

## Presentation of the Roebling Medal of the Mineralogical Society of America for 1986 to Edwin Roedder

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### *Members of the Society, Distinguished Guests, Friends:*

When I joined the United States Geological Survey in 1958, my immediate supervisor, the Chief of the Solid Group in the old Branch of Geochemistry and Petrology, was Edwin Roedder. As I struggled with all the paper work that a new employee who was also an alien had to complete, Ed was sympathetic and helpful, but at the same time he made it perfectly clear that he did not have time to waste and that he was only carrying out his administrative role through a sense of duty, not because it was either a challenge or pleasure. This first meeting highlights an important point about Ed—his commitment to his scientific endeavors is very strong. He accepts responsibility and willingly does his share of administrative work, but no matter what those other responsibilities may be, each and every day Ed finds the time, the energy, and the insight to uncover yet another hidden facet of nature. His enthusiasm never seems to flag. He has allowed neither the blandishments of fancy titles nor the enticements of bureaucratic sinecures to woo him from the front line of scientific enquiry.

I had not been a member of the USGS for very long before one of the bureaucratic hiccups that periodically convulse the Survey brought about a hierarchical reorganization. Suddenly, I was Ed Roedder's colleague, and I came to know and admire another side of the man. I found that even though he never stops working, he is ever ready to take an interest in, and to share his vast experience to help with, another's problems—though I must say, too, he doesn't suffer fools gladly.

Eventually it was time for me to do my own duty and to serve an administrative term in the Survey. For a period I was Ed's supervisor. I remember my interaction with Ed in that role with gratitude. He was ever a supporter and ever willing to instruct me in the ways of my new role. Unlike some who had not yet had to bear an administrative load, Ed grumbled, but he always responded promptly to bureaucratic requests. He never dragged his feet. He managed to turn even the silliest demand into a joke—often on himself.

I have used my own experience to try and paint a word picture of a man who can be an administrator when required but who is at heart an exceptionally productive scientist, a man who is dedicated to his work with a fierce, single-minded purpose, but who is also a congenial colleague. Sometimes such admirable traits can work at cross

purposes, and amusing situations result. Almost everyone has an Ed Roedder story. One of those I like best concerns an incident that happened in the late 1950s. Ed was getting himself organized in a new room in the old General Services Administration building in Washington. His specimen-collections habits border on the edge of manic, and as a result he always has boxes of material waiting to be sorted and stored. On this occasion, he piled several still-to-be-sorted boxes in the middle of the room with an irreverent label to himself saying "UNCLASSIFIED." Unfortunately the box on which he pinned the label had been used previously and already carried the label "TRASH." Next morning, on his way into the building, Ed noticed an excited group clustered around the trash bin. People were scurrying off in all directions with beautiful mineral specimens. The custodial staff had seen the two words that trigger action in Washington, *unclassified* and *trash*, and had thrown the whole lot out.

It is impossible to encapsulate Ed Roedder's professional accomplishments in a few words, because the magnitude of those accomplishments is just too large. But two predominant threads run through the fabric of his work. The first concerns the liquidus relations in the system  $K_2O$ -FeO-MgO-SiO<sub>2</sub>. His doctoral research was done at the Geophysical Laboratory on the FeO-free portion of the system under the direction of J. Frank Schairer. When FeO was added, Roedder discovered liquid immiscibility in the system. The importance of his discovery was not fully appreciated until lunar samples were returned by the Apollo astronauts. Immiscible glass globules were soon discovered. Further studies showed that the spheres had just the composition that Roedder's work predicted. A fascinating string of papers, many co-authored with Paul Weiblen, soon followed. The larger role of liquid immiscibility in magmatic differentiation, in planetary evolution, and in the formation of mineral deposits, has still to be explored. The impact of Ed Roedder's work in experimental petrology alone would justify a major award such as the Roebling Medal. But he has another and even greater claim to fame.

The second thread in his work concerns fluid inclusions. These tiny fluid capsules, locked in their crystal bottles, were discovered by Henry Clifton Sorby in the middle of the 19th century. They had been examined by many people before Ed turned his attention to them, but his skills and insight made all previous studies pale into insignificance.

One example of Ed Roedder's ever-questing curiosity and fertile mind concerns the vapor bubbles present in most fluid inclusions. Viewed under the microscope the bubbles can sometimes be seen to move in erratic paths inside their tiny enclosures. Ed finally realized that the motion is not Brownian, as had been assumed by all previous observers, but rather that it arises from thermal gradients across the inclusions. The discovery led him to invent an ingenious device for sensing tiny thermal gradients. No combination of thermocouples or thermometers has the same delicate sensitivity, nor matching rapidity of response. He was awarded U.S. Patent No. 3,344,699 for his invention on October 3, 1967.

Ed was so delighted with his solution to the bouncing bubble problem that he made a movie of one of his favorite bubbles. That in itself was no mean feat. None who were present will ever forget the extraordinary evening at the Geological Society of Washington when Ed described his findings under the outrageous title "Bouncing bubbles or Who put the pep in Mother Nature's pop." As if that were not enough, he followed his talk with a showing of his bouncing bubble movie, accompanied by an off-key rendition of "I'm forever blowing bubbles." He is not only a keen observer and a clever innovator, but he also has a delightful sense of the ridiculous.

Time and again, Ed has generated a great scientific

splash from the microscopic volume of fluid in an inclusion. He showed us how to find and study fluid inclusions, just as he showed us how to interpret the phase relations of the complex assemblages of vapor + liquid + solid phases so commonly observed. When the Mineralogical Society of America decided to publish a volume on fluid inclusions in their series, *Reviews of Mineralogy*, Ed Roedder wrote the *entire* volume. All other Review volumes are multi-author works. From his own observations Ed has repeatedly produced new data and drawn conclusions of stunning magnitude. His work has been one of the keys to unraveling the way fluids move through, and react with, the Earth's crust. It is well nigh impossible to pick an area of geology that has not gained mightily through his findings. Mineralogy, mineral deposits, igneous and metamorphic petrology, chemical sedimentation, and many other specialties have moved forward through his discoveries. His ever-fertile mind is always making new discoveries and providing correct interpretations for old misconceptions.

Mr. President, Ladies and Gentlemen, it is my great pleasure and privilege to present your Roebling Medalist for 1986, the irrepressible, indefatigable, irreverent, but also inspirational, King of the Bubbles, Edwin Roedder.