

2009 MEDALS & AWARDS

SUBARU OUTSTANDING WOMAN IN SCIENCE AWARD

Presented to Jaime D. Barnes



Jaime D. Barnes
University of Texas at Austin

Citation by Zachary D. Sharp and Jane Selverstone

Jaime Barnes finished her Ph.D. in the spring of 2006, and the contributions resulting from her thesis have already had a significant impact within the geological community. Her thesis work led to seven publications, with an additional four manuscripts published since that time. Her papers have been cited in print more than 80 times, which is remarkable considering that her first paper was only published in 2004. Her chlorine isotope work is novel and exciting, and has made her a very visible presence at national and international meetings.

Jaime carried out her M.S. and Ph.D. under the supervision of Jane Selverstone and Zachary Sharp. Her original interest centered on petrology, but she soon fell in love with geochemistry as well. After completing her Master's degree on fluids in Alpine shear

zones (*Journal of Metamorphic Geology*, 2004), she decided to enrich her geochemical arsenal with chlorine isotope geochemistry. This was not a simple endeavor, and took close to two years to perfect. She needed to work out the extraction method, develop a purification procedure for methyl chloride, and modify the mass spectrometer, adding new collectors and resistors. Through trial and error, finding some published procedures acceptable and others unworkable, she developed a method that allowed her to analyze trace amounts of Cl in rocks and minerals with high precision and accuracy. She was off to the races.

Chlorine isotope ratios of geological samples were first measured in 1960. Other than a few publications in the 1990s, virtually no other chlorine isotope analyses of rocks had been made until Jaime's work. After recognizing serpentinites as a major carrier of Cl into the mantle (*Earth Planet. Sci. Lett.*, 2004), she measured the chlorine isotope composition ($\delta^{37}\text{Cl}$ values) of Ocean Drilling Project (ODP) serpentinites. She identified a bimodal isotopic distribution of samples depending on whether they had been hydrated directly by seawater or by porewaters from a thick overlying sequence of sediments. This work provided significant insights into the mechanisms of seafloor serpentinization (*Chem. Geol.* 2006). Having characterized the distinct isotopic signatures of serpentinites formed under different tectonic conditions, she turned to an obducted oceanic sequence in Elba, Italy, and demonstrated that information on the seafloor history of each serpentinite-bearing nappe was preserved throughout the subsequent metamorphic and obduction history (*Geochem. Geophys. Geosyst.*, 2006). At the same time, she was part of a team that worked out the chlorine isotope composition of the mantle, primitive meteorites and the crustal variations through Earth's history. This work places new constraints on the formation of our planet and the global chlorine cycle (*Nature*, 2007).

Jaime continued at UNM as a Postdoctoral fellow working with Tobias Fischer and Sharp studying chlorine

isotope distribution over subduction zones. She worked on the Izu-Bonin-Mariana arc and Central American arc, with two sampling campaigns under her belt. In a paper in *Geology*, she identified variations perpendicular to the IBM arc, assigning fluid sources to different types of volcanic materials at the surface. Looking at along-arc variations in the Central American arc, she was able to constrain potential sources related to specific 'forcing functions'. This work is in press in *Geochemistry, Geophysics, and Geosystems*.

Jaime knew that there was a water-soluble chloride phase in her serpentinite samples, but she could not identify it at the SEM or electron microprobe scale. Undeterred, she realized that she needed to take another approach. Using the transmission electron microscope, she and Adrian Brearley found high concentrations of Cl in the center of chrysotile tubes using the transmission electron microscope. The implications of this finding are the topic of a manuscript that is currently in preparation.

Jaime's chlorine isotope work has generated a great deal of international interest, leading to several collaborative studies. Axel Liebscher (Potsdam, Germany) and Jaime determined the chlorine isotope fractionation between aqueous fluid and vapor up to the critical point (*Chem. Geol.* 2006). She worked with Huiming Bao (Louisiana State University) on identifying sources of aerosols in the McMurdo Dry Valleys, Antarctica (*J. Geophys. Res.*, 2008) and most recently with Bruce Watson (RPI), in a project to determine Cl diffusion rates in silicate melts.

Jaime has compiled a long list of honors in her short career. She was an NSF graduate student fellow, was awarded the "Excellence in Graduate Research" Award from the University of New Mexico Sigma Xi chapter, and won the V.C. Kelly Outstanding Doctoral Candidate scholarship and the Best PhD award from our department. In 2007, she was awarded one of five L'Oréal Women in Science Awards in the United States. This was the first time that the award, which is judged by the AAAS, was given to a geoscientist. Clearly, Jaime's achievements have been

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recognized at all levels. She was active as a teaching assistant (even though she was fully funded by research monies) because she wanted to gain valuable teaching experience for the future. She also mentored several high school students as part of the NASA SHARP minority mentorship program.

Overall, Jaime is an exceptional young scientist. This was apparent to the faculty at the Jackson School of Geosciences at University of Texas, where she was recently appointed Assistant Professor. She is eager to tackle difficult problems, and quickly gets the results of her work into print. She also made time to marry fellow geoscientist Dan Breecker, and last year gave birth to their first child. Jaime works hard, but is always cheerful and generous with her time, helping both graduate and undergraduate students in the laboratory or in any other way she can. We were always aware when Jaime was around because we could hear her infectious laughter down the hall. Jaime will no doubt be an inspiration to other young women in the Geosciences and a mentor to many aspiring geoscientists in general. She is very deserving of the Subaru Outstanding Woman in Science Award from the Geological Society of America.

Response by Jaime D. Barnes

It is truly a great honor to receive the Subaru Outstanding Woman in Science Award in memory of Doris Curtis. I would like to

thank GSA for this award and Subaru for their sponsorship.

My path to academia began as an undergraduate when I entered UT-Austin as a declared geology major. It was there that I took Bill Carlson's petrology class. I would like to thank Bill for pulling a shy undergraduate aside and asking her to do an undergraduate honors thesis with him. Bill first introduced me to scientific research- teaching me what questions to ask and how to answer them. It was also Bill who encouraged me to look outside the state for graduate school- a hard task for a native Texan.

I decided to head just slightly west to attend the University of New Mexico and work with Jane Selverstone. Jane and I instantly bonded. She is an amazing scientist, teacher, and role model. Jane taught me the basics of how to do field work, write a paper, and give a talk- and how to do them well. She remains my voice of reason, a source of excellent advice and my very dear friend. I quickly got pulled into the world of stable isotopes through the contagious enthusiasm of Zachary Sharp. It was Zach who showed me that science is first and foremost fun. At first I was a bit apprehensive about this man who ran into my office almost daily yelling "I just had this idea- let me show you, now" or "grab a wrench and come quickly" and then would disappear as quickly as he appeared. Little did I know that my tidy, meticulously neat and orderly world needed Zach. Zach taught me to be creative, try new things, and how to

multitask. With time, my initial tentativeness began to disappear. I broke many things, many expensive things, but Zach always shrugged it off. "We can fix it" and he always did. I would not be standing before you, accepting this award, if it were not for these two amazing people. They share in this award as much as I do. Jane and Zach were the perfect complement as mentors. Jane taught me my field skills- while Zach muttered that JD was the same in every direction so why did I have to take a strike and dip- and Zach taught me my laboratory skills- while Jane poked her head into the stable isotope lab but would never cross the threshold. I hope that in the future, I can provide my students with a fraction of the support that Jane and Zach did for me.

And finally I would like to thank my family and friends for their support, especially my husband, Dan Breecker. Dan takes everything in stride with a constant grin upon his face, helping me keep things in perspective and providing a balance in my life. He and I are incredibly lucky to be able to navigate this journey into academia together as we chase our already quite fast one year old son.

I am exceptionally grateful to be a member of a community so supportive of its young members and am humbled to accept this honor.