ARTHUR L. DAY MEDAL

Presented to Kenneth A. Farley

Kenneth A. Farley
California Institute of Technology

Citation by Peter W. Reiners

The impact of Ken Farley's scientific work and personal mentoring can be felt over a wide swath of the earth and planetary sciences. The clarity and integrity of his work serves as a model for those who have had the privilege of working with him; his leadership and insight in geochemistry make him highly deserving of the Day Award for application of physics and chemistry to geologic problems. As one of Ken's former postdocs, I am honored to have the opportunity to highlight some of his many contributions.

Ken seems to have an almost supernaturally lucid vision of natural processes, as if he has seen the answers in the back of the book to the problems most of us struggle with awkwardly. This may come from working with some of the most demanding giants of geochemistry, including Karl Turekian and Harmon Craig, as well as the rigorous scientific atmosphere at Caltech.

Ken's most influential work is in noble gas geochemistry—some of his earlier work demonstrated clear coupling of isotopic systems of noble gases and other elements in ocean-island basalts and systematic genetic variations among their mantle sources. He was a pioneer in the use of cosmogenic noble gases for examining surface processes, and he discovered the utility of extraterrestrial ^{3}He as a powerful proxy for deep-sea sedimentation rates and for variations in the flux of extraterrestrial material to Earth—approaches whose potential has just begun to be tapped. Ken's work in diffusion and the development of modern (U-Th)/He thermochronology elegantly solved several long-standing technical and interpretational problems, unleashing a technique with enormous impact on geomorphology and tectonics. While leading the way in these fields, Ken has also mentored an exceptional array of graduate students and postdocs.

Ken will no doubt make many more discoveries in the future with the concise critical analysis that characterizes the Farleyian approach. He illuminates scientific landscapes in a clear, fresh light and shows us how to see them with the same clarity.

On behalf of the community and those Ken has mentored, thanks and congratulations for this well-deserved award.

Response by Kenneth A. Farley

I want to thank Pete Reiners for his kind citation and the GSA for recognizing my work with the Day Medal. It's a great honor to receive an award with sixty years of history and to be included among such remarkable figures in the history of geochemistry and geophysics - figures that include my thesis adviser and many of my mentors.

Pete mentioned a range of topics I have worked on, but their relationship may be puzzling—oddly enough, it's through helium. At a recent cocktail party I was explaining my work to some Caltech trustees when I announced my sudden realization that every paper I have written discusses this element. You can imagine their blank stares—I can assure you that beyond balloons and squeaky voices helium is a pretty weak conversation-starter. But it truly is a fascinating element—its two isotopes have completely different origins in many materials, it is not gravitationally bound to earth, and it has no chemistry. And the million-fold (!) variation in 3He/4He ratio in common Earth surface materials gives us a huge range to investigate!

For the last decade I have worked to develop (U-Th)/He dating. This came about in a curious way—in 1994 I met a Caltech graduate student counting fission tracks for his thesis. Having come from a background in chemistry, I had never heard of such a thing! But by chance I happened to have just calculated the enormous ratio of alpha to fission production by ^{238}U. If you can count fission tracks by eye, by golly it should be easy to measure the alphas; of course someone else—Rutherford—had already thought of that, in 1905. It's probably just as well I was unaware of the many earlier attempts at helium dating—almost all unsatisfying. I managed to recruit that track-counting grad student to have a look at helium, but when I mentioned to my noble gas colleagues my idea, I often got an incredulous "Why are you working on that?". A review of my first NSF proposal to do the work captured that skepticism: "Farley is dumpster-diving". I would love to say I knew better, but you can be sure there was great relief when our very first data set showed a correlation between age and elevation—the unmistakable sign of a sensible result.

The best part of this award is the opportunity it gives me to contemplate how my work has come about.

I would not be in geoscience at all if it were not for Karl Turekian, who inspired me as a Yale undergraduate to abandon chemistry, and engineered my path into geochemistry. Although I had a challenging relationship with my thesis adviser Harmon Craig at Scripps, I credit him with having taught me the key lesson that discovery requires measurements - often of things you have never analyzed before and things others think are a waste of time. And equally importantly, that the results—even if unexpected and strange—must record something. The trick is then to identify that something and determine if it is important or mundane (or just bad data!). This isn't the standard scientific method, but it's what motivates me - the thrill of developing a measurement technique, obtaining new data, and trying to figure out how it came to be and what it might be good for.

I need to thank my many collaborators over the years. This includes my four graduate students and more than a dozen post-docs who shared the fun of discovery and moved me in scientific directions I would never have explored otherwise. It also includes my faculty colleagues at Caltech, who not only tolerated my incessant and often ignorant questions, but embraced the methods we developed by finding fascinating applications for them - applications that then pushed my research in new directions.

I'm also pleased to acknowledge my research technician, Lindsey Hedges, who is in attendance at this ceremony. Lindsey has remarkable attributes that I simply do not—most notably incredible patience. (U-Th)/He dating requires meticulous attention to calibrations and to preparation of tiny mineral grains. I find such work unbearably difficult and frustrating, but Lindsey makes it look easy—she once tweezered a pile of zircons to spell out my name! Anyone who runs a lab

can appreciate the incredible value of having a technician who "does it right", every time.

I have also been fortunate to be well-supported financially. Keeping a laboratory functioning requires non-stop feeding, and I must acknowledge years of support from the National Science Foundation. We often complain about how risk averse NSF is, but decisions relating to my proposals have always seemed fair and open. While not everything got funded, I can't complain; the review panel even liked my dumpster diving! I have also benefitted from grants from the G.B. Moore Foundation and a Packard Foundation fellowship - money with minimal strings that let me think big.

I have worked at Caltech for my entire professorial career—I could not ask for a more stimulating and supportive environment in which to be a scientist.

My wife Kristen and my sons Scott and Ryan should share this award with me. Their acceptance of my long work hours was too often repaid by vacations collecting samples that were always "right on the way". It's hard for me to imagine putting in the effort that science requires without having such a great family to return to each evening.