W. R. Marshall

W. Robert Marshall

1916-1988

By R. Byron Bird, Edwin N. Lightfoot,
Dale F. Rudd, and John G. Bollinger

W. Robert Marshall, former dean of the College of Engineering of the University of Wisconsin, died at age seventy-one on January 14, 1988, after suffering a heart attack. At the time of his death he was still quite active professionally and was serving as the director of the University-Industry Research Program. This influential position was a fitting capstone to an impressive career, which included teaching, research, industrial consulting, professional society leadership, and university administration. He spent much of his time at the University of Wisconsin trying to strengthen ties between academia and industry. He was also an effective author, whose books and writings strongly influenced chemical engineering education and research.

Bob Marshall was born on May 19, 1916, in Calgary, Alberta, and came to the United States as a child; he became a naturalized U.S. citizen on March 20, 1944. He was an undergraduate in chemical engineering at Armour Institute of Technology (now called Illinois Institute of Technology), which awarded him the B.S. in 1938. In the spring of 1937 Professor Olaf A. Hougen of the University of Wisconsin was a visiting professor at Armour, and forged a lifelong relationship with Bob, who accompanied Olaf back to Madison for graduate study. In 1941 he received the Ph.D. from the University of Wisconsin based on a thesis

entitled "Through-Circulation Drying," done under Professor Hougen's direction.

In 1941 Bob accepted a position in the Engineering Department of the Engineering Experiment Station of the E.I. du Pont de Nemours and Company in Wilmington, Delaware. The du Pont experience played an important role in shaping Bob's professional attitudes—in particular his emphasis on solving real engineering problems, his feeling that science and engineering are equal partners in the advancement of technology, and his concern that research results should be put in such a form that they will be of direct use to the practicing engineer.

During his stay at du Pont Bob served as an instructor in the evening program of the Extension Division of the University of Delaware. This led to his collaboration with Professor Robert L. Pigford on the book *The Application of Differential Equations to Chemical Engineering Problems,* which was published in 1947 by University of Delaware Press. This book was extremely influential because it was richly illustrated with imaginative and important problems, many of which even today provide excellent examples of how mathematics can be used to solve problems of engineering interest.

In 1947 he was once again attracted to the University of Wisconsin by Olaf Hougen, where he was given an appointment as associate professor of chemical engineering. His teaching activities included a new graduate course on applied mathematics (based on his book) and the graduate course on mass-transfer operations, which he revitalized by introducing new ideas based on transport phenomena and boundary-layer theory. His research program took shape quickly, and he soon had a rather large graduate group working on a wide variety of drying processes. He and his students made major contributions, particularly in the areas of atomization and spray drying, and for some time he was referred to as "the founder of modern spray-drying technology." All in all Bob directed the Ph.D. theses of thirty-two graduate students, most of whom have made substantial professional contributions.

In 1954 his famous monograph *Atomization and Spray Drying* appeared as the second volume of the Chemical Engineering Progress Monograph Series, published by the American Institute of Chemical Engineers. This monograph summarized his seven years of research at du Pont and six years of research with his students at the University of Wisconsin. In this book Bob showed how applied mathematics, fluid dynamics, transport phenomena, statistics, and physical chemistry could be used to solve critical problems in spray processing, and that this could be done in such a way as to obtain workable design methods and performance characteristics of spray dryers. In 1981 a practicing engineer in a large U.S. industry said of Bob's monograph, "Using many of the principles described in this publication, we have improved equipment capacity nearly ten-fold with accompanying major improvements in costs. When you consider that we produce approximately two billion pounds of spray-dryed products annually, these improvements were and are of obvious economic value." Bob was an early practitioner of "engineering science" in the best sense of that term. His work was the basis of industrial processes that were to produce billions of pounds of products every year.

Although Bob was a gifted teacher and a brilliant research supervisor, he was soon asked to transfer his talents to help solve administrative problems. In 1953 he was appointed associate dean of the College of Engineering and executive director of the Engineering Experiment Station. In this capacity Bob was able to combine his originality and enthusiasm to bring about a number of changes. He chaired the committee that led to the establishment of the Department of Nuclear Engineering, which included both graduate and undergraduate programs. Along with Farrington Daniels he established the Solar Energy Laboratory. He was also instrumental in the development of the Materials Science Program. He was directly responsible for setting up a lively exchange program with Monterrey Institute of Technology in Mexico, and also a student exchange between the University of Wisconsin and universities in West Germany.

In 1971 Bob was named dean of the College of Engineering, a post that he was to hold for ten years. In this position he was able to continue being creative in an administrative way. His strong belief that engineering opportunities should be open to women and minorities led to the creation of one of the first student programs for minorities in engineering in the country. He also encouraged the involvement of College of Engineering faculty members in the Development Program for the Institute of Technology at Surabaya in Indonesia; this involved the building of a new campus and providing postgraduate training for the engineering faculty. His concern for the inability of engineers to be effective in the political and public service arenas led him to establishing courses in the General Engineering Department dealing with the interaction of engineering and society. He also gave positive encouragement to the development of the first instructional program on technical Japanese translation in the United States, and set up a mechanism for faculty and student exchange between the chemical engineering departments of the University of Wisconsin and Kyoto University.

After retiring from the deanship in 1981, Bob accepted the assignment of director of the University-Industry Research Program. In this capacity he found new opportunities to put his experience and leadership to work by facilitating and supporting faculty research relationships with industry. Bob concerned himself with the diversity of research activities on the entire campus and the possible beneficiaries of this research throughout the state. He worked on such problems as patent advice for professors, small business development, and sources of external research support.

Bob Marshall was an enthusiastic supporter of the American Institute of Chemical Engineers (AIChE) and had a keen sense of responsibility to the organization. He accepted numerous committee assignments and was the primary force in establishing the Continuing Education Committee, which he chaired from 1964 to 1967. He served as director from

1956 to 1958, vice-president in 1962, president in 1963, past president in 1964, and treasurer from 1976 to 1980. The institute recognized his research and leadership roles by bestowing on him many awards and special recognitions: Institute Lecturer in 1952, William H. Walker Award in 1953, Professional Progress Award in Chemical Engineering in 1959, and Founders Award in 1973. In 1983, on the occasion of the Diamond Jubilee of the AIChE, he was included in the list of thirty "Eminent Chemical Engineers" in the United States.

In addition to participation in the AIChE, Bob also served on seven committees of the American Society for Engineering Education, including the Black Engineering Colleges Development Committee and the Professional Development Committee of the Biomedical Engineering Division. For Argonne National Laboratory he served as chairman of the Chemical Engineering Review Committee and as member of the Policy Advisory Board. He was very active in the Associated Midwest Universities organization, serving on the board of directors and as vice-president in 1961 and 1962 and as president in 1962 and 1963. He had a three-term stint on the Executive Committee of the Engineers Joint Council and served for two years as vice-president of that organization.

In addition to the awards he received from the AIChE, Bob Marshall was accorded many other honors, including fellow of the American Academy of Arts and Sciences in 1960, the Gold Medal of the Verein Deutscher Ingenieure in 1974, and an honorary doctor of laws from the Illinois Institute of Technology in 1981. From his own College of Engineering he received the Ragnar E. Onstad Award for Service to Society in 1981, and the Byron Bird Award for Excellence of a Research Publication in 1983.

Election to the National Academy of Engineering (NAE) came in 1967. Within the NAE he served on the Commission on Education, of which he was vice-chairman in 1969 and chairman from 1970 to 1974. He also was a member of the

Committee on the Interplay of Engineering with Biology and Medicine from 1968 to 1973, and served as chairman from 1969 to 1973. In addition he was on the Committee on Membership from 1968 to 1970.

Bob was always professional and gentlemanly. He was devoted to providing the best possible opportunity for his colleagues and students to deploy their talents and energies to maximum effectiveness. It came naturally to him to convey to others his enthusiasm for their skills and potential, and he provided them with the chance to present their ideas and hopes in a supportive setting. He never assumed any credit for their contributions. He simply wanted his associates to be able to attain their goals. Many people owe their own professional success to words of encouragement from Bob Marshall. He was always available to his friends and colleagues when they needed help or advice.

In addition to his university and professional activities, Bob found the time to support the community in which he lived. He was a member of the school board in Monona, Wisconsin, for six years. He was vice-president of the Madison Downtown Rotary Club from 1984 to 1985, and he served as a member of the board of directors of United Way from 1981 to 1982.

Bob was a very genuine and modest person, and despite his exalted standing in the professional world, he was never ostentatious or condescending. He always gave his very best efforts to every task that he undertook; but he did more than that—his performances always had a sense of "style" and "flair" that few others can attain. Whether he was chairing a committee, making a technical presentation, or giving a eulogy at a memorial service, Bob could supply a little extra spirit or warmth or humor that would upgrade the performance from excellent to superb. He left his colleagues, friends, and family a remarkable legacy of accomplishments, inspiration, and high principles.