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Memorial of Hans P. Eugster
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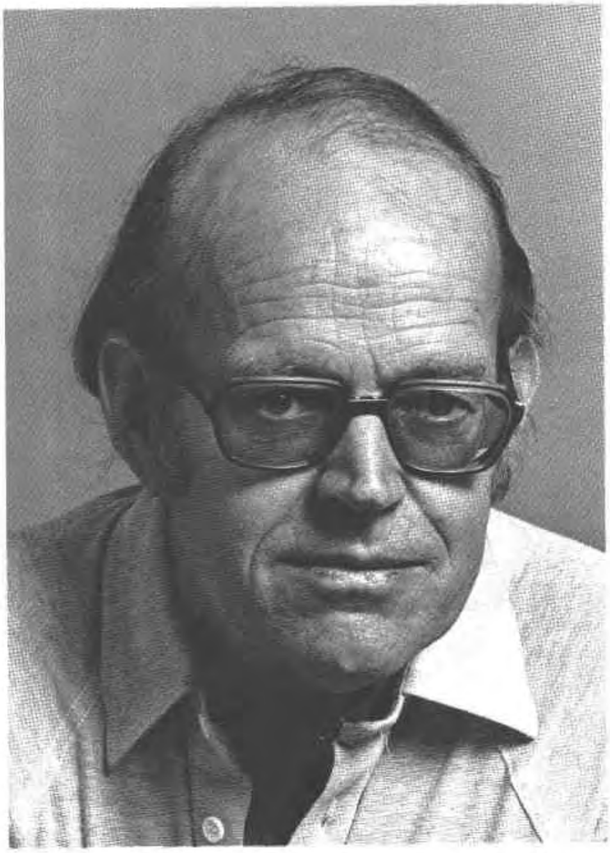

Hans-Peter Eugster, artist and internationally known earth scientist, died unexpectedly at the age of 62 on December 17, 1987, of a ruptured aorta as he was being admitted to Johns Hopkins Hospital in Baltimore. The cause of death appeared to be unrelated to previous cardiac problems. He is survived by his wife, Elaine H. Koppelman, James Beall professor of mathematics and computer science at Goucher College, his three daughters, Rachel, Erica, and Sandra, and two brothers, Conrad and Carl, in Switzerland. He will be remembered as perhaps the most broadly accomplished petrologist of our time, equally proficient in theory, experiment, and field. His contributions to mineralogy were monumental, covering the fullest range of states, temperature, pressure, crystallinity, and composition.

Hans, the third of five children, was born on November 19, 1925, in the Swiss village of Landquart in the upper Rhine Valley. It is said that an early passion for collecting rocks was supplanted by the more glamorous role of assistant to a budding chemist brother, but after chlorine gas killed his mother's treasured grape vines, he returned to geology. He received a master's degree in geology from the Swiss Federal Institute of Technology (ETH) in Zürich in 1948, and completed that year as crystallographer in the Institute for the study of snow and ice. He was trained in petrology and mineralogy by Paul Niggli, and, for his doctoral thesis at ETH, mapped metamorphics in the Alps. The plan was then to learn optical spectroscopy in L. H. Ahrens's lab at M.I.T. and return to teach at Niggli's Institute.

Hans arrived in the United States knowing very little English, a fact subsequently of great consternation to close associates awed by his writing skill in his second language. On Niggli's death, instead of returning to Switzerland (fortunately for those of us to become his students), Hans accepted Hatten Yoder's invitation to initiate hydrothermal experiments on the phase relations of micas at the Geophysical Laboratory of the Carnegie Institution in Washington, D.C. It was his working with iron-bearing micas that led to the development of oxygen buffers and to the concept that gaseous component fugacities are controlled by mineral assemblages.

At the Geophysical Lab Hans also acquired his first student, Dave Wones, through a predoctoral fellowship. They argued about who learned the most from whom, but as one privileged to have known both well, I feel we all profited enormously from the association. This was most obvious in the pioneering of an entire conceptual and experimental framework for the study of volatiles in buffered systems, which has been applicable over an extremely wide range of geologic conditions from granitic melts to alkaline brines.

I was lucky enough to be a graduate student at The Johns Hopkins University when Hans came up from the Lab to give his first lectures. The enthusiasm for his research and his broad interdisciplinary interests carried into his teaching and his course syllabus. At first he tried to teach classical Goldschmidt geochemistry with its emphasis on the abundance of the elements, thus demonstrating his early appreciation for the foundations of geochemistry as we know it today. Subsequently, he shifted emphasis through the revolutionary experimental petrology he was then practicing to the development of thermodynamic theory and fundamental solution chemistry as applied to the interactions with earth materials. In this, he was as concerned with surficial processes as he was with supercritical fluids, and always focused attention on significance to earth and human history. Indeed, it was ironically characteristic of Hans that he was among the first to understand that very basic insights to the geochemistry of solids would come from a thorough understanding of their coexistent fluids. He also suggested that, through the theory of solutions, there was "very little intrinsic difference between an igneous rock and a chemical sediment."

Just after Hans became an associate professor at Johns Hopkins in 1958, a manuscript by C. Milton on the Green River Formation sparked his interest in sedimentary mineralogy, geochemistry, and diagenesis. This led to his work in hydrology and sedimentology, first with me and then with Lawrie Hardie. Clearly a major inspiration here was Wilmot H. Bradley, a kindred spirit and Renaissance man who was undaunted by interdisciplinary boundaries. Hans claimed not to understand his fascination with saline lakes, but I would suggest that the attraction was twofold. First, Hans early recognized the foundations of experimental petrology in the work of Van't Hoff on the evaporation of seawater (as he subsequently explained in a brilliant summary article in 1971 in *Science*). Second, he saw the powerful challenge and promise of the fusion of different disciplinary approaches, which was so necessary in closed basin studies and which culminated in the dozen specialists we brought together to work with Ron Spencer on Great Salt Lake.

In addition, Hans's studies took him to fascinating and culturally divergent parts of the world, such as the East African Rift Valleys, Sicily, the Bolivian Altiplano, and the Qaidam Basin in China, as well as the Great Basin and intermountain western U.S. The lessons learned in the recent settings were then used to decipher the most persistent of unusual rock units, such as the Precambrian banded iron formations, and of geologic problems, such as the nature of ore-forming fluids. At the same time, Hans collaborated closely with theoretical chemist John Weare, who was a friend through mutual interests in art before he became a coworker, on problems in more esoteric geochemistry. Eventually this resulted in the attainment, with a computer, of what Van't Hoff could not work out experimentally—geologically consistent phase relations for the evaporation of seawater. But throughout the height of his involvement with surface-water phenomena, Hans continued important investigations, most consistently with I-Ming Chou, of the experimental geochemistry of supercritical saline solutions.

The development of unifying principles applicable to the full range of natural conditions was typical of Hans in all his endeavors; in fact, he preferred to call himself simply a chemical geologist. In this connection, one can note that Hans made significant contributions to the literature of both low- and high-temperature geochemistry nearly every year for at least the last fifteen. Although those of us who worked with him on saline waters and sediments have been accused of ruining an outstanding metamorphic petrologist by dragging him in the mud, anyone who knew Hans would know how "all very simple," as he would say, it was for him to move us off in many new directions, sometimes all at once. How many of us, his graduate students, ended with two or three theses combined into one?

Hans became a full professor at Johns Hopkins in 1960 and an adjunct professor at the University of Wyoming in 1970. He received the Arthur L. Day medal of the Geological Society of America in 1971, the V. M. Goldschmidt medal of the Geochemical Society in 1976, and the Roebling medal of the Mineralogical Society in 1983, where he served as president in 1985. He was a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He had been chairman of the Department of Earth and Planetary Sciences at Johns Hopkins from 1983 until June 1987.

Hans was the consummate scholar and academic, devoted to the university mission and his students, for whom he always found time in the most hectic of schedules. He trained, directly or indirectly, the entire generation of experimental petrologists using solid buffers. In his bibliography is a definitive work on the contribution of N. L. Bowen, as well as J. H. Van't Hoff, in the development of modern geochemistry, and his medal acceptance speeches feature valuable insights on the impact of the medal namesakes on our field. This attention to the role of people, institutions, and history in our efforts also was very characteristic of Hans's holistic view of the world.

In introducing Hans for presentation of the Roebling medal, Dave Wones characterized so well the exceptional traits that Hans represented to us, his students, colleagues, and friends. Most importantly, Hans brought to us the "feeling of self worth, which is the greatest gift that one human being can bestow on another," as Dave eloquently put it. In addition, Dave emphasized Hans's demand for truth, creativity, and his personal generosity.

The inspiration of Hans's creativity and intellectual curiosity was particularly strong. I remember well the dedication that had him put a cot in the lab and literally live with the brine-CO_2 experimental apparatus we set up, after ruptured tubes and lab-floor salt pans had greeted every attempt I made to get a night at home. Many years later Hans publicly complimented me for making it appear easy to work with him. This was misleading, for his standards and intensity never made it really easy, but always made it highly rewarding. And his sense of humor often made it entertaining. His gleeful involvement as grantee and grantor of our special award for inconsequential research was a case in point.

Hans's personal generosity was first and foremost of the spirit; his ideas and insights were offered without reservation. His basic good cheer was pervasive and contagious, even when he was going through earlier cardiac difficulties. He was a painter, potter, and accomplished musician, and used to say that he was an artist who worked in geology to make a living. He broadened all our horizons, extended our understanding of unifying principles far beyond normal expectations, and profoundly influenced our science. Even by many who never knew him, he will be sorely missed.

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