complaint that the author "keeps on assuming that all of Euclid's theorems are as familiar and available as his first axioms, which is far from true." The occasional brief notes of the translators are helpful in the full understanding of the text.

The Dialogues were published in 1638, when Galileo's life was nearly at an end, but it is shown by Professor Favaro in the scholarly introduction which he contributes to this edition, that most of the discoveries described in them were made many years before, while Galileo was at Padua.

The book is printed in a manner worthy of its contents. The diagrams and illustrations are reproductions of the originals. In publishing this translation the authors have done a service to all English-speaking students of the history of physics.

W. F. MAGIE

Chemistry and Its Borderland. By ALFRED W. STEWART, D.Sc., lecturer on organic chemistry in the Queen's University of Belfast, etc. With 11 illustrations and 2 plates. Longmans, Green and Co. 1914. Pp. xii + 314. Price $1.50 net.

The scope of this book is best shown by giving the titles of the fifteen essays of which it consists. They are: The Ramification of Chemistry, The Allies of Chemistry among the Sciences, The Relations between Chemistry and Industry, Immuno-chemistry and some Kindred Problems, Colloids and the Ultramicroscope, The Work of the Spectroscope, Chemistry in Space, The Inert Gases and their Place among the Elements, Radium, Niton, Transmutation, The Nature of the Elements, Chemical Problems of the Present and Future, The Methods of Chemical Research, and The Organization of Chemical Research.

The first three of these essays, as well as the last three, appeal most interestingly to the general non-technical reader. The others, which deal with special developments of chemistry, would hardly be intelligently read by those who have no chemical training, but they do serve well to give the chemist a comprehension of the work that is going on in other branches of his specialty. These particular chapters are, however, somewhat lacking in clarity, especially that on immuno-chemistry. It is difficult to describe advanced work in any chemical field in easily comprehensible language, and a failure to put the theories of Ehrlich and Metchnikoff successfully into popular language is not to be wondered at. Perhaps it is hardly worth while to try.

The essay on Chemical Problems of the Present and Future presents an interesting discussion of the part to be played by chemistry in energy and food supply. As possible developments along the line of sources of energy are suggested more efficient storage batteries and primary batteries, improved methods of utilizing solar radiations, artificial coal, the use of explosives in gas engines, and the use of radium. In discussing food supply the question of fertilizers is dwelt upon, with comments on the annual loss of $80,000,000 in the nitrogen of sewage carried into the sea. The future use of the seaweeds of the Sargasso Sea is mentioned and a good description is given of the fixation of atmospheric nitrogen in the electric furnace. A second division of the food problem is the discovery of new supplies. These may be materials which have hitherto, as foods, gone to waste, as oleomargarine, or they may be synthetic foods. At present the latter are too expensive to be thought of, but processes for their manufacture on a large scale may some time be discovered. This leads the author to a brief discussion of the possible synthetic production of living tissue.

> We have the means of building up more and more complex protein derivatives, and, sooner or later, we shall probably synthesize substances quite as complex as the natural protoplasmic materials; when this point is reached, unless our knowledge of "vital" reactions has considerably advanced, we shall at best be in the position of a watchmaker who has constructed a watch but has forgotten to make any contrivance for winding it up. At this point, chance might enter into the problem, and the protoplasmic machine we have designed might spontaneously set itself in motion, but more than this we are not entitled to

expect. Experiment is the only possible test, and the date of the crucial trial is still far distant.

This, however, does not prevent the author from indulging in an interesting speculation:

> Suppose that this new protoplasm had properties slightly different from those types which we know; its accidental discovery might involve us in very serious consequences. Assume that it had great powers of assimilation and reproduction, and we might find it rather a dangerous neighbor, so that finally the new discovery might end in the rapid extirpation of the long-sought-for product. Even more serious, however, would be the state of things if the synthetic creature resembled our ordinary bacteria, and was capable of lodging in animals, and there liberating new forms of toxins against which we are not immunized. It is just a possibility, but it would certainly be a most awkward end to an experiment.

The further career of this future Frankenstein may be left to the speculations of H. G. Wells.

The essays on chemical research may well be commended to every one interested in the future of those industries which are in any way connected with the applications of chemistry. While written from an English standpoint, they are none the less applicable in America. In both these countries the future held out to the student of chemistry is by no means attractive and the expectation of adequate remuneration for a life work is less than in many other fields. Yet the future of these industries is bound up with chemical research, and that not merely in the field of the direct applications of chemistry, but even more especially in the field of pure science, and here it is that there is the least hope of adequate remuneration. The outlook is nevertheless not without hope, both in Britain and in America. The foundation of the Carnegie Trust for the Universities of Scotland and the Science Research Scholarships of the Royal Commission for the International Exhibition of 1851 are dwelt on at length, as steps in the right direction, and in an appendix is set forth the Outline of a Scheme for the Improvement of Research Conditions, worthy careful perusal, however much one may disagree with some of the suggestions.

The book is well written and comparatively free from errors, though exception might be taken to the accuracy of occasional statements. We object seriously to the use, unfortunately far too frequent here and elsewhere, of "body" where "substance" or "compound" is meant, and we wonder if the word "researcher," for one engaged in research, has come to stay.

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Nucleic Acids. Their Chemical Properties and Physiological Conduct. By Walter Jones, Ph.D. Longmans, Green & Co. 1914. Pp. viii + 118.

Nucleic acids and their components have held, for more than a century, the interest of the chemist, of the biologist, of the physician, of the pharmacologist, and of the physiologist.

The first acquaintance with the derivatives of nucleic acid was made through the discovery of uric acid by Scheele in the year 1776. The name given to the substance betrays the scanty information of the discoverer concerning the chemical structure of the acid, hence of its exact place in the economy of the organism. The constant occurrence in the urine of appreciable quantities of uric acid may have led one to the conclusion that it belonged to the class of final products of metabolism. What was the mother substance of uric acid? The question could not be answered when information concerning the chemistry of the tissue components, or of food stuffs, was lacking.

Nucleic acids were discovered much later by Altman, a cell biologist. He was in search for an explanation of the staining properties of cell nuclei. The problem, as far as Altman was concerned, was solved by the demonstration of the presence in the cell nuclei of a substance with the properties of an acid. The substance was named nucleic acid. Altman little thought of the possible relationship of the new substance to the uric acid of the urine. On the other hand, the chemists and physicians engaged in researches on uric acid