

Acceptance of the Dana Medal of the Mineralogical Society of America for 2006

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Alex, thank you for your kind words—all the more meaningful coming from a good friend and colleague. Concerning the UNM English major and the poetry contest, he went to Edinburgh and finished third. More importantly, he now has a new perspective on the relation of science to literature. Every research group should have a poet laureate.

This is a moment when one reflects on their career and whom they should thank. For me, it is certainly the collaborators from different disciplines over many years. Some are here today in this first session—Alex Navrotsky, Lumin Wang, Bill Weber and Allison MacFarlane. Each of these four come from a different sub-discipline—and each have added considerable breadth to our research interests and capabilities. Other colleagues and collaborators will appear in later sessions—all were important to our research program. I certainly want to acknowledge the talented group of graduate students and post-docs who have been members of the research group. Bryan Chakoumakos was the first post-doctoral fellow, followed Takashi Murakami, Janusz Janeczek Wiliang Gong, Peter Burns, Mostafa Fayek, Shixin Wang, Donggao Zhao, Keld Jensen, Satoshi Utsunomiya, and Jie Lian. The first Ph.D. graduates were Mike Jercinovic and Greg Lumpkin, followed by Mark Miller, Ray Eby, Bob Finch, Al Meldrum, Binxi Gu, and Chris Palenik—to name a few. Most of these alumni were with the group when we were at the University of New Mexico—and all will remember our Friday lunches at El Patio. Today, at the University of Michigan, I am blessed with a large group of graduate students from three departments that are melded into the “mega” group, jointly led by Lumin Wang and Udo Becker. Certainly, I could not have attacked the scientific problems that interested me without the insight and help of all of these individuals.

I also want to thank those who had enough faith to fund this work, Bob Gottschall and Yok Chen, in the Materials Science Division of Basic Energy Sciences (DOE). More than 20 years ago, they took a chance on an unknown geologist who wanted to investigate radiation effects in minerals. Without the continuity of the support from BES, we could not have roamed as widely in the research or produced our contributions to the fundamental insights into radiation damage processes.

Alex referred to me as a “. . . fundamental and an applied mineralogist.” I have always tried to focus on fundamental questions, but I am very proud to be an “applied” mineralogist. This was not always the case. When I was a graduate student at Stanford, I was fortunate enough to have an NSF Fellowship and the freedom that goes with having an independent source of support. Because of this independence, I resolved to work on a topic in which there was no interest and no apparent relevance or



application. This was, of course, a naïve decision, and one that condemned me to years of obscurity. However, when I first read about metamict minerals, I knew that I had found the perfectly “dead” topic. Adolf Pabst at Berkeley had written an important paper in 1955, but during the next 20 years, there had been no activity or hint of interest. However, buried in this fine paper was a profoundly interesting observation: monocline huttonite, ThSiO_4 , was apparently “resistant” to radiation damage, while the tetragonal form, thorite, easily accumulated radiation damage. I wondered immediately about the possibility of structural controls on radiation-induced amorphization, and most of my subsequent research has grown out of an effort to understand the relation between the structure of a material and its response to a radiation damage event.

This work has led me down two exciting, but different, research paths: Along the first path were fundamental studies of heavy-particle interactions with ceramics or, in more modern parlance, the use of ion beams to “manipulate” or “tune” the properties of ceramics at the nanoscale. I hope that the audience appreciates how deftly I have used the important buzzwords to signal the relevance of this research. The second path includes studies related to all things “material” in the nuclear fuel cycle. Our group has worked nuclear waste forms, nuclear fuels, and the performance of nuclear waste repositories. I also became especially interested in the crystal-chemistry and geochemistry of the actinides, particularly plutonium. There is something magical about elements that have 5f electrons—and are also fissile. Today, when my colleagues consider our research group—with its many

post-docs and graduate students from different disciplines—they compliment me on my wisdom in selecting fields of research of such high interest and funding potential. I assure you that this was not the way that it started.

What is the moral to the story? Choose simple, but fundamental, questions that interest you. Be prepared to stay with a question for years. Choose good collaborators that can provide new insight and tools. Choose good students, whose curiosity and energy will drive the research. Believe that every fundamental insight has an important application. All of us can be clever, but we should use the privilege of being a scientist to have a broader impact on our science and society.

Concerning the impact of mineral science on the broader scientific community and society, I want to say that one of the

great and recent pleasures for me has been the birthing process of the magazine, *Elements*. Initially, this idea was rejected by all, but now we are 10 mineralogical and geochemical societies working together, and the number is growing. *Elements* has already become an important medium of communication for our discipline. Again, success came because we were wise in selecting our collaborators and fellow editors—Pierrette Tremblay, Ian Parsons, Mike Hochella, and Bruce Watson.

Finally, I must acknowledge my wife, Helga. The difficulty, however, is that she has never taken me or my work very seriously. Instead, many evenings of work have given way to her fine meals, a good wine, and conversation. Let me just say that she has kept me from being as dull, as I am capable of being.

Thank you all.