree in chemical engineering acquired after four years residence in a college or university.

He arrived at the university with a record of eleven or twelve years of schooling, and certificates to prove reasonable competency in English, mathematics up to advanced algebra and trigonometry, one or perhaps two foreign languages and elementary physics or chemistry.

It is rather unlikely that up to the time of entrance he had acquired any real experience in organized industrial effort. He probably was still schoolboy raw material with the schoolboy viewpoint of business or professional life.

More likely than not his decision to study a branch

of engineering was reached in the last few months of high school. But even if youth could determine its trends two or three years before entrance into a university, the high schools, as presently constituted and arranged, could not differentiate their curricula to provide more specific training for that small percentage of youths already thinking of engineering as their future profession. So the university is given the task of beginning and completing its contribution to an engineering education in one hundred and fifty weeks.

I do not believe a university can turn out usefully and satisfactorily trained engineers—at least from the raw material now supplied them—in such a brief period. And when we consider the limitations now being placed on parents' earnings by that "more abundant life" so beloved by our fireside orator, it does not seem feasible, at least in the near future, to extend generally four year engineering courses to six years. I fear that such a plan might result in removing some of the most promising material before completion of the full course and, as a corollary, the placing of an undesirable emphasis on family circumstances.

Rather, it is my opinion that some large part of the engineering students should be drawn from special preparatory schools—technical high schools or institutes if you will—where the two years prior to university entrance would be principally devoted to the study of English, mathematics, economic history, chemistry, physics, mechanical drawing and shop, and a foreign language, preferably German.

If arrangements could be worked out so that in the summer preceding university entrance these technical school youths could be employed in industry (and personally I would not care very much about the relation of the industry to the precise type of engineering education contemplated), they would not be schoolboy material entering an engineering school as an extension of school-boy days, but some proportion would be willing neophytes

ready to understand and undertake what should be their pride of accomplishment — a reasonably well-rounded education in engineering fundamentals.

Special preparatory schools seem a long way off, but as a practical intermediate step there seems to be merit in a five year course for the degree of Bachelor of Science in Engineering, with curricula so devised that men could graduate in four years with a Bachelor of Arts degree if circumstances made the fifth year impossible. Also, as the personnel departments of industries are reaching back with offers of positions to third year men, if and when they graduate with a Bachelor of Science degree, would it not be an appropriate and equitable arrangement for industry to foot the bill for the fifth year of its selected men?

I can agree with everything Professor Lewis has said on the inadequacy of available training for engineering students in the social sciences, but here again I have the feeling that some participation in organized industrial effort, preferably beginning in the summer before entrance and in some of the succeeding university years, would quicken interest in the study of psychology, sociology and even economics by making them real instead of abstract subjects.

It is unfair to permit youth to be a schoolboy until a degree is secured and then suddenly to demand an ability to understand men and be welcomed as a man among men.