2015 MGPV Early Career Award to Frances Elaine Jenner

Frances Elaine Jenner, The Open University, Milton Keynes, United Kingdom, is the 2015 MGPV Early Career Awardee. The award presented at the Joint MGPV-MSA-GS Reception during the 2015 GSA Annual Meeting, Baltimore, MD.

Dr. Jenner is an analytical geochemist pioneering several novel analytical techniques and applying them to igneous rocks from wide temporal and geographical ranges. Dr. Jenner is unusual in having both the analytical skills to devise new approaches and the intellectual agility to find entirely new geological interpretations, which were not even part of the debate before her studies were carried out. Her ability to generate novel, high-quality data has allowed her and her colleagues to overturn previous assumptions or hypotheses about a variety of igneous processes, giving us a better understanding of mafic volcanism over the last 3.8 billion years of Earth history.

While she collaborates extensively with experimental petrologists, Dr. Jenner mostly analyses natural samples of diverse provenance. Working from the Greenland Eoarchean to modern submarine volcanics, her areas of study span more than 95% of the terrestrial rock record in geologic time. Her onshore field areas range from the periglacial west coast of Greenland to tropical Samoa. While ocean drilling programs do not fit the stereotypical mold of outcrop hammering and rock licking, they are none-the-less the only way we currently have of accessing ~70% of our planet's surface that is under water. And it is her ability to choose the right sample or samples for her new analytical methods that allows her to discover novel petrologic processes.

Upon the completion of her PhD on the nature of Eoarchean rocks, Dr. Jenner branched out into the quantification of “less commonly analyzed elements” in volcanic glasses. One such element is selenium. In theory, selenium should be a useful proxy for sulfur in systems (such as volcanic glasses) that may have undergone partial degassing. But there was no standard analytical protocol for measuring this low-abundance chalcogenide in silicate materials. She and her colleagues devised an analytical protocol to routinely measure selenium using LA-ICPMS. The use of the relatively cheaper, versatile LA-ICPMS equipment meant that selenium contents of target glasses and minerals could be determined along with other elements of interest in a whole-scale manner much more economically than the use of other techniques.

While an analytical specialist may have been content to do this without too much thought to the geologic implications, Dr. Jenner and her colleagues immediately put it to use in investigating the enrichment of Cu, Ag, and Au in arc-related magmas and showed that magnetite crystallization triggers sulfide saturation by changing magmatic fO$_2$. 
The use of higher-quality data to reject a long held but data-poor assumptions is a hallmark of Dr. Jenner’s research. Although she has continued to analyze selenium for the purpose of constraining sulfide saturation and chalcogenide behavior, her next major achievement was to roll out the same approach to the rest of the periodic table and a wider variety of sea-floor volcanic glasses. Applying these techniques to hundreds of ocean-floor volcanic glasses, her work yielded a rich, high quality dataset that showed that the mid-ocean ridge fractional crystallization models needs refinement.