There are other matters in connection with this question which appear to be of more importance than the pure questions of technical training, and which are deeply rooted in English custom and feeling.

In the first instance, engineers have from time immemorial in this country (England) been educated by an apprenticeship to other engineers. The result has been more or less hand-to-thumb methods. This, of course, can be improved by direct technical training of the character given in America to engineers.

English industries, however, are conducted under two bureaus of administration—commercial and technical. The attitude of the commercial direction always tends towards the greatest immediate result, which usually takes the form of the least outlay of capital. The tendency of the engineer is to get the minimum production cost per unit, which involves large outlays of capital. Neither side is entirely right, and in America this has been successfully overcome by educating the commercial bureau as engineers. In other words, our engineers are administrators instead of consulting men, so that any improvement in English industries must come by a reorganization of their method of administration, as much as by superior education of their men, and this is a matter which can not be accomplished by technical education, and, in any event, would be of very slow growth. There are many hundreds of American engineers in the employ of English concerns, and almost universally they are in executive positions. The whole of the gold mining industry practically is under the direction of American engineers, and England owns mines yielding fully seventy-five per cent. of the gold output of the world, and the American form of administration has been introduced into this industry almost universally.

Another matter which enters into the great English question is that social dignity does not attach to the position of engineer. In the English social mind, the engineer is still an artisan or a tradesman, and the distinction of the engineer as a professional man of equal rank and personal attainments to any other profession has but few advocates in this country. The consequence is that the young men of better families, looking about for a profession, must choose either the law, the church, the army, the navy, medicine or the civil service if they hope to attain social dignity. The result is that it would be very difficult to draw the average brains of the country into the technical branches, whereas I think the feeling in America is quite to the contrary.

HERBERT C. HOOVER.

LONDON.

SCIENTIFIC BOOKS.

RECHERCHES SUR LES SUBSTANCES RADIOACTIVES.

OF the half dozen books which have recently appeared on radioactivity, two are of commanding importance, for they contain the records of the epoch-making work of the two investigators to whom we are most largely indebted for our present knowledge of the phenomena in question, E. Rutherford and Mme. Curie. Of these two wholly dissimilar treatments the former is the more comprehensive and perhaps the more suggestive; for, from beginning to end, it is a presentation of a well-developed theory of the cause and nature of radioactivity. Facts are everywhere grouped about, and fitted into, and interpreted in the light of this theory. On the other hand, Mme. Curie's 'Researches sur les Substances Radioactives,' now appearing in its second revised and corrected edition, deals very sparingly and very conservatively with theory. It is primarily a record of the experimental researches which have been made by herself and her husband during the past five years. Nevertheless, the work of other experimenters is given ample attention, so that the book constitutes a very complete and concise résumé of the present

state of our experimental knowledge of the subject.

The first chapter is a description of Mme. Curie's now well-known researches upon uranium and thorium compounds—researches which led (1) to the discovery of radium, polonium and actinium; and (2) to the announcement that radioactivity, whatever its nature, was an atomic property. This last announcement was based at first upon perhaps rather meager evidence, but it has since met with fuller and fuller confirmation. Nevertheless it still needs more complete investigation.

In the second chapter is found a description (which Madame Curie is of all persons most competent to give), of the methods which have been used in the separation from pitchblende of radium, polonium and actinium. The chapter concludes with an account of what is perhaps the most important work which has come from the hands of Madame Curie, viz., the determination of the atomic weight of radium. Any one who is familiar with the details of this work will be little inclined to credit the correctness of determinations which lead to values other than 225.

The third chapter deals with the nature of the radiations from radioactive substances—a subject in which Rutherford's experiments first brought order out of confusion, but to which the contributions of the Curies have been of but little less importance. The proof that the Beta rays impart negative charges to conductors upon which they fall, and the inverse proof that the body from which these rays emerge is left with a positive charge, were first made by Mme. Curie. Again, the study of the penetrating power of the Alpha rays of polonium, in which the important discovery was made that the fraction of the rays absorbed by various media increases with the thickness of the medium already traversed, was made first by the Curies. It is very difficult at present to reconcile this discovery with Becquerel's conclusion that the magnetic deviability of the Alpha rays diminishes with an increasing distance from the source. The third chapter contains also the important work in which M. Curie demonstrated the ionizing action of radium rays upon liquid dielectrics, and showed that this action is wholly independent of temperature. The chapter concludes with a description of the heating and luminous effects produced by radioactive substances—subjects in which the greater part of the knowledge which we now possess has come from the Curies.

The last chapter, upon induced radioactivity, is perhaps the least satisfactory of any in the book to the student who is not already thoroughly familiar with Rutherford's work on radioactive change, and on the nature of excited radioactivity; for he will be likely to find himself confused by a mass of disconnected facts. Madame Curie is evidently not yet completely converted to the disintegration theory of radioactive processes. She therefore adopts the conservative method of confining herself in the main to a presentation of the existing state of our experimental knowledge, leaving to the last three pages of the book the discussion of the various hypotheses which have been advanced to account for the emission of energy exhibited in radioactivity. Here she presents briefly the four following hypotheses, (1) Atomic disintegration of the radioactive substances; (2) transformation of gravitational energy; (3) absorption of some unknown form of ether energy; (4) atomic disintegration of other substances induced by the presence of a radioactive substance. Although she inclines less markedly than most of us toward the first, a leaning in that direction is nevertheless observable.

R. A. Millikan.

University of Chicago,
October 19, 1904.

International Catalogue of Scientific Literature. First Annual Issue—L—General Biology. London, Harrison & Sons. 1903. Pp. xiv + 144.

This branch of the 'International Catalogue of Scientific Literature' is stated to include the following: "(1) Literature dealing with methods of work and investigation common to all branches of biologic science; (2) Literature dealing with the morphology, development or physiology of living organisms

in general, in so far as the differences between animals and plants do not enter into consideration; (3) Literature dealing with the study of the cell generally."

There are five main headings: 'General'; 'Methods and Apparatus'; 'General Morphology'; 'General Physiology'; 'General Cytology.' That the classification of subject matter is scarcely more than a beginning, is shown by the very small number of subheadings, only 87 numbers out of a possible 9,999 being used. Under 'General Morphology' there occur only four subheadings, namely: 'General'; 'Tectology (Structure of the Individual)'; 'Promorphology (Fundamental Principles of Structure)'; and 'Teratology'; which are numbered 1,000, 1,100, 1,200 and 1,500 respectively, all other numbers from 1,000 up to 2,000 being yet unfilled. 'General Physiology' and 'General Cytology' are somewhat more elaborated, but in the former there are only thirty-two subheadings, and in the latter only thirty-one, out of a possible four thousand in each case. It is easy to point out important omissions which might readily have been avoided. Such a voluminous subject as 'regeneration' is not mentioned. While 'senescence,' 'degeneration' and 'death' are all present, 'growth' is wanting. Physiological articles are found under both 'General Physiology' and 'General Cytology.' Some of the subjects which were pointed out in a previous review (SCIENCE, XIX., No. 493, p. 886) as absent from the branch of the catalogue devoted to physiology proper, are here found under 'General Cytology.' These include 'irritability' and 'fatigue,' but 'summation of stimuli,' 'rhythm,' 'specific energy' and 'automaticity' are omitted, while no mention is made of the tactic irritabilities. If articles on the physiology of the cell are to be indexed in both branches of the catalogue, it would seem to be the most logical and convenient arrangement to employ the same classification for both; but this method is not followed, and with the exception of cross references there seems to be no relation whatever between the two.

The present volume is supposed to include the literature published in 1901, together with a portion of that of 1902. Nine hundred and eighty-two articles are catalogued. The number of American journals is thirteen, of which the *American Naturalist* is credited to the United Kingdom. Cross references to other volumes of the catalogue are very numerous and tend to compensate for the incompleteness of the present volume.

The general impression left by an examination of the volume is that in its present form it is tentative and inadequate. It might easily be made a valuable adjunct to the volumes on botany, zoology, physiology and bacteriology.

FREDERIC S. LEE.
COLUMBIA UNIVERSITY.

SOCIETIES AND ACADEMIES.

THE SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

THE first regular meeting of the club for the year 1904–05 was held October 25, at 7:30 P.M., in the physical lecture room of Science Hall. Dr. V. Lenher gave an account of results obtained in a preliminary study of the gases dissolved in the water of Lake Mendota. It was shown that the amount of oxygen dissolved in the water of this lake decreases rapidly when the thermocline is reached, at a depth of about twelve meters, and that the carbonic acid in the water increases, so that while the surface water is faintly alkaline from dissolved calcium carbonate, the reaction of the water at this depth becomes acid.

The second paper of the evening, by Dr. S. Weidman, treated the subject, 'Wisconsin Iron-Ore Deposits,' with especial reference to the Baraboo district. The first year's shipment (1904) from the newly-discovered Baraboo district in Sauk County will probably reach 100,000 tons. The ore lies in the synclinal valley between the Baraboo quartzite ranges. The ore, associated dolomite, slate and quartzite are of pre-Cambrian age, like the formations in the Lake Superior iron districts. The valley is covered with upper Cambrian sandstone, and explorations are carried on by drilling through this formation. A number of good ore deposits have been