C. H. M. van Bavel—Soil physicist and environmental agronomist

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Dr. van Bavel, a native of Breda, the Netherlands, earned his undergraduate degree in horticulture from Wageningen University in 1945. He immigrated to the USA where in 1946 and 1949 he earned his M.S. and Ph.D. degrees in soil physics under the direction of Dr. Don Kirkham at Iowa State University. His research there on improving methods for measuring soil water content and availability led to the development of the commercial neutron meter and later the gamma transmission method for measuring soil water content and soil density (3).

He became associate professor of soil physics at North Carolina State University in 1949. During the next 8 yr, he laid the statistical foundation for evaluating irrigation requirements through an analysis of daily precipitation and evaporation data (8) and studied applied hydrology in mountainous areas. He demonstrated that evapotranspiration is a significant factor in estimating stream flow and showed how to use it to assist producers with crop management decisions based on available moisture and precipitation probabilities.

In 1957, Dr. van Bavel became chief physicist at the U.S. Water Conservation Laboratory in Phoenix, AZ. For the next 10 yr, he studied water use by crops in an arid environment (4) and showed that the concept of Penman (2) was valid for such an environment. Dr. L. Fritschen (1) and he showed that evapotranspiration from sudangrass [*Sorghum sudanense* (Piper) Stapf] was entirely a function of the environment. He helped to develop accurate weighing lysimeters for this research (5). After spending a summer at the Citrus Experiment Station in Riverside, CA, Dr. van Bavel developed the leaf resistance porometer for measuring stomatal diffusion resistance (6). He demonstrated that, with a sufficient number of measurements, the transpiration rate of a cotton plant (*Gossypium hirsutum* L.) could be calculated. Commercially available leaf diffusion porometers, which researchers around the world use, reflect this work. Also, while at the Phoenix laboratory, Dr. van Bavel showed that crop temperature in an arid environment is often below air temperature in order to satisfy the energy balance of the field (2).

Dr. van Bavel became professor of soil physics and environmental agronomy at Texas A&M University in 1967, where he used computers to model the dynamics of crop water balance. Recent research has dealt with fundamental aspects of water use efficiency in crop production under field and greenhouse conditions. His models of the flow of energy, water, and carbon in soil-crop-atmosphere systems have been based on fundamental principles and not impirical data. The work related to the energy balance of greenhouses has introduced new concepts for constructing, heating, and cooling, and automatically operating greenhouse systems, based on both physical and physiological processes, including the capture of solar energy in liquid circulated through double-walled greenhouse roofs (7).

Since 1977, Dr. van Bavel has developed models for interpretating remotely sensed microwave signals to detect the incidence and severity of drought stress and the rates of evaporation. His latest research has resulted in the development of an instrument using a heat source and a sensor to measure the flow of water in the stem of a single plant. He is presently adapting the instrument so that it can be made available to other researchers.

Dr. van Bavel has over 190 scientific publications and contributed to eight books. He is a Fellow of both the American Society of Agronomy and the Soil Science Society of America. He has received the Superior Service Award from the USDA, the Horton Award from the American Geophysical Union, a Fullbright Award, the Soil Science Award from the Soil Science Society of America, and the Faculty Distinguished Achievement Award from Texas A&M University.

Dr. van Bavel earned a national and international reputation as a scientist with a keen mind, a strong wit, and penetrating curiosity, which allowed him to grasp, explain, and utilize the underlying scientific principles. He is a deep thinker not satisfied with working at the surface of a solution, and has the unique ability to assimilate an array of apparently scattered facts into a unified explanation of a phenomenon. He has based his research and teaching on the fundamental physical sciences, which he readily transfers to practical applications, including the neutron and gamma probe, the diffusion porometer, and the water flow measuring device.

After 38 yr as a soil physicist and environmental agronomist, Dr. Cornelius H.M. van Bavel has retired but will continue his research part-time at Texas A&M University.

A symposium entitled "Physics in Agronomy" was held 3 Mar. 1987 at Texas A&M University to honor Dr. van Bavel on his retirement. Speakers included Drs. W.R. Gardner of the University of California, who spoke on the physical environment of soil organisms; J.S. Boyer of Texas A&M University, who spoke on how plant cells enlarge; C.B. Tanner of the University of Wisconsin, who spoke on physics needed in conservation tillage; R.D. Jackson of the USDA in Phoenix, AZ, who spoke on evaluating surface energy balance by remote sensing; and

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K.W. Brown of Texas A&M University, who spoke on the soil scientists responsibilities on topics of public interest. His former students and associates from across the country participated in the symposium and honored him for his contributions to understanding the physical environment.

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