ACCEPTANCE OF THE MINERALOGICAL SOCIETY OF AMERICA AWARD BY JULIAN R. GOLDSMITH

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Mr. President, Dr. Fisher, Ladies and Gentlemen:

When my 12 year old son learned of this award, he asked, what specifically, was to be awarded. When I told him that I was to receive the *American Mineralogist* free, his response was, "Gee whiz, couldn't they give you something like *Life*, or *The Saturday Evening Post?*" If I could not properly transmit my feelings to him, I hope that I can, even without the use of additional words, convey to you the assemblage of emotions associated with being the recipient of this honor. I dare not dwell on other realities such as my unworthiness or the greater worth of the contributions of others, for this would reflect upon the group responsible for the choice. It is perhaps best to change the subject.

It would be even better if I would sit down, but it is difficult to pass up saying a few words to a captive audience. In addition, how else can one get into print in the *American Mineralogist* with a wait of but a few short months? I shall therefore drift into professionalistic "shop-talk."

To fully understand any mineralogical or petrological system, or in general, any homogeneous or heterogeneous system, one must know the equilibrium relations, or states of lowest energy for all temperatures of interest. Single mineral phases, let alone mineralogical assemblages or rocks, can be marvelously complex, and theoreticians are a long way from being able to rigorously compute configurations in systems such as these. Laboratory studies and mineral syntheses have distinct limitations as equilibrium can not always be obtained, and the experimentalist must keep a few natural specimens within sight for a number of reasons. Let us assume that all of our knowledge of the compounds that we call minerals was restricted to that obtained in the laboratory; that we had never seen a rock. The common potassium feldspar of the crust, microcline, would be completely unknown to us, as it has not been synthesized, and we would be quite happy with a sanidine-quartz assemblage as a stable laboratory "rock" that we might call granite.

I have given some thought to the difficulty with which certain substances crystallize relative to others, and have attempted to explain some crystallization phenomena on the basis of what I have called, perhaps unfortunately, the relative "simplexity" of the compounds. In so doing, I have been accused by some of everything from duplicity to "subversity." Permit me to digress to the extent of saying that the word simplexity was not fabricated by me, but can be found in Webster's unabridged,

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and merely means simplicity. I prefer to think of it as a series between the end members simplicity and complexity. If a high degree of order, or some other complex configuration coupled with lack of mobility in the system makes it more difficult to produce some phases than others, the "others"

may well appear to be the stable configurations, and fool us into thinking we understand the system under consideration. This might be as real in natural systems as it is in the laboratory, and the lowest energy state in a particular system at or near earth-surface temperatures could be a phase or phase assemblage that no one has ever seen. This difficulty which tends to disappear at higher temperatures obviously cannot be resolved by the back-extrapolation of experimentally determined *P-T* curves into frozen regions with the tacit assumption that the equilibrium assemblage is unchanged, or by computation of relative energies of known configurations at lower temperatures. Thermodynamic data, carefully and laboriously obtained at very low temperatures, may show up residual entropies that would be in apparent violation of the Third Law of thermodynamics, and would indicate that other phases are stable, but these data cannot tell us what these phases may be.

One might ask, "So what? Things are as they are and all we are concerned with is knowing under what conditions they got there." This, however, does not really satisfy one's insatiable curiosity. If we are now at the point where I can be considered to be undergoing metaphysical polymorphism, I had surely best sit down, before I bore you to the point where you would not hear me express my deepest thanks for being named recipient of the Mineralogical Society of America Award.