In Memoriam

Richard Chace Tolman
1881-1948

Richard Chace Tolman, professor of physical chemistry and mathematical physics at the California Institute of Technology and dean of the Institute's Graduate School from 1934 to 1946, died September 5, 1948, in Huntington Memorial Hospital, Pasadena, at the age of 67 years, from pneumonia following a stroke which he had suffered on August 14. For more than a quarter-century one of the great leaders in the intellectual life of the California Institute, for more than a decade at different times scientific agent or adviser to the Government in critical problems, Dr. Tolman was, through the comprehensive versatility of his mind, not merely an expert student of relativity, thermodynamics, and other equally abstruse fields, but a theoretician of the structure of the universe the breadth and acumen of whose concepts had led to his being numbered among the world's greatest cosmologists.

He was born in West Newton, Massachusetts, March 4, 1881, and took his B.S. degree in chemical engineering from the Massachusetts Institute of Technology in 1903. The following year he spent in Germany, part at the Technische Hochschule at Charlottenburg, Berlin, and part in an industrial chemistry laboratory at Crefeld. Returning for graduate study at the Massachusetts institution, he served as research associate in theoretical chemistry for two years and in physical chemistry for two years thereafter, receiving the doctorate in 1910. After service in chemistry on the faculties of the Universities of Michigan, Cincinnati, and California (Berkeley), he was called to a professorship of physical chemistry at the University of Illinois in 1916.

During the first World War as chief of the Dispersoid Section of the Chemical Warfare Service, and after the war as associate director and director of the War Department's Fixed Nitrogen Research Laboratory, Dr. Tolman made his first participation in scientific affairs for the Government in time of emergency. Of marked importance in its own right, this was significant foreshadowing of the still greater contributions which he was to make years later in even more urgent circumstances.

From his War Department responsibilities Dr. Tolman went to the faculty of the California Institute of Technology in 1922, where for nearly two decades he was to have uninterrupted opportunity for the studies which brought him world prominence in science and for important and creative work in clarifying the interrelations between physics and chemistry, contributing thus to the breaking down of compartmentalization and to the consolidating of knowledge. Completing at the California Institute the elegant solution of the problem of experimentally measuring the inertia or mass of the electron which he had begun at Berkeley, he went on to a wide range of work in statistical mechanics, relativistic thermodynamics, and cosmology. In all these fields his contributions were of fundamental and lasting significance, as is well exemplified by his classic *The principles of statistical mechanics,* which appeared in 1938.

This period of rich productivity was not permitted to continue; in June 1940, foreseeing the crisis that lay ahead for the United States, Dr. Tolman came to Washington to offer his services to his country. For the next six years he was to have a primary responsibility in the joined efforts of science, industry, and the military which were essential to, and successful in, preserving the free way of life. He served as vice-chairman of the National Defense Research Committee from its inception and had special cognizance of problems of armor and ordnance. He played a very important role in the early inspiration that led to development of the proximity fuse and of rockets. Throughout the arduous and complex undertakings which led to the development of atomic bombs, his knowledge and acumen were of the first order of importance. Not only did he serve as scientific adviser to Gen. Groves from the establishment of the Manhattan District and as U. S. adviser to the wartime Combined Policy Committee, but once the bombs resulting therefrom had put an end to the war, he became chief technical adviser to Mr. Baruch, U. S. representative to the United Nations Atomic Energy Commission, in its endeavors to develop sound means for control of the weapon and development of the peaceful uses of atomic energy. In these exacting assignments he was in the highest sense a scientist-statesman. The U. S. Medal for Merit and the rank of honorary Officer of the Order of the British Empire came to him in recognition of that fact.

Of profound scholarship and unsparing intellectual rigor, Richard Tolman was, in addition, a man of great wisdom and personal kindliness. Outstanding as

was his ability in research, it was more than equaled by his skill in teaching, and that, as always, was owed to wisdom and kindliness. In his own being he combined the ethical insight and scientific intelligence on which, taken together, he based his faith, declared at Brown University in 1947, "that the control of evil is possible. I am sure," he said in that address, "that humanity will continue to encounter great troubles, but I do not think that civilization will destroy itself. To surmount our troubles, we shall need courage, and patience, and clarity of thought, and sincerity in the advocacy of fair and reasonable courses of action. For these virtues we may pray, each in his own fashion."

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Book Reviews

Cancer, I, Hérédité, hormones, substances cancérigenès. J. Maisin. Paris: Casterman, Tournai-Paris, 1948. Pp. 248. 84 fr.

In the Introduction the author states that he has written this book for intellectuals not specialized in the cancer problem, although he hopes that the physician and even the cancerologist may draw some benefit from reading it. This statement alone suffices to explain the high qualities of the book. For if an intellectual from a field writes for another intellectual from another field, he will, naturally, maintain his subject on a plane high enough while avoiding tedious detail and an excess of technicalities. On the other hand, since he can rely on the receptiveness of mind of his reader and his general background, he will try to go to the essence of the facts and the biological problems therein involved. By doing so, these problems detach themselves from the strict branch of science from which they have emerged and become universal biological problems. Dr. Maisin has fully succeeded in making himself understood by another intellectual, and his hope of capturing the interest of the specialist has been fulfilled.

Whatever should be known of the work done on cancer in order to understand future developments is succinctly given in the first pages of the book together with pertinent historical data. The author then goes into a complete survey of the three main subjects of this volume: the relation of cancer to, first, heredity; second, hormones; and third, certain chemical substances called carcinogens. This he does brilliantly.

We are all aware of the appalling number of significant contributions to these subjects during the last 20 years. All of them are reviewed by the author, and the references are appended in an orderly fashion. The author does not list these coldly, leaving to the reader the task of drawing his own conclusions on the basis of the raw material displayed. The reader is constantly helped in this task by the author, who selects the facts, uses the right adjectives to qualify them, and often gives his own opinions on the problems, to many of which the School of Louvain has actively contributed.

One notes in the book the predominance of American literature, especially during the last 8 or 10 years. Interesting contributions from Europe have appeared, however, even during the war, and those from France and Belgium are not generally known among American cancerologists. Inclusion of these still further enhances the value of the book.

In several ways Maisin's book reminds one of that written by Charles Oberling and published in 1942. This book, which was translated into English, has been avidly read and has had a decided influence on many minds. The same should be done with Maisin's book following publication of the second volume.

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Outlines of physical chemistry. Farrington Daniels. New York: John Wiley; London: Chapman & Hall, 1948. Pp. viii + 713. (Illustrated). $5.00.

As Prof. Daniels states in his preface, *Outlines of physical chemistry* is to be regarded as the first edition of a new book. The high standards set by Getman and by Getman and Daniels in their previous well-known and widely used texts on physical chemistry have been maintained, but progress in research in physical chemistry required a rewriting rather than merely a revision.

The author's point of view is perhaps best presented by quoting a statement from the introductory chapter: "Usually science progresses by inductive reasoning from a few facts, follows with deductive reasoning based on the hypotheses, and, finally, tests by experimental measurements designed to prove or disprove the theoretical deduction. Many hypotheses are destined to be discarded when new facts and more precise data are obtained, but they fulfil a very necessary function in the development of science. A successful hypothesis is not necessarily a permanent hypothesis, but it is one which stimulates additional research, opens up new fields, or explains and coordinates previously unrelated facts. The scientist needs imagination in creating new hypotheses, but he needs also ingenuity and skill in devising experiments to test them and critical judgment in evaluating the results."

The general field of physical chemistry is covered quite completely, and it seems pointless to list the titles of the chapters. It should, however, be mentioned that in addition to the traditional topics, excellent chapters on