

## PROFESSIONAL ASPECT

### Field Practically Unlimited--- Importance Of Chemistry

When Hamlet suggested "Why may not imagination trace the noble dust of Alexander, 'til he find it stopping a bung hole?" Horatio thought this strain on his imagination too severe; his intellect could not conceive of so wonderful a transformation. Were Shakespeare to write today, however, he would need but a very superficial knowledge of the triumphs of modern chemistry to recognize that Hamlet's was but a very simple proposition. The popular magazines in recent years have done so much to exploit the achievements of chemistry and its influence upon our modern life, that it is but necessary to refer to current literature, for example last week's Saturday Evening Post or Munsey's Magazine for March, to realize the marvellous changes which chemistry has wrought.

An artisan is limited in his work by the tools at his command; an architect by the building materials available; what are the restrictions of the chemist? Clearly he is limited only by the reagents which will submit themselves to chemical change or interaction. But with the exception of argon, neon, and one or two other rare elements, all the materials of the universe are capable of chemical reaction, and all are available for his work. From this point of view the field of the chemist is unlimited, and one need but consider the advance made in the last twenty-five years, to predict the progress of the future.

The man who carried on industrial processes based upon these chemical reactions has always been an important member of the community. Even in the most primitive conditions of society the men who smelted the iron and tanned the leather, dyed the fabrics and burned the pottery, were those who contributed the necessities as well as the comforts to the race. These men were industrial chemists in the sense that they knew the properties of certain raw materials, and the changes which they were able to bring about in them by the agencies at their command. But so long as these industrial processes remained purely empirical, progress was excessively slow and the different industries benefited each other but little. With the development of the fundamental principles underlying all chemical change and the establishment of the elementary laws of chemical science, all these industries were found to rest on a common basis, and in proportion as the theory of a process became understood its utility and efficiency increased.

The phenomenal rapidity with which the science of chemistry has developed in the last fifty years, and the progress with which chemical investigations are still being carried on, makes the profession based on chemistry of increasing importance to the community.

The two Institute courses founded upon chemistry, namely Course V and Course X, are differentiated in that the former, after laying a substantial foundation in the fundamental principles of chemistry, allows the student the privilege of moderate specialization in certain particular fields of chemical work, while the latter, also furnishing an equally good foundation in chemistry, devotes an equivalent portion of the time to the principles of mechanical and electrical engineering. The options of the course in chemistry permit of following lines which lead naturally to first, the profession of a teacher of chemistry, or a research worker in chemistry. Much has been said lately about the inadequate salaries paid to teachers; but teachers of chemistry are not unknown to us whose salaries are larger than those of their technical brethren. For the adequately trained research chemist this is an ever-increasing field for employment. While ten years ago there was not, to our knowledge, a single research laboratory in the United States, now there are, exclusive of the research department of educational institutions, eight and possibly more, large manufacturing firms which support well-organized laboratories devoted exclusively to chemical research.

The second option equips more espe-

cially for general analytical work. While it is true that what may be called the "pure chemistry" of the early times, namely alchemy, was largely given to fraud of one kind or another, the graduates of Option Two are especially equipped for detecting and combating fraud. The openings in federal, state, and municipal laboratories for the control of foods and drugs are multiplying rapidly, and it will not be long before commercial products other than foods and drugs will be subjected to government inspection and control. The rapidly growing practice for manufacturing organizations to buy and sell upon specification is also calling for men of this general training.

The third series of optional studies of Course V, include bacteriology together with other courses dealing with the problems of sanitation and the public health. The general awakening apparent throughout the entire country and the interest now taken in questions of pure air and water supplies, the disposal of garbage and sewage, the pollution of streams by manufacturing wastes, and similar topics, increase the already large demands for men with the equipment furnished by this option.

The course in Chemical Engineering is essentially the preparation for the man who would apply his knowledge of chemistry to the manufacturing industries. But in order to manufacture economically on a large scale, as complete a knowledge as is possible of mechanical engineering is necessary. With this end in view, in addition to offering a thorough training in chemistry, fundamental courses in drawing, mechanism, applied mechanics, steam engineering, elementary electric engineering, etc., are introduced. Such a course should equip a man not only to originate ideas relating to the application of chemistry, but should enable him also to carry these ideas into effect. In a manufacturing business based upon chemical changes he is able not only to diagnose the ills of the patient, but to prescribe a remedy, and to operate if necessary.

There was a period in our industrial development when "increased production" was the watchword of the day. Our unsurpassed wealth of raw materials made it possible to operate at a profit in the face of the most extravagant wastefulness. But evidence is everywhere at hand that a change has come over the manufacturing public, and while we still strive for increased production, more attention is constantly being paid to increased efficiency of production. In the industrial progress of the future, the chemical engineer will play an important part. From the Research Laboratory, where his composite chemical-engineering training makes him particularly valuable, to the details of factory design, equipment and operation, the chemical engineer will be more and more an indispensable factor in determining the prosperity of the country, and the comfort and material well-being of its inhabitants.

## WATER ANALYSIS

By MRS. E. H. RICHARDS.

Of all the varied problems brought to the chemical laboratory for solution none has had more perplexing history than that of deciding on the quality of water for different uses. No technical subject ever had a hotter warfare over methods than was waged between 1860 and 1880 over the determination of organic matter and its significance in water. The earliest investigations in America in these directions were made for the Mass. State Board of Health in improvised laboratories in the basement of Rogers Building, 1872-1875, when the foundations for subsequent methods in general use were laid.

In 1884 a course in sanitary chemistry to include water analysis was established at the Institute. It was, as so much of the Institute work has been, in response to the demand, coming from those in the field, for more work than they had received. In the twenty-six years the laboratory notes have been rewritten fourteen times, in the attempt to keep up to date. The positions which former students hold in the world of Sanitation, as well as their statements in regard to the course seem to offer abundant proof of the success of this attempt.

In line with this policy of keeping up with the times, the laboratory has recently been rearranged and refitted in accordance with the most modern practice.

# ARTHUR D. LITTLE, Inc.

## Laboratory of Engineering Chemistry

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Four courses come to the laboratory for the various branches of water analysis; Courses V. and VII. take up only sanitary analysis. Their work is really more of an educational than of a technical nature. Course V., fourth year, learns the necessity of the application of refined methods to the determination of small quantities and how to handle apparatus without contaminating it. They are also trained in the use of color reactions for the determination of very minute amounts of the various impurities occurring in water.

The students get an outlook into the great field of chemical operation through another door. They put in practice all the manipulation they have learned in preliminary courses.

Course VII., third year, receives a similar training but with a leaning towards those methods and operations which are the result of, or accompany, bacterial action, the work being a link in the chain of the correlated sciences.

Students of Course X. who follow their profession will have very serious problems to face—becoming more serious each year—relating to quality of water for manufacturing purposes, and especially to the effects on boilers and pipes. They must be prepared to watch the new conditions imposed by treated waters and the subsequent use of these waters for irrigation, etc.

For these students a short course as an eye-opener is given in the fourth year. Three or more samples from different sections of the country are examined for their principal characteristics. This examination then forms the basis of judgment as to what industries the water is suited, or to what it may be suited by treatment. References are given and discussed concerning the subjects to watch for in current literature. A compact little laboratory manual has been prepared covering the needed work in industrial water analysis as it can be given in a half school year.

In the third year, Course XI. uses this same manual for a somewhat similar though more complete course in industrial water analysis.

In the fourth year the laboratory gives Course XI. a very complete course in water analysis and water supplies. This work while chemical in nature is approached from an engineering standpoint.

The great aim of the laboratory in all the courses is to present such problems as may be met with in actual practice and in this way to present to the student a professional point of view.

## CHEMICAL SOCIETY

Popular With Students And  
Members Of Department

The chemical society organized in 1903 has ever been successful in its attempt to further the interests and broaden the point of view of its members.

Although having a considerably smaller membership than many of the professional societies, the meetings are well attended. Students who are taking chemistry in the second, third, and fourth years are eligible for membership, and the annual dues are fifty cents.

The chemical faculty have always shown a keen interest in the affairs of the society, evidenced not only by their attendance at the meetings and dinners, but also by their willingness to present subjects in which they have specialized and which are of great practical benefit to the students.

During the year at least one banquet is held, and each month one or more men, prominent in some special branch of work, presents a topic of general interest. As is true of all similar societies at the Institute, greater interest by the members will give greater satisfaction in that it will stimulate the officers to greater activity and warrant holding meetings more often than is now practicable.