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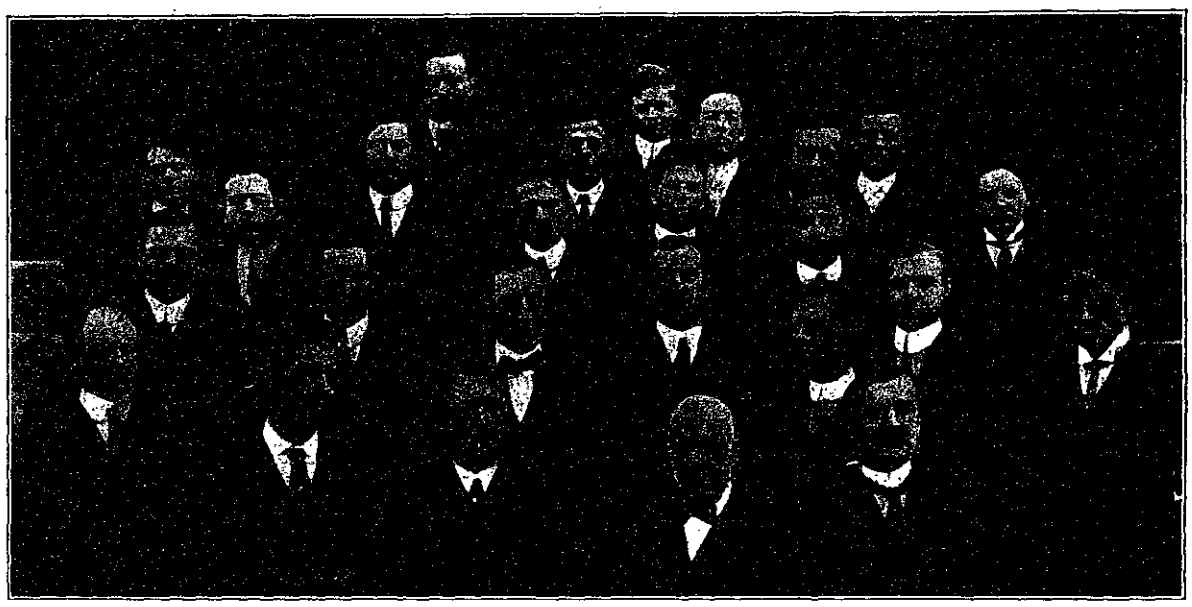

Instructors and Students in Courses VIII and XIV

ELECTROCHEMISTRY

By H. M. GOODWIN.

Course XIV—Electrochemistry—is of so recent development at the Institute that its history is necessarily brief as compared with that of most of the other Institute Courses. A consideration of the evolution of the course into its present form and of the conditions in the industrial world, which have led up to its establishment and given rise to the profession of electrochemistry, is not without general interest however, and should be of value to those who are contemplating electing electrochemistry as a profession. It will indicate the character and scope of the problems which an electrochemist is likely to be called upon to solve and will help to answer the question so frequently asked by prospective students, "What is Electrochemistry, and for what does it prepare a graduate on leaving the Institute?"

As a recognized profession, electrochemistry is the most recent of those which have arisen through the application of electricity to industrial problems of the day. Its evolution has taken place in much the same way as that of electrical engineering, which in the early eighties was hardly more than that branch of applied physics dealing with the application of electricity to such infant industries as telephony, electric lighting, and later electric railroads, etc. The first Course in Electrical Engineering in this country was offered at the Institute in 1882 as a distinct branch of the Course in Physics,—"Physics B." From small beginnings it has developed, until at the present time it is second to none in importance and magnitude. As soon as it became apparent that a demand for men trained in the combined sciences of electricity and chemistry was becoming felt in the community, the Department of Physics likewise inaugurated the Course in Electrochemistry, at first as an option of Course VIII,—"Option 3,"—this being a natural development of the instruction in electrochemistry which had been given regularly by the writer to students in physics and in other courses since 1894. The curriculum of studies forming this option was first announced in the spring of 1901, the course being at that time, it is believed, the only one of its kind offered in the United States.

During the summer of 1901 the writer, accompanied by Professor Thompson, made a tour of the electro-

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HISTORICAL SKETCH OF THE COURSE IN PHYSICS

By CHARLES R. CROSS.

From the first conception of the plan of the School of Industrial Science of the Institute in the mind of its founder, Professor Rogers, the importance of the study of physics, both pure and applied, was clearly recognized. In that remarkable document, "The Objects and Plan of an Institute of Technology," issued in 1860, it is said under the heading "School of Physics," that "another leading department of the School of Industrial Science would be that of General and Applied Physics," and this is followed by a detailed statement of the nature of the study thus contemplated. And from the opening of the institution to students down to the present day the subject of physics, together with mathematics and chemistry, has been assumed by the faculty to constitute the basis upon which the professional instruction must necessarily rest,

In the "Scope and Plan of the School of Industrial Science," 1864, Professor Rogers further sets forth the desirability of laboratory instruction in physics beyond the customary lecture courses, whereby the student may be taught the processes employed in various physical measurements.

This conception of a physical laboratory, designed for the regular systematic teaching of students in classes, was an *entirely* new one in every respect. Advanced students had carried on physical researches in the foreign universities, and in a few instances, as in Sir William Thompson's laboratory in the University of Glasgow, undergraduate students apparently had sometimes been allowed to work as volunteers, to aid the professor in some of the researches upon which he was engaged at the time, but, so far as it appears, nothing beyond this had been suggested. In this country there was no instruction given in the subject beyond the ordinary collegiate courses of lectures.

It was not until several years after the opening of the Institute that the original intention of Professor Rogers could be carried out. It was a matter of great difficulty to organize such a laboratory. There was no experience elsewhere which could serve as a guide; the methods which had sufficed in the chemical laboratory were not applicable, a series of experiments had to be devised which were within the grasp of undergraduate students, which should be capable of completion within one or two hours, together with apparatus of a simple character, not too complex for ready manipulation by the unskilled student. There was no text-book available, so that one had to be written for the purpose, and manuscript notes had to be used meanwhile, as there were then none of the present neostyling processes in existence and the typewriter was a thing of the future. Furthermore, there was the very serious difficulty of expense, since it was quite beyond the power of the Institute to purchase any considerable number of instruments of precision. These obstacles were all surmounted, however, by the knowledge, skill, enthusiasm and indefatigable perseverance of Professor Edward C. Pickering, then Thayer Professor of Physics at the Institute, and the Corporation having assigned the needful room, in October, 1869, the Physical Laboratory of the Institute was opened to students, and systematic laboratory instruction to classes in physics was then given for the first time in the world. A little later the Corporation voted to give the laboratory the very appropriate title, "Rogers Laboratory of Physics."

The rooms originally assigned to the laboratory were those in the Rogers Building, now numbered 12, 13, 14, and the west half of the present General Library, the remainder of which was subsequently added. The physical lecture room was next to the President's office, where rooms 10 and 11 are now.

Several students in the Institute, of whom the writer was one, even prior to the opening of the laboratory, had desired to make a specialty of the study of physics to a greater or less extent, and to such persons more detailed instruction had been given, including considerable experimental work. Also, a little later, a number of advanced students entered the newly-established laboratory to pursue special investigations, which resulted in the publication of several valuable scientific papers. During the summer of 1872 the laboratory was opened for the benefit of a number of college professors who were desirous of studying there. These facts made it apparent that there had come to be a distinct need of a systemati-

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PHYSICS AND ENGINEERING

By LOUIS DERR.

If we follow the dictionary and define engineering as the art of constructing civil or military works which require a special knowledge of machinery and the principles of mechanics, we may at once declare that the relation of physics to engineering is that of the foundation to the house; for the laws of motion and the action of forces are among the fundamental propositions of physics. Widely differing applications of physical laws are made in the various branches of applied science, but the fundamental principles are the same in all. In fact, the extension of engineering into fields previously unknown makes a good knowledge of physics indispensable to the engineer, many of the most important problems of engineering being really questions of physics rather than of engineering as such.

This is especially true in engineering research. The extension of our knowledge of the properties of steam, both saturated and superheated, affords problems of great difficulty, but of physics rather than mechanical engineering; the increasing use of high and low temperatures in the arts necessitates the development of methods for their measurement and control, and these too are primarily physical rather than mechanical problems. The endeavor to produce better illumination for our streets and houses at a smaller energy cost has brought forth a host of new illuminants, the investigation and improvement of which are studies for the physicist rather than the electrical engineer. The fixation of atmospheric nitrogen, perhaps destined to have a profound effect upon agriculture, seems to be a problem in physics having very little to do with chemistry; the development of telephony and telegraphy, "wireless" and otherwise, is the story of the discovery and adaptation of one physical fact and law after another; and the list might be extended indefinitely. Physics does not concern itself with the great tasks of organization and finance; but no engineering project can be permanently successful that is not built solidly upon the natural laws that have been discovered and unified by patient investigators whose very names are in many instances forgotton.

It is not necessary to limit the argument to the advanced problems of research. A knowledge of some of the simpler propositions of physics will oftentimes save considerable wasted effort in every-day work. A few instances may be of interest in this connection,

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