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Presentation of the 2021 Roebling Medal of the Mineralogical Society of America to George Rossman

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Good morning, my name is Ed Stolper, and it is my great pleasure to introduce George Rossman for this year's Roebling Medal. In my opinion, George is—and has been for going on fifty years—one of the most original and wide-ranging scientists in the broad discipline of mineral sciences. This award is well deserved, and his selection for this recognition brings honor both to him and to the MSA.

After college in Wisconsin, George came to Caltech as a graduate student in inorganic chemistry to work with Harry Gray on electron transfer and its connection to color. But George was an avid mineral collector, and he combined his interest in these fundamental chemical problems with his love of minerals and began to apply his expertise in spectroscopy to minerals. After completing his Ph.D. in the early 1970s, he was then hired as a faculty member at Caltech, jointly between the division of chemistry and chemical engineering and the division of geological and planetary sciences. He established a unique program in mineral spectroscopy from the optical to the far-infrared, publishing hundreds of papers in which he characterized the structure, bonding environments, and chemistry of an extraordinary range of minerals. George's work was unique in its approach and range, and I have always thought of him as one of the first modern "mineral physicists," contributing to a major transformation of the discipline of mineralogy by coupling techniques and insights from modern inorganic and physical chemistry to natural materials in all their complexity and then using those insights to understand better the natural world.

The range of George's contributions based on this approach is vast. Basically, he would put any and all minerals that came across his desk—and he has an enormous collection and an encyclopedic knowledge of minerals—into his spectrometers, and for each of them, he connected the spectroscopy to their physical and chemical properties, resulting in insights that range from the atomic to the planetary scale.

To give just one such example—which alone would merit the Roebling medal—George has from the start of his career been interested in hydrogen in minerals. Whether H is present as a major stoichiometric component or as a trace constituent, infrared spectroscopy has given him a powerful approach to studying the many important issues surrounding H in minerals. Then about twenty years ago, with his student David Bell, George quantified in mantle minerals from a well-constrained petrological context the concentrations and substitution mechanisms of "trace" hydrogen in "nominally anhydrous" mantle minerals (e.g., olivine, pyroxenes, garnets, etc.) and this upended our thinking by showing that vast amounts of hydrogen could be stored in the mantle in such minerals. This single example illustrates how George's approach—with his love of minerals, his expertise as an inorganic chemist, and his knowledge of Earth science—can and did lead to a revolution in our understanding and thinking about a problem of planetary importance. And there are many more examples that I could give.

I just want to say a word about what I have described as George's "encyclopedic" knowledge of minerals. George once told me that he used to go to mineral shows and compete in mineral identification "contests" where photos of minerals were projected on a screen, and the various contestants would identify the minerals and their localities. Not surprisingly, George typically finished at or near the top in terms of his ability to identify mineral specimens. Although I was surprised at the fact that there are such contests, I was not surprised by this demonstration of George's preeminence at mineral identification, which has humbled me on many occasions. But George did freely admit that he was very poor at identifying localities!

My office is two doors down from George's, and this has not only had a significant impact on my career—it was he who urged and then taught me to use infrared spectroscopy to measure the concentrations and speciation of water and carbon dioxide in glasses back in the early1980s—but it has also allowed me to observe the steady stream of students and colleagues from all over Caltech—and indeed the world—coming to seek his advice on minerals and spectroscopy. With a twinkle in his eye and his infectious love of science, George often plays the role of "Mr. Wizard," giving impromptu demonstrations in his office and lab that have fascinated and taught so much to so many. George learned a lot of this as a graduate student from his mentor, Harry Gray, as the lead teaching assistant in the "Chem 1" class required of all Caltech undergraduates. And he has great stories to tell about demonstrations gone awry (including unexpected explosions and the telltale evidence of them to this day on the high ceiling of the chemistry lecture hall). I recall one day when some donors were visiting George, he spontaneously asked one of the visitors if he could borrow her ring, and he stuck it in his Raman spectrometer and proceeded to wow her with all he could learn about it in real time—I have always wondered what he would have done had he discovered that it was counterfeit or not what she thought!

So, again, it is a great personal pleasure to introduce the 2021 Roebling medalist: A remarkable and pioneering scientist, a teacher par excellence, a great colleague, and my friend, George Rossman.

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