ROBERT KENNEDY DUNCAN, EMINENT CHEMIST[1]

A MEMORIAL ADDRESS[2]

By Professor ALEXANDER SILVERMAN

HEAD, DEPARTMENT OF CHEMISTRY, UNIVERSITY OF PITTSBURGH

To-day marks the seventy-second anniversary of the birth of Robert Kennedy Duncan in Brantford, Ontario, Canada. Of his youth, his training for the baccalaureate degree and graduation with honor from the University of Toronto, his residence as a fellow in Clark University, his teaching in various high and preparatory schools, his graduate study in Columbia University, so much has been written that the details need not be repeated. His marriage in 1901 catalyzed his efforts and from that year to 1906 he was professor of chemistry in Washington and Jefferson College. Three summers during this period he traveled abroad, and as an additional interest to his teaching and travels wrote numerous articles interpretative of science for *McClure's Magazine*. In 1901 *McClure's* sent Duncan to Europe to visit Pierre and Marie Curie in Paris and to report on developments in radioactivity, and on his 1903 trip his objective was the accumulation of new scientific knowledge in general. The 1905 and 1906 trips were made for *Harper's Magazine* to furnish enlightenment on modern chemical industry in Europe, and in the latter year he attended the Sixth International Congress of Applied Chemistry in Rome, where his idea of industrial research fellowships got its inception. Duncan was impressed by the contacts between industry and men of science, and the consequent cooperation of science and industry, in parts of continental Europe. Returning to America, he transferred in 1907 to the University of Kansas, where he was appointed professor of industrial chemistry and where he established his first industrial fellowship.

Having known the very first fellows and also Duncan and his successors, I find it exceedingly interesting to follow the evolution of his plans. His compelling and fascinating books, "The New Knowledge," which appeared in 1905, and "The Chemistry of Commerce," which came in 1907, were under discussion everywhere in America. It is not strange that in 1909 when Andrew W. Mellon received a communication from France regarding a chemical discovery and consulted an officer of the Gulf Oil Company regarding its value he was told that, according to Duncan's "Chemistry of Commerce," the process had no utility. Nor is it strange that after having read his books Mr. Mellon and his brother Richard invited Duncan to come to Pittsburgh for a conference. The consequence of this visit was his appointment as professor of industrial chemistry and head of a new department of industrial research in the University of Pittsburgh under Chancellor Samuel Black McCormick.

Before continuing the steps in the development of the larger Duncan plan, it might be interesting to have a few side-lights. E. Ward Tillotson, of Mellon Institute, who was a fellow under Duncan in Kansas in 1909, commenting upon his early work on glass, has said: "Dr. Duncan looked upon it with a sort of reverential awe." He had just read in a journal about investigations on radioactivity and about a "glass tubule with thin walls permeable to alpha rays and yet strong enough to withstand atmospheric pressure when evacuated. To him this was a veritable wonder." Sometimes his poetical nature and idealistic vision culminated in scientific regret, as when he shared the disappointment of a manufacturer who tried to impart the clarity of Iceland spar to glass and found the reverse to occur when he introduced it. But most of Duncan's predictions have come true.

Already in 1901, when Duncan became professor in Washington and Jefferson College, he was interested in glass. He engaged in research for a local manufacturer. While his first two patents in 1903 covered the making of phosphorus, three which followed in 1904 protected a process for ornamenting glass and similar ware.

Shortly after coming to the University of Pittsburgh he made an unannounced visit to Thomas H. Howard, of the Phoenix Glass Company, saying that he had made a successful experiment in the laboratory for the production of electric light bulbs without the expensive materials ordinarily employed and that this observation might mean a great saving to industry. Duncan had already contacted several glass companies for the purpose of renting a pot, but the price was prohibitive. The appearance of Duncan, his slight build, his keen eyes, his intense concentration of thought, prompted Mr. Howard to furnish facilities. Duncan then tried the experiments personally. The results were disappointing, but his only comment was: "This is a case where science and practice disagree." Obviously, his personality had greatly impressed Mr. Howard, for later the company established a fellowship under Duncan. According to Mr. Howard, the fellow selected for the research was "a

[1] Contribution No. 415 from the Department of Chemistry, University of Pittsburgh.

[2] Delivered before the Robert Kennedy Duncan Club of Mellon Institute of Industrial Research, Pittsburgh, Pa., November 1, 1940.

good mixer, could tell a rattling good story and was a generally fine chap." Mr. Howard inquired whether he was "more full of wit and good humor than chemistry." Duncan merely answered: "Up to a certain point you are correct; he is a good fellow and a fine mixer, but he is also a bright chemist." Duncan was right. A new type of glass was developed for the company, a type entirely different from anything that had previously been produced.

Samuel R. Scholes, of Alfred University, who became a fellow in 1911, speaks of the versatility of Duncan's mind. Winkelmann and Schott had published their factors on thermal expansion of glass-forming oxides and had assigned the lowest values to magnesium oxide and boron trioxide. Scholes proceeded to prepare a glass, $MgO \cdot B_2O_3$ in composition, but found that it merely crystallized and was not glassy. At about this time borosilicate glass was in its early stages of development. Also, when the Shoop spray for molten metal was invented Duncan wondered if glass could be sprayed to produce enamel surfaces. Scholes commented that "glass was a viscous liquid that could not be blown into tiny droplets by a spray gun" and so that subject was dropped. As Scholes soliloquizes, "Just what interesting results in the production of glass wool might have resulted if we had followed that up, one can only conjecture." It seems, therefore, that there were times when Duncan had rare flashes of insight which did not necessarily materialize. We all recall how W. F. Hillebrand overlooked helium and Justus von Liebig passed bromine by. Both were discovered by other scientists. However, as a result of Duncan's beginnings, Mellon Institute has provided leading technologists for the glass industry and has completed many significant researches. The fruits in the field of glass technology are in themselves a recognition of the initial interests of Robert Kennedy Duncan.

Resuming Duncan's career in Pittsburgh, we follow him to the frame building erected in 1911 on O'Hara Street to house the first industrial fellowships, and then in 1913 we see the experiment recognized by the brothers Andrew W. and Richard B. Mellon, who founded Mellon Institute of Industrial Research and the School of Specific Industries and authorized the construction of an adequate laboratory building. In 1914 construction was begun, but unfortunately the man who had the vision did not live to see its completion. He died on February 18 of that year. The building was dedicated to Robert Kennedy Duncan and to Judge Thomas Mellon, the father of the founders.

Already in 1911 work in pure research commenced. In 1922 a department of research in pure chemistry was added to the institute. The contributions of this new department to human well-being through its studies concerning the treatment of pneumonia would alone have justified its creation, to say nothing of other developments.

Always the research quarters became overcrowded. It was a natural step in 1937 from the O'Hara Street quarters to the magnificent temple of research on Fifth Avenue. The fruition of Duncan's planting in the field of industrial research has been so generally recognized that elaboration is unnecessary. If one examines Bulletin No. 4 of the Mellon Institute Bibliographic Series, which lists the books, bulletins, journal contributions and patents by members of the institute (1911–1938), the findings are as fine a tribute to Dr. Duncan and his successors as can be found.

In a booklet published by the institute in 1924 concerning industrial fellowships is the statement, "In his allegorical romance, 'The New Atlantis,' written before 1617, Francis Bacon planned a palace of invention, a great temple of science where the pursuit of natural knowledge in all its branches was to be organized on principles of the highest efficiency." It took three centuries to find a Robert Kennedy Duncan to bring about a realization of the allegory.

This tribute to Duncan cannot close without a mention of other far-reaching aspects of his work. Duncan insisted that every fellow should render some teaching service to the University of Pittsburgh in the early contracts which he drew. At least three hours per week were indicated. While not every individual was a natural born teacher, some of the fellows were able to offer special courses which could not be had in any other institution, and it was possible to have a variety of special topics presented, probably the greatest covering industrial applications that could be found in a single institution.

To-day, specialists of Mellon Institute, although the institution is now a separate corporation, still render this valuable service to the University of Pittsburgh. In turn the university offers graduate instruction to the junior institute members, and again in turn the institute affords special equipment and library facilities which the university does not possess, which are utilized for research. Duncan's plan has created an interest of industry in teaching and of the teacher in industry. He has done even more. In his early travels abroad he remarked that certain countries, in the order of the mutual interest displayed by industry and education, had attained industrial excellence. He classified the countries in their order of supremacy on this basis. His hope to place America in the lead has been realized.

No better conclusion to this tribute can be offered than the words of Harrison E. Howe, editor of *Industrial and Engineering Chemistry,* in an editorial published after the dedication of the last building:

"An institution is the lengthened
shadow of one man."

While unquestionably the best dedication of the new home of Mellon Institute is the work of that organization during the past years, thought naturally reverts to the conception of Robert Kennedy Duncan about 1906 and to the very real application of Emerson's saying to this situation.

But it is more than that, for attracted by what might be accomplished according to Duncan's plan, a number of other shadows have appeared signifying the major contributions of many individuals. The aggregate shadow is broadening to resemble that of a great pyramid.

OBITUARY

SIR OLIVER LODGE

A COMMANDING figure in the annals of science has gone to rest with his fathers in philosophy. Sad in his loss to this world, we can not but hope that in the spirit of his own beliefs, couched in that unusual mixture of humility and strength which was of the essence of his nature, the transition for him was not so great as that which convention has attributed to the mystery of death. How this grand old man of science would delight in cementing his beliefs, so courageously entertained, by meeting in the Halls of Valhalla all his spiritual colleagues of the past and telling them of those wondrous things which it has been his privilege here on earth to see, and in which those long-departed giants of science could witness so rich a harvest of their labors.

Sir Oliver Lodge came to the active service of science in an age when physics had taken a new lease of life. The ordering of the heavens in the mind of Newton and of his followers for two and a half centuries had developed the resources of discovery to a point where stagnation was threatened. Then came a new era of promise in the discoveries of Faraday, Ampère, Henry, and that little group of philosophers whose labors became moulded by Maxwell into a coordination of thought in which more and more of the phenomena of nature, including optics, were pictured as but separate parts of the common domain of consistency of the universe. Encouraged by the detailed powers of dynamics to build mechanisms closely analogous to the large scaled mechanisms of mankind, but in the unseen world, and with potentialities to coordinate that world, the hope was that nature's greatest strongholds might now capitulate to the ingenuity of the intellect of man and become revealed to his senses in a picture harmonious with his primitive intuitions. The mathematics of McCullough and the epoch-making researches of Maxwell had provided substantial cause for a belief in the existence of an all-pervading ether which had no bounds in space, which permeated all matter, and was indeed the great sea of the universe in which all happenings took place. Born as a medium of conveyance, it began to seek a more and more dominant rôle with matter itself as nothing other than a specialization of its substance and the behavior of matter as a specialization of its movements.

Sir Oliver Lodge was one of those who seized most tenaciously upon this encouraging scheme of philosophy and all that went with it. To the end of his days matter and energy were very concrete realities to him and he liked the kind of ether that he could almost stir with his walking stick. In physics he was a strong materialist, which fact, in some respects, contrasts strongly with his acceptance of phenomena in the realm of psychical research, where again, however, he seemed to seek a substantial reality of another kind.

Sir Oliver Lodge's early interest in electromagnetic theory led in a natural way to his experiments with lightning conductors, which experiments almost anticipated the work of Hertz. Further experiments on electric waves led to his invention of the "coherer," which permitted the reception of waves over distances of considerable amount and almost led, in his hands, to a practical realization of the possibilities of wireless telegraphy on a commercial scale. Indeed, it is probably true of Sir Oliver Lodge, as of others of his epoch, that he would have been encouraged to pursue the possibility of wireless waves to a stage of achievement comparable with that of a later epoch, had his knowledge of electrodynamics been less; for in the spirit of the knowledge of the times, the wireless possibilities of to-day would have seemed outside of the realm of reason into which, indeed, they were only brought by the later discovery of things of an entirely new type, having to do with such properties of the upper atmosphere as are associated with the Kennelly-Heaviside layer.

With an eye to the practical side, Lodge invented the electrical method of dispersing fog and was associated with many other devices in the field bordering between engineering and physics. He did pioneer work in the science of electrolysis, and played an important part in that field of research, so much a center of interest of the day, in which the endeavor was to ascertain whether or not the supposed ether was carried along with the earth in its motion through space. Lodge contributed one of the pioneer experiments in this field, a field from whose birth pangs was born