2003 Nier Prize Citation for Steven J. Desch

One of the most vexing problems in the fields of Meteoritics and Cosmochemistry is the origins of chondrules and igneous calcium-aluminum-rich inclusions (CAIs) found within chondritic meteorites. For essentially 200 years, the mechanism(s) that melted these objects during the earliest stages of our solar system's formation have remained an enigma. Many mechanisms have been proposed, but it was not until the research of Dr. Steven J. Desch, in collaboration with an experimental petrologist, that a detailed quantitative model was produced that makes specific predictions that match what is observed within the rock record (Desch and Connolly 2002, *Meteoritics & Planetary Science*). Using a one-dimensional model, Steve quantitatively showed that a nebular shock wave model provides the heating and cooling histories needed to produce chondrules and type B CAIs, as determined through numerous investigations. The model predicts, in detail, the melting and cooling of igneous spheres within a nebular shock wave and the factors that affect this process, including the relationship between gas and solids. The latter has been largely ignored or incorrectly assumed by previous researchers, and Steve's calculations show that this factor has a profound affect on the thermal histories of chondrules and type B CAIs.

What is even more spectacular is that Steve is somewhat new to the fields of Meteoritics and Cosmochemistry. He received a B.S. and M.S. in Physics from Rensselaer Polytechnic Institute, an M.S. in Astrophysics from the University of Chicago, and finally, a Ph.D. in Physics from the University of Illinois, Urbana-Champaign in 1998. Dr. Desch has spent considerable research efforts to constrain aspects of star formation through magnetohydrodynamic calculations that illuminate the importance of ambipolar diffusion compared to Ohmic dissipation in reducing magnetic flux. His modeling has also constrained the aspect of magneto-rotational (Balbus-Hawley) instability in protoplanetary disks. He accepted a National Research Council position at NASA-Ames where, among many problems, he worked on modeling chondrule formation from lightening, which, although he published, he soon abandoned for the nebular shock wave model. In 2000, Steve joined the postdoctoral staff at the Department of Terrestrial Magnetism of the Carneige Institution and turned his theoretical modeling skills to various issues in the field of Astrobiology and new problems in Meteoritics and Cosmochemistry, including the shock wave model for chondrule formation and the origins of short-lived radionuclei in the early protoplanetary disk.

Steve has the wonderful ability to explain complex intricacies of physics at a level that the non-specialist can appreciate without compromising the quality of his research. As he develops new theoretical methods for looking at complex problems in our field, Steve consistently achieves a level of understanding of the petrology and geochemistry of chondrites that many non-geologists never obtain. His theoretical modeling and his passion for building bridges between Astrophysics and Meteoritics/Cosmochemistry are impressive and admirable. I am confident that he will be one of the future leaders in the successful communication between the above disciplines. The Society has shown wisdom in recognizing, and thus encouraging, the important role that theoretical Astrophysics plays in our desire to investigate and solve long-standing problems within our understanding of the origin of our solar system.

Finally, Steve has successfully completed this impressive list of achievements while he and his wife, Aida Hatem, started a family (they have two sons Joesy and Alex Desch)! It has been a great privilege to work with, and learn from, Steve. I can think of no young scientist more eminently qualified to receive the 2003 Nier prize. Mr. President, members of the Meteoritical Society, their friends and family, it is with great humility and honor that I present Dr. Steve Desch, an exemplary young scientist; the 2003 Nier Prize winner.

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