

Presentation of the Mineralogical Society of America Award for 2014 to Fang-Zhen Teng

WILLIAM F. MCDONOUGH¹

¹Department of Geology, University of Maryland, 247 Regents Drive, Building 237, College Park, Maryland 20742-4211, U.S.A.

Ladies and gentlemen, it is an honor and a privilege to present the citation of Fang-Zhen Teng and I do it for both Roberta Rudnick and myself, his Ph.D. supervisors. Fang-Zhen hails from a fairly simple rural Chinese background where he exceeded village norms by becoming a University of Science and Technology (USTC) student and later an Associate Professor at the University of Washington. As a graduate student at the University of Maryland, Fang-Zhen began his journey from student to scientist, maturing successfully into a great young researcher and mentor.

I am forever grateful to Fang-Zhen for the several lessons he taught me in geochemistry as he dutifully studied the lithium isotopic composition of crustal rocks for his Ph.D. My first mentoring lesson came after I predicted that crustal rocks would have a heavy lithium isotopic composition, greater than that of the mantle. I was wrong and Fang-Zhen showed that the opposite was true with crustal rocks on average being isotopically lighter than the mantle. Fang-Zhen insightfully pointed out the importance of bond coordination numbers in fluids versus minerals and the role of weathering in driving crustal rocks to lighter lithium isotopic compositions.

Did Fang-Zhen struggle during his markedly brief Ph.D. years? Well there was the time when he came into my office after receiving granite samples from Bruce Chappell. With a look of horror Fang-Zhen asked what should he do. I laughed; Bruce sent him a couple of kilograms each of all the classic I- and S-type granites. Prior to this, Fang-Zhen only knew scientific rocks as powders.

Fang-Zhen also struggled with his orals and proposal defense, but later this moment became a shining demonstration of his independence, creative insights, and innovative spirit. Having not convinced his committee of his Ph.D. research project, I specifically told him not to work on the Tin Mountain pegmatite samples and focus on his other projects. Again dutifully he went on to complete these other projects. One day, however, he sheepishly entered my office and asked politely if he could show me some new data. That was when Fang-Zhen presented to me his data on the Tin Mountain pegmatite samples, revealing the fantastic evidence of diffusively driven, 20 per mil kinetic isotopic fractionation along a 30-meter long profile from pegmatite to country rock. Yes, these are the samples I told him not to work on (what did I know!), but Fang-Zhen, using the Wisdom of Solomon, quietly showed the importance of these samples by demonstrating that the 17% mass difference between ⁶Li and

⁷Li readily leads to stunningly large kinetic fractionation gradients. This work demonstrated the power of lithium isotopes for tracking element transport in the shallow crust and has spurred several follow-up studies.

Fang-Zhen impressed many by quietly completing his Ph.D. in 4.5 years, a fact I announced to his fellow grad students at his dissertation defense; I also reminded them that, more impressively, he did it in a foreign language! With Ph.D. in hand, Fang-Zhen went to Chicago to work with Mini Wadwaha, Nicholas Dauphas, and Frank Richter on a series of groundbreaking studies exploring Fe and Mg isotopic systems, particularly during igneous differentiation with samples from the crystallizing Kilauea Iki lava lake. As previously shown with Li isotopes, Mg isotopes did not show fractionation through this differentiation sequence, but surprisingly large Fe isotope fractionation occurred, potentially due to variable oxidation states of Fe on equilibrium partitioning or kinetic fractionation associated with diffusion.

As an Assistant Professor at the University of Arkansas, Fang-Zhen and collaborators helped resolve two rather controversial debates regarding the Mg isotopic composition of the mantle and of chondrites, first by demonstrating that the Mg isotopic composition of the Earth's mantle is homogenous and comparable to that of chondrites and then second, showing that the Earth and chondrites have identical Mg isotopic compositions. Moreover, with a nod back to his Ph.D. studies, he characterized the Mg isotopic composition of the upper continental crust and the influence of continental weathering on Mg isotopes.

Fang-Zhen's contributions go well beyond these and his many other scientific achievements. He has organized and continues to organize special sessions on non-traditional stable isotopes and instrumental methods at various international meetings. He also has a remarkable record of mentoring many undergraduate, M.S., and Ph.D. students, as well as a number of summer interns in his years at Arkansas and now at the University of Washington. Many of these students come from underrepresented groups (including African Americans and women). Fang-Zhen is making sure that the next generation of scientists is as diverse as our society.

It is remarkable that at this young stage of his career Fang-Zhen has already had many outstanding research accomplishments in the field of non-traditional stable isotopes. Moreover, he is mature beyond his years, showing leadership in science society and in mentoring. I proudly give you Fang-Zhen Teng, the 2014 MSA Award recipient.