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Memorial of Alvin Van Valkenburg, Jr.* 1913-1991

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Noble friend from the city of falcons: so translates his name. Whether Schenectady, New York, can properly be called Falcon City is arguable, but "noble friend" is assuredly a most fitting sobriquet for Alvin Van Valkenburg, Jr. W.E.B. remembers him as a close friend and colleague at the National Science Foundation, a dedicated scientist who turned his talents to administering an important research grant program. C.B.S. remembers him as a nonbureaucratic bureaucrat, ever interested in the science being supported and ever helpful to young and first-time applicants for research grants. Many others will remember him for his work in the field of high-pressure research and especially for his role in the development of the diamond cell; still others will remember him for his role in forging closer ties between the U.S. Bureau of Mines and the academic community. But all will remember him as an intelligent, warm, and unpretentious human being, ever optimistic, ever generous, and ever ready to extend a helping hand.

Alvin Van Valkenburg, Jr. was born on August 12, 1913, in Schenectady, New York, the son of Alvin, Sr. and Mabel Kelly Van Valkenburg. Van used to say he came from sturdy peasant stock, and indeed his grandfather had been a farmer. But Alvin, Sr. had forsaken the plow for a career with the young and growing General Electric Company; perhaps this helped to shape Van's future interest in matters scientific.

At any rate, Alvin, Jr. entered Union College, soon decided on a major in geology, and received his B.S. degree in 1936. During his studies he became intrigued by the chemical aspects of the Earth and, after graduating, journeyed to Boulder for graduate studies, receiving an M.S. degree in mineralogy and petrology from the University of Colorado in 1938.

From Colorado it was back to Schenectady for a two-year teaching stint at Union; then, with World War II approaching, he moved to the Boston area, where he was employed from 1941 to 1945 as a physicist in charge of degaussing ships at the Charleston Navy Yard. During this period, Van enrolled for graduate work at Harvard University and quickly fell under the spell of two extraordinary professors, viz., Percy Bridgman, with his pioneering studies of the behavior of materials at high pressure, and E. S. Larsen, Jr., the renowned mineralogist and petrologist.

In 1945 he joined the staff of the National Bureau of Standards in Washington, DC, and through 1946 he pursued further graduate studies at Johns Hopkins University. Meanwhile he found time to court and wed the lovely Elsie Erling.

At the Bureau of Standards, it was not long before his fascination with high pressure again took over. Bridgman had designed and developed instrumentation for high-pressure studies to about 100 000 atm, but, no matter how powerful his hydraulic press, the apparatus was limited by the elastic limits of tungsten carbide, the strongest material that was then used as the pressure-transmitting medium.

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By the early 1950s, however, John Jamison and his group at Chicago and Van and several others at NBS were experimenting with single crystals of diamond, both as pressure vessels and as the pressure-transmitting medium. By the late 1950s, the NBS group of Weir, Lippincott, Van Valkenburg, and Bunting had developed a small hand-portable instrument that in early versions easily reached pressures in excess of 30000 atm and apparently had the potential of reaching much higher pressures. Three patents for this instrument were shared among Van and his colleagues at NBS. But Van is generally considered as the principal inventor, and there is little doubt that Van did more than anyone else to develop it, to inform the scientific community of its potential, and to make it available to investigators. He certainly originated the practice of placing the sample between washer-shaped gaskets that flow under high pressure and filling the small central hole with fluid to achieve hydrostatic conditions. As Van recollected it, the NBS group originally wanted to develop a device that would allow observation by infrared radiation while the sample was still under pressure. He built the cell and squeezed the sample but then couldn't determine whether the diamond faces were aligned or if the sample was still in place. He therefore put the whole cell on the stage of a polarizing microscope and looked through the optically transparent diamond crystals. When he saw that the changing pressure affected the interference colors and the birefringence of nonopaque samples and that phase transitions could be seen as they occurred, he realized he had something more than just a device for infrared spectrophotometry.

The resulting instrument is altogether remarkable—a portable apparatus easily carried in one hand that has achieved pressures equivalent to those in the core of the Earth. And because diamond is optically transparent and isotropic, the sample can be observed directly while it undergoes the effects of changing pressure. The sample can be heated by laser, cooled with liquid N_2, X-rayed, or observed in the infrared while under pressure. Recent models of the Van Valkenburg diamond anvil have achieved pressures of 2 000 000 atm and have been used to produce the solid phases of H, He, and Xe. In recognition of his role in inventing, developing, and perfecting the diamond cell, the Franklin Institute in 1986 awarded Van the John Price Wetherill Medal for significant "discovery or invention in the physical sciences."

In 1964 Van moved to the National Science Foundation as director of the quickly growing geochemistry program, a position he filled with distinction until late 1970. W.E.B. remembers that, before Van's arrival, research workers would visit and explain to him just what they were doing and why. After Van came, they would ask him if they were doing it right. C.B.S. remembers how helpful Van always was to neophytes in high-pressure research and how generous he was with ideas and suggestions regarding experiments that he himself might have undertaken. Van had many friends at the Geophysical Laboratory of the Carnegie Institution of Washington and was welcome to work there with colleagues such as Peter Bell and H. K. Mao whenever he had the time.

In 1970 E. F. Osborn, newly appointed director of the U.S. Bureau of Mines, asked Van to head a new Office of University Relations in the Bureau, and it was a challenge that he could not resist. But Van, ever conscientious, divided his time between the Bureau and NSF for several months until we at the Foundation could find a full-time replacement.

In 1974 Van retired from government service but kept his hand in scientific work as a guest investigator at the Geophysical Laboratory until 1980, when he moved to Tucson, Arizona. With him moved his small business of manufacturing and selling diamond cells, and he was joined in this by his son, Eric.

In this memorial, we have naturally emphasized Van's career and scientific accomplishments. But he was also well rounded and broadly gauged. He was a devoted family man and a loving husband and father. He formed abiding friendships and was always available with a helping hand. He was an accomplished gardener, and nothing gave him greater pleasure than being able to give a friend some tomatoes or a cantaloupe freshly picked from his yard in McLean, Virginia. With this interest, it is not surprising that Frank Schairer of the Geophysical Laboratory was able to tempt him into growing orchids, whose blossoms he would proudly display. Indeed, Van's one regret at moving to Arizona was giving up his orchids—for deserts are the one climate that orchids shun. But ever the cheerful adapter, he soon became fascinated with cacti and other plants of the Sonoran Desert and proudly displayed examples he had transferred to his front yard.

In addition to the professional positions he held, Van was active in many scientific societies. He was a Fellow of GSA, a Fellow of the Mineralogical Society of America and Treasurer from 1968 to 1972, a Member of the Geochemical Society, in which he served as Chairman for the Incorporation Committee, the Standards Committee, and the Emblem Committee, and a Member of the Philosophical Society and the Geological Society of Washington. He also was a feature editor for *Applied Optics* in 1969.

In the 1970s he became fascinated with the Grand Canyon, especially Powell's explorations. He rafted through the canyon several times and waxed so eloquent about the geology that we started referring to him as "John Wesley" Van Valkenburg.

Alvin Van Valkenburg, Jr. died on December 5, 1991, in Tucson at the age of 78. He had been ill for some time with a blood disease. The bald facts sound cold and hard—in sharp contrast to the warm man whose passing they chronicle. He lived a rich, full life and left a lasting footprint. There are too few Alvin Van Valkenburgs in the world, and we, together with his many friends, join Elsie, his son, Eric, his daughters, Lynn and Lois, and his grandchildren, Amy and Max, in missing and remembering a fine scientist and an exceptional man.

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