bonding action of clays in foundry molding sands, clay mineral composition of recent sediments, relation of composition to the properties of clays, clay minerals in soils and their significance, reactions of clay minerals with some organic cations, petrology of underclays, ceramic properties of clays and shales, ion exchange in relation to some properties of soil-water systems, the amenability of various types of clay minerals to alumina extraction, and the detailed study of the clay mineral micas which resulted in the name illite.

In 1948, he joined the faculty at the University of Illinois Department of Geology as a research professor. This move enabled Dr. Grim to share his vast knowledge of the clay minerals and their applications with a multitude of graduate students. Dr. Grim supervised 40 Ph.D. theses in his years at Illinois and had numerous scientists from around the world come to his laboratories for study and consultation. Dr. Grim is, in addition to being an outstanding scientist and superb teacher, a complete person. He is patient, kind, and compassionate. He was never too busy to talk to his students and advise and direct them scientifically and personally. He considers his former graduate students as his children and follows their careers very closely. He enjoys athletics and is an avid golfer. He loves to travel and has seen or is familiar with almost all the good clay deposits in the world.

Dr. Grim retired from active teaching at the University of Illinois in 1967 but this has not slowed him down one iota. He is working on a book on bentonites and is adjunct professor of Geology at Texas Tech in Lubbock, and is a consultant for many companies in the clay business and continues to work in foreign countries evaluating mineral resources. He has given lectures on Clay Mineralogy in Algeria, Argentina, Australia, Brazil, England, France, Hong Kong, India, Ireland, Israel, Italy, Japan, Mexico, New Zealand, Philippines, Russia, Scotland, South Africa, Sweden, Taiwan, and Venezuela. He maintains an office at the department of Geology at the University of Illinois and keeps abreast of the work being done on clays at the University.

In his many years of association with the clay minerals he has probably acquired more knowledge about this broad area which includes geology, engineering, chemistry, mineralogy, soil science, and ceramics than any other person.

Mr. President, it is a great pleasure to present to you the Roebling Medalist for 1974, Dr. Ralph E. Grim.

American Mineralogist, Volume 60, pages 498–500, 1975

Acceptance of the Roebling Medal of the Mineralogical Society of America for 1974

RALPH E. GRIM

Turtle Creek Village, Concourse Drive, Building 12C
Jupiter-Tequesta, Florida 33458

The award of the Roebling Medal is a very great honor, and I am deeply grateful for the receipt of this award. I am proud to be in the company of the distinguished mineralogists who have received the Roebling Medal in the past, particularly those who have also worked in clay mineralogy—Ross, Pauling, Gruner, and Brindley.

I feel a deep sense of gratitude to Clarence Ross. When I was getting started in clay mineralogy, forty years ago, I spent days in his laboratory in Washington, and we spent hours together studying his collection of clay mineral specimens and discussing all phases of clay mineralogy. In later years, we did not always agree—for example, in the use of the term 'illite'—but our friendship never wavered.

When I joined the Illinois Geological Survey in 1931, Victor Allen of St. Louis University had spent several summers on a petrographic study of some clays and shales in the state. A little earlier Ross and his colleagues had, by extremely refined microscopic techniques, revealed that clay

materials generally were composed of crystalline components. At about the same time, Sterling Hendricks and his coworkers were applying X-ray diffraction techniques to the analysis of clays and confirming the conclusions of Ross.

Therefore, just as I started work in Illinois, techniques became available for the first time to get at the fundamental components of clays—to go beyond chemical analyses which had never been very satisfactory in explaining the variations in the ceramic and other properties of clays, their genesis, *etc.* I was fascinated by this new field. Clay materials are ingredients in a wide variety of industrial products: refractories, building materials, foundry molding sand, oil well drilling mud, paper, paint, *etc.* As components of soils, they are important factors in the tilth of soils. The varying properties of clay materials are important to the engineer who must build structures on, through, or with clay material. I was intrigued by the possibility that mineral analyses of clay material using the new techniques could provide a better understanding of the variations in the properties of clay materials.

Illinois was a good place to study clays. It contained such material ranging in age from the Paleozoic to the Pleistocene, and it had an active clay industry. Above all, M. M. Leighton, then Chief of the Illinois Survey, gave me a completely free hand in my researches, and provided the necessary facilities.

Shortly after I joined the Survey, Bill Bradley, then a graduate student at the University of Illinois, came to work part time at the Survey. I never will forget the night that Bill and I sat together in Kammerer's Pharmacy in Urbana and discussed possible theses problems for him. I was enthused about clay mineral studies and tried to pass along this enthusiasm to him. I was successful. After receiving his PhD, Bill joined the Survey, and we worked together for many years. Bill Bradley had an essential part in many of my research activities, and I am everlastingly grateful for his friendship and the many discussions we had together.

The early work in Illinois involved cataloging the clay mineral composition of the various clays and shales in the state. In the course of this work, it was possible to show that overburden clay in the pit of a refractory producer, which for years had been scraped off and discarded, had unique properties for bonding molding sands. The operating company immediately began mining this clay and selling it for this purpose. This fortunate finding provided a welcome illustration of the economic value of clay mineralogy in Illinois. It helped tremendously in getting clay mineralogy started in Illinois.

To me, the fascination of clay mineralogy is that it can involve a combination of fundamental and theoretical mineralogy with the application of the fundamental data to a wide variety of practical problems.

One day the problem involves the use of clay in the manufacture of catalysts for the petroleum industry.

Another day, it is a matter of evaluating kaolins for the paper industry.

Another day, it is conferring with lawyers for a corporation or the Internal Revenue Service to resolve a matter of tax depletion allowance.

On another day, it is serving on a consulting board with engineers regarding a foundation problem.

On still another day, it is applying information on the changes on heating clay minerals to shortening and improving the firing schedule of ceramic ware.

In every case the situation or problem involves the properties of clays, and a solution requires an understanding of the factors controlling the properties, and this revolves around the clay mineral composition, the structure and composition of the clay minerals, the susceptibility of the clay minerals to change with a changing environment, *etc.* What one learns today, one applies tomorrow to a new problem.

In 1950 I moved from the Survey to the University of Illinois to develop graduate work in Clay Mineralogy, and to continue my researches. I was delighted to have an opportunity to work with students, and pleased that the University position gave me greater freedom to pursue the application of clay mineralogy in diverse fields. I owe a debt of gratitude to George White, then Head of the Department of Geology at the University of Illinois, who gave me complete freedom to pursue clay mineralogy as I wished, and to the University which provided the necessary research facilities.

Between 1950 and my retirement in 1967, about forty students completed their Ph.D. degree in Clay Mineralogy, and they are now scattered throughout the world—in Universities, Geological Surveys, and Industry. To this group should be added about ten more persons who came to the University for periods of months to years as post doctoral fellows. These people have been added brains, eyes, and hands to me. They have helped immeasurably in keeping me abreast of developments in clay mineralogy, for which I am deeply grateful. I am proud of every one of these scientific children, and my greatest pleasure is to follow their careers.

In the years following my retirement I have continued my researches, both at Illinois and at Texas Tech University, where I was appointed Adjunct Professor of Geology in 1972. In Texas, Dr. Necip Güven and I have been working together preparing a volume on bentonites.

American Mineralogist, Volume 60, pages 500–502, 1975

Presentation of the Mineralogical Society of America Award for 1974 to James J. Papike

David B. Stewart

U.S. Geological Survey, Reston, Virginia 22092

Mr. President, Fellow Members, and Guests of the Society.

My pleasure in introducing to you a colleague and friend since 1964, the 1974 recipient of the Mineralogical Society of America Award, is tempered by the knowledge that the teacher who had a vital role in shaping Jim Papike's career was not certain he would be well enough to make this introduction himself. However, that distinguished crystallographer, Tibor Zoltai, has asked me to personally convey to you his congratulations, Jim, with his hopes that you will continue your excellent applied crystallography.

I will tell you first about the distinguished research contributions for which the MSA Council made this Award. I will then remark on Papike's catalytic role in crystallography and lunar science. Finally, I will give you a few glimpses on the lighter side of things. First—the best part—his distinguished achievements on difficult and important crystal-chemical problems with immediate petrological applications. Papike has focused much of his research on the geologically abundant, geophysically significant, and mineralogically and crystallographically complex amphibole and pyroxene mineral families. These studies began at the U.S. Geological Survey, where together with colleagues Ross, Clark, Appleman, and others, precise structures were determined for the amphiboles glaucophane, tremolite, *C*-cen-