

Memorial of Richard Edwin Stoiber, 1911–2001

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Richard Stoiber, volcanologist, geochemist, mineralogist, petrologist, and tectonic geophysicist, died peacefully at his home in Norwich, Vermont on 9 Feb 2001 after a long illness, but not long after a 90th birthday party that he shared with old friends and family. A Life Fellow of MSA, he was Frederick Hall Professor of Mineralogy Emeritus at Dartmouth College and the honoree of the mineral stoiberite.

Dick Stoiber was known in his later career as a volcanologist, noted for the analysis of gaseous volcanic emissions and the study of mineral deposits. He was known worldwide as the keeper of a volcanoes web site, and to a privileged few thousands of Dartmouth students as an indefatigable and famously original teacher in the classroom and field. Few today may know that he was also a leading innovator in the trace element geochemistry of ore minerals, an accomplished spectrographer, a student of the petrology of ore deposits, a crystallographer and optical mineralogist, an atmospheric scientist, and an acute student of the geometry of subduction related to volcanism.

Born in Cleveland and raised in New Jersey, Stoiber attended Dartmouth and graduated with the class of 1932. He returned as an instructor in 1935, having completed his residency for the Ph.D. at the Massachusetts Institute of Technology (MIT), and except for the war years, never left. In 1941 he married Edna Howley, herself a highly original person, who became a devoted supporter of his teaching and his students, and later a gifted painter whose pictures graced their home in Norwich. They raised two children, Christine and Philip, both able scholars in their own right.

At MIT, Stoiber studied economic geology, receiving the Ph.D. degree in 1937. The major outgrowth of his thesis was the ground-breaking 1940 paper “Minor elements in sphalerite” published in *Economic Geology*, in which he pioneered the field of trace element geochemistry applied to ore deposits. His analytical tool was the optical spectrograph, to which he returned in the years following WW II. During that war, he took leave from teaching to serve in the Quartz Crystal Program of the U.S. Army Signal Corps, where he joined the search for oscillator-grade quartz crystals used for the control of radio frequencies. Out of this work came a publication on the geology of quartz crystal deposits. In due course, he published papers on mineralizing solutions in the Picher Field of Oklahoma and Kansas, amygdale mineral zoning in the Michigan copper deposits, and, with his colleague John Lyons, orientation fabrics in lake ice.

Stoiber’s career quest was the origin of ore deposits, and he pursued this quest at first through mineralogy and geochemistry, especially in Michigan and in the sulfide deposits of eastern Vermont. His field studies took him to the central and



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western USA, Canada, Norway, Sweden, Finland, Spain, Brazil, Mexico, and Central America. But by the early 1960s, while going full tilt with his trace element analyses and his grating spectrograph, he got the notion that he was approaching the subject from the wrong end. Instead of looking at the fossil remains of ore-forming solutions, he reasoned, why not go to the source? To some close associates, this seemed almost like an overnight switch from sober chemical mineralogy to the wild goose chase of gaseous emanations from volcanoes. Little did they know how fruitful this quest would become: in the end, Stoiber became a volcanologist to learn where ore deposits come from, but his questing mind soon enough made him ask where volcanoes come from!

There followed the most productive era of his career, investigating the fumaroles and sublimates on Central American and other volcanoes, tracing the source and nature of volcanic gas, making remote sensing of volcanic emanations a tool for understanding volcanic hazards, worrying about the localization of volcanism in arcs, and returning full circle to the origins of valuable mineral deposits. In this quest, Stoiber was notably energized by the collaboration of his graduate students, in particular M. J. Carr, W. I. Rose, and S. N. Williams. With Carr, he described the relation between the buckling and fracture of lithospheric plates in Benioff zones and the occurrence

of volcanoes along these ruptures. With Rose he described the eruptions and emanations of Central American volcanoes, and with Williams he documented the early days of the 1980 eruption of Mount St. Helens. With D.R. Nielson, he pointed out the unreliability of the potassium content of lavas as a characteristic of depth to the seismic zone. With J.M. Hughes, he studied vanadium sublimates from volcanic fumaroles, and this work ultimately led to the discovery and characterization of stoiberite ($\text{Cu}_5\text{V}_2\text{O}_{10}$) by Dick's colleague R.W. Birnie and Hughes. Stoiber's group adapted the ratio correlation spectrometer (COSPEC), originally developed for the analysis of industrial smokestack gases, for the ground or airborne analysis of gas in volcanic plumes. He and they pursued research on volcanoes in Europe, Africa, Japan, South Asia, Oceania, Mexico, and especially Central America. The list of selected publications given below and on the web will illustrate the great variety of these investigations.

Dick Stoiber was a man of enormous nervous energy that constantly drove his spectacular classroom teaching and guidance of students. Most of those who experienced his lectures and lab tuition and supervision of research have never seen the like before or since. His course design was fresh and often radical; his presentation arresting to the point of being scary; his erudition submerged under a torrent of words that always carried a hint of uncertainty, so that when the light went on it seemed that it had been a joint effort between student and teacher. As, in his discourse, he approached some strange name of place or mineral, his voice would take on a sing-song parody of incantation, and the student would make a note to remember. He could roam restlessly around the room, encouraging the fear that he might get near at any moment and ask a question, or he might hop up on a chair and crouch while lecturing. Even renowned sleepers could not fall asleep in a Stoiber lecture.

At MIT, Stoiber studied optical crystallography with Martin Buerger. At Dartmouth, finding no decent text for the classroom, he wrote his own mimeographed text. Following Buerger's treatment, his particular concern was to pursue the subject from the standpoint of the vibration direction and the associated refractive index, avoiding all mention of velocities and velocity surfaces, which he regarded as red herrings. He also wished to emphasize practical crystal identification, using enlightened theory and starkly simple illustrations only to aid that end. Over the years, his later multilith book became famous as the "orange pumpkin," so colored because he wanted people to know the color of the fringe on a crystal when it matched the refractive index of the liquid in which it was immersed. Bringing this work to a wider audience together with Stoiber was one of the most challenging and exhilarating experiences of my own life. It was a wild ride, in fact. The ideas and words flew faster than the receiver could manage. Shouts of celebration signified that the right turn of phrase was finally found. We met every day one June to rewrite critical passages and then cut and paste corrections in the multilith master. On the side, we studied the opaque minerals of the Kiglapait intrusion, and learned all about cloth-textured ulvöspinel-magnetite intergrowths.

At Dartmouth, Professor Stoiber was the first to espouse

foreign study, and then to make it a regular part of the curriculum in which every junior Earth Science class went to Central America for a whole term to study geologic problems in the field. This so-called Stretch Program so invigorated the geology major at Dartmouth that it attracted unusual attention and support, as well as new students and, incidentally, a few converts to volcanology. In almost two decades of his leadership, about 500 students went to Central America to learn and study, many to write a senior thesis on returning. After reaching age 55, when many teachers begin to tire, he supervised 50 undergraduate theses, 26 Masters theses, and 9 Ph.D. theses. At 78, he wrote a history of Earth Sciences at Dartmouth. At 84, he created the Electronic Volcano Web Page, a source of information about the world's volcanoes. He was twice Department Chairman, but always a strong voice for innovation and rigor and excellence, both in his own discipline and in College committees, where he blended incisiveness with compassion.

Dick Stoiber was a Life Fellow of the Mineralogical Society of America, the Geological Society of America, and Sigma Xi. He was a member of the Society of Economic Geologists, the American Institute of Mining Engineers, the American Association of Geology Teachers, the Geochemical Society of Japan, the American Geophysical Union, the International Association of Volcanology and Chemistry of the Earth's Interior, and the Explorers Club.

At his memorial service in Norwich, eulogists rightly characterized Dick Stoiber as a man of passion and love; for knowledge, for its dissemination, for the Earth and its study, for his family, for his students, and for his colleagues and friends. For all of those people, life with Dick was a wild and joyous ride. His scholarship and personal graces have left the world a better place.

ACKNOWLEDGMENTS

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