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Presentation of the Mineralogical Society of America Award for 1981 to Alexandra Navrotsky

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Mr. Chairman and Fellow Conferees:

It is my great privilege to present Alexandra Navrotsky as the recipient of the 1981 Mineralogical Society of America award. Alex knew that she was headed for a career in scientific research ever since her first days at the Science High School in New York. She came as an undergraduate to the University of Chicago and emerged with a Bachelor's Degree in chemistry in 1963. I first met her that year, as she began her Ph.D. work at Chicago. Alex was already a scientist of demonstrated talent, but, as yet, uncertain direction. She started out in physical organic chemistry, and but for some unexplained act of fate, might now be getting awards for work in molecular structure, or, perhaps, biophysics. Certainly her intellectual endowments militated an exceptional scientific career. Alex has never told me what circumstance impelled her towards inorganic substances, but this circumstance has proven to be our good fortune.

In 1964 Alex started thesis work with Ole Kleppa on the thermochemistry of spinels, an important family of the mineral kingdom. Ole was just setting up several high temperature oxide melt solution calorimeters, which are effective with those refractory minerals which do not dissolve well in hydrofluoric acid, the universal solvent of previous calorimetry. The spinel family offers a wide variety of interesting thermodynamic properties—complex solid solution, order-disorder relations, *etc.*, just the sorts of problems that a brilliant analytic mind like that of Alex Navrotsky would be attracted to. This chance combination of a new calorimetric method, an intriguing problem, and Alex, was our second stroke of good fortune. Her Ph.D. work on the formation, solid solution, and order-disorder properties of many of the spinel compounds was an important advance in the thermodynamics of minerals.

I sometimes joke with Ole Kleppa that many otherwise respectable Norwegian chemists seem to be irresistibly drawn to the study of rocks and minerals. Perhaps some of this fatal fascination was transmitted to Ole's Russian-American protegée, or perhaps her mother's life-long avocation as an amateur mineralogist was influential; collecting minerals is a continuing interest that Alex and her mother pursue whenever their busy schedules allow a field trip. For whatever reasons, Alex's spinel work was followed by solution calorimetry on cordierite, rutile, sillimanite, olivine, pseudobrookite, and many other minerals. In many of these studies there is an important thermodynamic consideration which proved crucial to interpretation of the thermochemical data. An example is the temperature dependence of the disordering of sillimanite, as revealed in heat of solution experiments. In this study, as in many of the others, it was Alex's great insight into thermodynamics which provided the key interpretation.

After leaving Chicago, Alex devoted the next few years to finding out what other laboratories occupied with thermodynamics were doing. She sojourned for a year each as a Research Fellow at the Institute for Theoretical Metallurgy at Clausthal, Germany, and in the Department of Geosciences at Penn State. Each visit led to collaborative publications. In 1969 Alex came to Arizona State as a faculty appointee in the Department of Chemistry. By this time, she had become irrevocably committed to the world of earth science, and this fact was recognized a few years later by a joint appointment in the Department of Geology. Her pioneering researches at ASU propelled her within a few years to the rank of Professor. She has indeed been prolific, and I can only briefly indicate some of her important accomplishments. These include studies of the energy systematics of cation substitutions in oxide and silicate mineral families, enthalpies of

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formation of important rock-forming minerals, the thermodynamics of high pressure phases of geophysical interest, the thermochemistry of saline aqueous fluids, and, most recently, the thermochemistry of silicate melts and glasses.

Alex has become known as one of the very responsible and devoted researchers in geochemistry. She has written numerous reviews and overview articles which have helped to guide her field. She spent the year of 1976–77 in Washington as National Science Foundation Program Director for Chemical Thermodynamics. She co-edited a recent book on the thermodynamics of minerals and melts and is an Associate Editor of the American Mineralogist. One of her great contributions to the health of mineralogy is her visible (and vocal!) presence at many meetings. I sometimes use Alex's face as an indicator during my talks—a quick frown means that I have let something dubious slip out, and a beaming smile signifies approval. Her comments are always incisive, but delivered with a piquant and friendly wit that refreshes one, after the initial shock of realization that you'd better be accurate and careful—very little gets past Alex Navrotsky!

Alexandra Navrotsky has substantially developed and guided the field of thermodynamic mineralogy. I am therefore proud to present her as the recipient of the MSA award for 1981, in the certain knowledge that her productivity and leadership are in an expanding mode, and that her influence will continue to be one of the mainstays of geochemistry.