

## Acceptance of the Mineralogical Society of America Award for 1979

HO-KWANG MAO

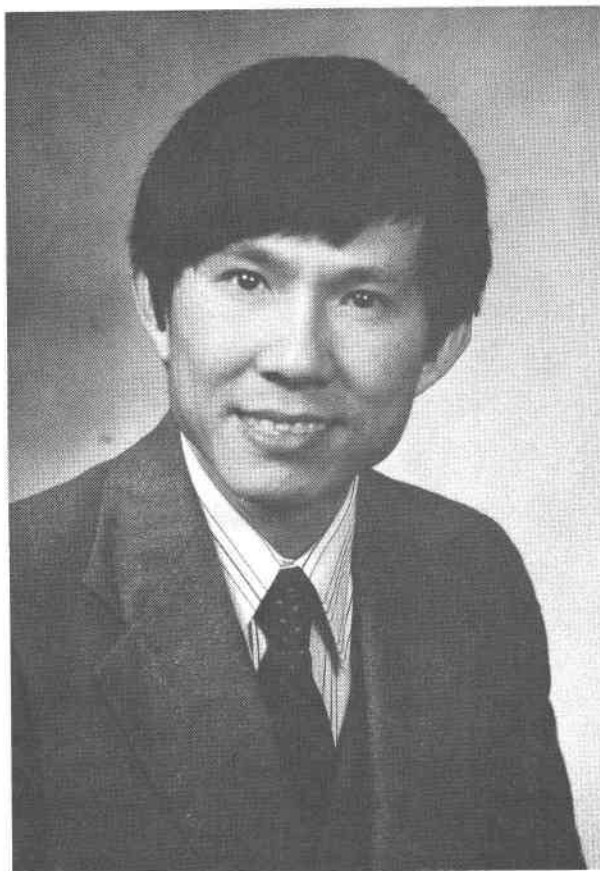
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### *President, Bill, Members and Guests:*

When Dr. Evans informed me that I was chosen to be the recipient of this year's MSA award, I could hardly believe my good fortune. This is so great an honor that one may be excused for asking oneself, "Have I really deserved it?" Speaking for myself, I dare not even pose the question. Having taken no part in making this decision, however, I can accept the award with a clear conscience. The responsibility rests with my esteemed colleagues and for this, too, I am truly thankful!

As mentioned by Roger Burns in his 1975 acceptance speech, I believe that this award is in recognition of a special branch of mineralogy as much as an individual. This year I realize that the society is recognizing the booming field of high-pressure research with the diamond window cell, a field that is based on a technique invented by Van Valkenburg and his colleagues and introduced to the Earth Sciences by Bill Bassett and Taro Takahashi.

New branches of mineralogy have traditionally been developed by adopting a technique or principle already established by physicists or chemists, but in this case high-pressure research with the diamond cell is an exception. The method was invented and developed by geologists and now the diamond cell is being adopted by physicists. The reverse of the traditional path is not a total surprise, for two reasons. First, geologists have long had the clear and well-defined objective of generating megabar pressures in order to experiment with conditions of the Earth's core and to study the properties of minerals at these conditions. Second, the technique is more suitable for the mineralogist. While the sample in diamond cell is often thought to be too small, it is of comfortable size for the mineralogist accustomed to using a microscope. The view through diamond windows with a petrographic microscope is similar to the view of a thin section with a 20× objective, and thus a sample can be easily studied by spectroscopic, X-ray, and microprobe techniques.



I received the Bachelor's degree from the Department of Geology, National Taiwan University with conventional training in mineralogy, physics and chemistry. At graduate school at the University of Rochester, I was fortunate to have as thesis advisors William Bassett and Taro Takahashi. Bill taught me the operation of the diamond cell and various associated techniques. He is so resourceful and always at the frontier of developing new ideas that even after I left Rochester I still returned occasionally to work with him. I have gone back to learn methods of laser heating and the Brillouin scattering techniques he developed. Taro was active both in high-pressure

geophysics and solution geochemistry. Probably as a result of his influence, I am now also involved in studying intergranular diffusion of metasomatic processes with John Frantz.

After I completed the Ph.D. degree Taro suggested that I apply for a fellowship at the Geophysical Laboratory in order to broaden my background. I became a post-doctoral fellow with Dr. Peter Bell for several years, and then a staff member at the Geophysical Laboratory.

Pete taught me to use other high-pressure apparatus established at the Geophysical Laboratory, ranging from the carbide squeezer to the piston-cylinder apparatus. He also interested me in crystal-field spectroscopy. Soon I found it was stimulating and fruitful to work with him. We have been working jointly ever since. Together we went through the period of the Apollo project supported by NASA, and then the development of megabar pressure cell supported by NSF.

I am deeply grateful for encouragement from the Geophysical Laboratory. Our director, Hatten S. Yoder, Jr., and former director, Dr. P. H. Abelson, have given me full support, even on high-risk projects at the developmental stage. I have enjoyed most the academic freedom in the laboratory, ranging from choosing my own projects to choosing my own working hours. This freedom, however, has usually meant working long hours every day and having my wife, Agnes, help me with experiments on Saturdays and Sundays.

Taro's suggestion of widening my field of interests at the Geophysical Laboratory was a good one. I have had the rare opportunity to work with the masters of experimental petrology. I was the last one to learn the techniques of making silicate glasses from

Frank Schairer. I learned instrument design from Joe England himself. In discussions with Hat Yoder I began to gain a broad appreciation of petrology. My background has also been enriched by cooperating with colleagues at the Geophysical Lab. The Mössbauer technique of Dave Virgo, the Raman technique of Shiv Sharma, and the single-crystal X-ray technique of Larry Finger and Bob Hazen are all applied to diamond cell. Those techniques are no longer used to obtain isolated measurements. They are merged into a powerful tool to unravel the secrets of minerals as single entities.

With the development of the techniques, the pressure-temperature conditions of 90% of the earth, instead of the previous 10%, could be duplicated in the lab. These new techniques have opened a new dimension in mineralogy. In almost every system studied, new minerals with new physical and chemical properties, new structures, and new mineralogical processes have appeared. The disproportionation phenomena Pete and I observed and the strong F-Mg partitioning phenomena T. Yagi, Pete, and I observed at high pressure are likely to change the understanding of the mantle and its origin. It will be a long and difficult route to solve the many mysteries of the Earth's interior, and this effort must involve colleagues in many other institutions, but at least we have a vehicle to start.

Looking back at past work and the many colleagues involved is a humbling experience. Each one of my colleagues is equally or more deserving of the award than I. I think my fortune lies in being associated with the right persons at the right places. With this in mind, I shall conclude as I began with the repeated expression of profound and sincere gratitude.

Thank you, all.