NATIONAL ACADEMY OF SCIENCES

CHARLES ALLEN THOMAS

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A Biographical Memoir by

R. BYRON BIRD

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CHARLES ALLEN THOMAS was elected to the National Academy of Sciences at age forty-eight and was, in addition, chosen to be one of the twenty-three Founding Members of the National Academy of Engineering when he was sixty-four[1]; also, he was elected a Fellow of the American Academy of Arts and Sciences at age sixty-seven. He was a distinguished scientist, an important figure in the Manhattan Project, a prolific inventor, a leader in the chemical industry, an outspoken and effective advocate for higher education and research, and an energetic public servant. Several articles have appeared on Dr. Thomas, which give many details of his accomplishments, and we have drawn on these sources in preparing this memorial tribute,[2–9] as well as on several unpublished documents.[10–18]

Dr. Thomas was born in Scott County, Kentucky, the son of Charles Allen and Frances Carrick Thomas. Of his early childhood and education Dr. Thomas had this to say:

I was born and spent my early childhood on a farm—didn't see a street car, in fact, until I was seven years of age. My father, who died when I was six months old, was a minister. On the farm I had many hours of private schooling from my mother and grandmother, who were both wonderful teachers, and there became acquainted with a great many books which were in the family's possession. My family moved to Lexington, Kentucky,

when I was seven years old, where we lived practically on the campus of Transylvania College. I had a laboratory and workshop at home as far back as I can remember, and built one of the first, if not the first, wireless station in Lexington, in the days before radio. My home atmosphere was religious as well as academic. . . . My formal education was begun at Hamilton College's small preparatory school in Lexington; from there I went to Morton High School, and entered Transylvania College at the age of sixteen. After finishing Transylvania I went to M.I.T. Throughout my schooling, I preferred science to any other study.[13]

The laboratory in the family home mentioned above was the scene of a rather large chemical explosion which almost destroyed part of the house. At age thirteen some of the professors at Transylvania College offered him the use of their laboratories. Incidentally, in 1954 President Eisenhower dedicated Transylvania College's Frances Carrick Thomas Library, named in honor of Dr. Thomas's mother, who along with his aunt and grandmother had had such an enormous influence on his early education and development.

When World War I came along, he enlisted in the Student Army Training Corps; then, until the end of the war, he was a rifle instructor at Camp Perry. He received his A.B. degree from Transylvania College in 1920 and his M.S. in chemistry from Massachusetts Institute of Technology in 1924. He helped to pay for his tuition at MIT by singing professionally. According to his son,[16] "his singing voice was superb, a high baritone, combined with an accomplished 'presence'—always in good taste—and well-received by the crowd." On June 5, 1933, Transylvania College awarded him an honorary Doctor of Science degree.[19]

In 1923 Charles F. ("Boss Kett") Kettering recruited Dr. Thomas and Dr. Carroll A. ("Ted") Hochwalt into the General Motors Fuel Research Laboratory as research chemists, where their first assignment was to work on anti-knock ma-

terials for motor fuels; this work contributed to the successful program that resulted in the production of the tetraethyl lead compound used for a long time in motor fuels. He also worked on a new process for the extraction of bromine from sea water. The following paragraph from a letter by Dr. Thomas refers to his earliest adventures in industrial chemical research: "The greater number of my scientific publications are patents, which is typical of industrial work. Between 75 and 100 patents are now in my name. My earliest work was on the development of tetraethyl lead with the late Tom Midgley of General Motors. I am particularly proud of the first work I did on the extraction of bromine from sea water, which was the forerunner of the present process. I believe my first contribution to science was a patent published with Tom Midgley on the production of synthetic rubber from isoprene, polymerized with sodium potassium alloy."[13]

In 1924 Dr. Thomas moved to the Ethyl Gasoline Corporation as a research chemist. Then in 1926 his entrepreneurial talent manifested itself, when he and his associate Dr. Hochwalt established the Thomas and Hochwalt Laboratories in Dayton, Ohio, where they did research work for various industrial organizations. This included the development of a fire extinguisher that would not freeze in unheated buildings, and the discovery of a method for speeding up the aging of whiskey. Dr. Thomas served as president of the laboratory until 1936, when it was acquired by the Monsanto Chemical Company for 1.4 million dollars in Monsanto common stock shares. The remainder of his professional career was devoted to Monsanto. In 1936 he was appointed the director of Central Research in St. Louis. His work there was primarily involved with synthetic organic chemistry. He worked on the chemistry of diolefins, olefins and aromatic hydrocarbons, plastics, and the syn-

thesis of various aliphatic compounds. His findings relative to the reaction between olefins and diolefins, particularly in the presence of aluminum chloride, are among his most important contributions to science. In this connection he developed the proton theory of aluminum chloride, which explains the mechanism through which the catalyst is able to effect such a wide variety of reactions: cracking of paraffins or aromatics, dehydrogenation condensations of aromatic nuclei, isomerizations and rearrangements in the aliphatic and aromatic series, polymerization, and alkylation. This aspect of his work culminated in the publication in 1941 of the important book *Anhydrous Aluminum Chloride in Organic Chemistry*, of which he was the senior author. According to his son, much of the book-writing was done on Saturdays and Sundays.[16]

His advancement in the Monsanto Company proceeded very rapidly: in 1945 he was elected vice president and technical director and a member of the company's executive committee; in 1947 he was chosen to be executive vice president; in 1948 he was elected vice chairman of the exceutive committee and chairman in 1949; he served as president from 1951 to 1960; and finally as chairman of the board from 1960 to 1965. He served as chairman of Monsanto's Finance Committee from 1965–68 and retired from the company in 1970.

Dr. Thomas's involvement in the atomic weapons project during World War II has been described briefly by Dr. Glenn T. Seaborg (formerly chairman, U. S. Atomic Energy Commission) thus:

> I first met Charlie Thomas in June of 1943, after he joined the Manhattan Project at the request of General Leslie Groves and James Conant. At the time he was the Director of Monsanto's Central Research Department. Soon after joining the Project, Charlie assumed the role of coordinator for the work of developing methods for the purification and production of

plutonium in metallic form. This work was carried on at four different places—Los Alamos, Chicago, Berkeley and Ames—and it was Charlie's task to weave it together into a coherent whole. I remember that these monthly "Thomas group" meetings were held at the Metallurgical Laboratory in Chicago over a year's period extending from the summer of 1943 until the summer of 1944. A great deal of first-class scientific work was carried out in this connection under Charlie's direction.

In addition to this administrative work, Charlie Thomas made statesmanlike contributions to the early discussions over the control of nuclear energy and its furture developments. In 1944 he was appointed a member of the committee headed by Zay Jeffries that produced the report "Prospectus of Nucleonics." In this report, which outlined and speculated on the possibilities of nuclear power, Charlie argued for an international organization to prevent nuclear armament and to encourage research in peaceful applications that would involve the collaboration of the universities, the Government and private industry.

Charlie's work in this direction continued, and in 1946 he was appointed by Dean Acheson to serve with Robert Oppenheimer, David Lilienthal and others on a special Board of Consultants formed to appraise matters relating to international inspection and the nuclear potential of various nations. The extensive and highly significant work of this Board was to culminate in their writing of the famous Acheson-Lilienthal report and the presentation of the first plan to propose placing the atom under international control so that it could be controlled and developed for the benefit of all mankind.

During these historic years Charlie had also assumed leadership of a special Monsanto division to take over the Clinton Laboratories to produce radioisotopes, work on reactors using enriched uranium, and learn more about the important process of converting thorium to uranium-233.[15]

Dr. Thomas's directorship of the Clinton Laboratories at Oak Ridge, Tennessee, lasted from 1945 to about 1948; during this time the laboratories were beginning to explore the peacetime uses of nuclear fission. Less well known was Dr. Thomas's involvement in the purification of polonium, which was a part of the triggering device for the Nagasaki bomb. This work was done in several different buildings in Dayton, Ohio, including the "Runnymede Playhouse," a large

greenhouse on his mother-in-law's estate that contained a tennis court and a squash court.[8,9]

In recognition of his war-time services he was one of a group of scientists who received the Medal of Merit in 1946; the citation stated, in part, that "his initiative and resourcefulness and his unselfish and unswerving devotion to duty have contributed vitally to the success of the atomic bomb project." He was among those present on July 16, 1945, when the first atomic bomb was exploded at Alamogordo, New Mexico. He described his feelings at this test in some detail in a commencement address; just before the bomb went off he said:

> The gravity of the situation weighed heavily upon us, and I will never know what went through the minds of my colleagues as we lay there on the sand that night. I could not but think of the cost and effort going into this experiment, something over two billions of dollars . . . and years of concentrated effort on the part of thousands of American physicists, chemists and mathematicians. In a way this single experiment embraced the accumulation of two thousand years of research, beginning with the Greek scientist, Democritus, who had the first conception of the atom.[17]

In addition to his service to the U.S. government in atomic energy matters, Dr. Thomas was appointed chairman of the Scientific Manpower Advisory Committee of the National Security Resources Board; in this role he was involved in the formulation of policy regarding the maximum contribution to national defense from the nation's scientific and technological personnel. In 1951 President Truman appointed Dr. Thomas to an eleven-man committee of prominent scientists to assist with the coordination of government and private scientific research with defense planning. In 1953 he was appointed as a consultant to the National Security Council, during the Eisenhower Administration. He also served as the U.S. Representative to the United Nations Atomic Energy Commission.

In addition to these governmental advisory posts, he contributed his talents by serving a number of industries and private organizations, including the following: trustee of the Carnegie Corporation of New York; member, Board of Directors of Chemstrand Corporation, Southwestern Bell Telephone Company, St. Louis Union Trust Company, the First National Bank in St. Louis, the Central Institute for the Deaf, Metropolitan Life Insurance Company, RAND Corporation, and the Civic Center Redevelopment Corporation of St. Louis; member, Advisory Board of the St. Louis Council of the Boy Scouts of America; and vice chairman of the St. Louis Research Council. He was also active on behalf of such organizations as Radio Free Europe, the United Fund, and the St. Louis Globe-Democrat Fund for Children. In 1963 he served as president of the St. Louis United Fund.

One of Dr. Thomas's greatest concerns was the importance of education and research, and these concerns led him to another very important set of activities: serving as curator of Transylvania College; donating $600,000 to endow the Charles Allen Thomas Professorship of Chemistry at Washington University; serving as chairman of the Board of Trustees of Washington University; serving as a member of the Corporation of the Massachusetts Institute of Technology from 1950 onward; being a generous benefactor to MIT by donating funds to promote scientific endeavors at that institution; serving as chairman and member of numerous departmental visiting committees at MIT; leading a remarkable bond issue campaign in 1965 to provide the newly established St. Louis Junior College District with adequate facilities; and serving as chairman of the Board of Directors for the Washington University Medical Center.

It is not surprising that Dr. Thomas's many contributions were recognized by numerous awards: in 1947, the

Industrial Research Institute Medal for outstanding achievement in the administration of industrial research; in 1948, the American Institute of Chemists's Gold Medal for his work in research administration; in 1952, the Missouri Honor Award for Distinguished Service in Engineering; in 1953, the Society of Chemical Industry's Perkin Medal; in 1955, the Priestley Medal of the American Chemical Society (of which he had been president in 1948, chairman of the Board of Directors, 1950–53); in 1963, the Palladium Medal of the Société de Chimie Industrielle; and in 1966, the St. Louis Globe Democrat Man of the Year Award. Fourteen U.S. colleges and universities conferred honorary degrees on Dr. Thomas in recognition of his extraordinary contributions to his profession and to society.

Dr. Thomas was much concerned about the negative attitude of the public toward large corporations. In a speech to business leaders in 1952 he urged them to "remember that our businesses and their profits are only a means to an end, a means toward making Americans happier and America a stronger and more unified nation."[4] Clearly he was dedicated to the proposition that businessmen have a moral obligation to exert positive leadership in improving society as a whole; certainly in his own life Dr. Thomas demonstrated this remarkably well.

Dr. Thomas had rather strong views about the importance of developing nuclear-powered electric generating plants. In 1980, he made the comments in a newspaper interview: "A modern industrial society depends on the continuance of a plentiful supply of energy. . . . It is time for America to wake up. . . . Because this country has failed to draft . . . a sensible energy policy, Americans now find themselves paying out $60 billion a year for imported oil. Yet virtually nothing has been done to speed up the production of coal and synthetic fuels or tap our huge oil-shale

reserves."[5] Further on in the interview, Dr. Thomas expressed the belief that America was not spending enough money on the basic research needed to keep abreast of the leading industrial countries.

Dr. Thomas's son recalls his father's concern about the attitudes of some persons regarding the development of nuclear energy:

> While admiring intelligence he developed severe doubts about 'intellectuals'—both real and fancied—and their attempts to influence political events. . . . This was particularly true in regard to those who attempted (largely successfully) to prevent the development of nuclear energy in the U. S. He also sensed the concealed agenda of the radical left that began trashing our campuses during the 1960's.
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> While he understood all this, he accepted the Chairmanship of the Washington University Board of directors, and at the height of radical activity [organized a group to work with him to raise about] $90MM for that school. Somehow he sensed that this would pass, and the University would be needed even more than ever. I applaud this act of faith in the teeth of contrary evidence.[16]

In 1949, Dr. Thomas gave an address at the MIT Mid-Century Convocation panel on "Specialization in 20th Century Education." In this talk he discussed among other things the importance of technically trained people to be able to use knowledge for creative endeavors. The following paragraphs from his address capture the main point:

> Analytical thinking alone is becoming more and more influential, with the spotlight shifted to the scientist and engineer. There is some evidence that in his favored position, his lack of ability to synthesize may be extremely dangerous. Without the counterbalance of synthetic thinking, extreme analytical thinking may lead to defeatism. Certainly we see evidences of this today.
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> In interviewing hundreds of graduates from our American colleges I am impressed with the desire for security. If not at the top, it is high up among their life goals. There seems to be little of the fortitude which is the real security of a truly intellectual person, one who is a synthesist as well as an analyst.[14]

Later in the same talk, he offered some further advice to those charged with higher education: "Our collegse should freely face the fact that a large portion of their curricula makes them vocational institutions. They should pound home to their students the fact that when they leave they are not educated, that they have a great deal more to learn, so much more, in fact, that they will not have time to learn it all."[14] These comments are as valid now as they were four decades ago.

Dr. Thomas's career reveals that he had a sense of adventure. He had this to say on the subject of risk-taking on the occasion of his eightieth birthday: "Today it seems that we want no part of risk. As we have become more affluent, better educated, better informed, we have become less risk prone without recognizing fully that we are in the process of trading off other desirable social features. Not the least of these are high levels of technological innovation and creativity on which much social progress has been based in the past. Risk is such an integral part of human existence, that we have difficulty in examining it directly. A riskless society is a retrogressive society or at best a static one."[18]

Dr. Thomas married Miss Margaret Stoddard Talbott of Dayton, Ohio, in 1926; they had four children: Charles Allen, III, Margaret Talbott, Frances Carrick, and Katharine Tudor. After his first wife's death (in 1975), he married Margaret Chandler Porter in 1980. He and his first wife were enthusiastic skeet shooters and raised Labrador retrievers. He was also an airplane pilot. After retirement from Monsanto he devoted much of his time to the management of Magnolia Plantation, a 15,000-acre family farm near Albany, Georgia.

Those who knew Dr. Thomas agreed that he was an affable and gregarious man, with a keen interest in people and unbounded interest in science and technology. He in-

spired all who came in contact with him; he was a selfless man of great stature. William H. Danforth, the chancellor of Washington University, characterized Charles Allen Thomas by the following statement: "I think that his great characteristic is his insatiable curiosity, his desire to know about life."[6]

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NOTES

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10. "Resolutions of the Corporation of the Massachusetts Institute of Technology on the Death of Charles A. Thomas, Life Member Emeritus," adopted at the meeting of the Corporation on June 1, 1982; Institute Archives and Special Collections, MIT Libraries.

11. "Charles Allen Thomas," Regular Board Minutes of the Board of Trustees of Washington University. October 8, 1982, p. 3.

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13. Charles Allen Thomas to Raymund L. Zwemer, Executive Secretary, National Academy of Sciences, September 17, 1948.

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15. Glenn T. Seaborg, "On the Physical Sciences," in *Science, Engineering, and the Quality of Life: Charles Allen Thomas Science Symposium*, St. Louis, Missouri, March 5, 1970, pp. 27–38.

16. Charles Allen Thomas, Jr., to R. Byron Bird, August 9 and 29, 1990.

17. Charles Allen Thomas, "Crossroads," speech given at the Washington University Commencement Exercises, June 13, 1946.

18. Charles Allen Thomas, after-dinner comments on the occasion of his eightieth birthday at Sea Island, Georgia.

19. Letter of April 16, 1991, from Carolyn S. Denton, curator of special collections at Transylvania College, to R. B. Bird.

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