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Editorial

It is with great pleasure that, on the occasion of his 70th birthday, we have the opportunity to honor Ernst Zinner by dedicating this issue of *Meteoritics & Planetary Science* to him. Ernst has been active in the scientific community for more than 40 years, much of that time as a member of the Physics Department at Washington University, and he has touched the lives of countless friends, colleagues and former students. For over 20 years, his work has focused largely on the development and use of secondary ion mass spectrometry (SIMS) to address outstanding problems in cosmochemistry, geochemistry, and nuclear astrophysics. Through innovative development work on the Cameca 3f ion microprobe in the 1980s and more recently on the Cameca NanoSIMS, and through the many students, postdocs, and visitors that he has trained over the years (who in many instances have gone on to establish SIMS laboratories of their own), Ernst has created a lasting legacy in which the phrase "Washington University ion microprobe" is synonymous with cutting edge research in the study of extraterrestrial materials. Indeed, the extensive field of presolar grain research was largely driven by the pioneering work of Ernst and his colleagues with the ion microprobe, and has led to a dynamic interface between the previously distinct fields of astrophysics and meteoritics.

Ernst's scientific contributions have been widely recognized, and he is the recipient of several prestigious awards, including the J. Lawrence Smith Medal from the National Academy of Sciences and the Leonard Medal from the Meteoritical Society. However, perhaps more telling than these honors is the widespread respect accorded Ernst by his scientific colleagues. This is amply demonstrated by the numerous papers contributed to this special issue. The issue opens with an appreciation of Ernst Zinner by Kevin McKeegan, which reviews the highlights of Ernst's scientific career. This is followed by four sections that demonstrate the wide range of Ernst's scientific interests. Indeed, Ernst is himself a co-author of four papers included herein that cover areas as diverse as using presolar grains to understand nucleosynthesis and stellar evolution, work on refractory inclusions and early accretionary processes in the solar nebula, and understanding meteorite petrogenesis through the application of trace element distributions.

Ernst is perhaps best known for his presolar grain research, and the first six papers in the volume center around this topic. Four of these papers focus on SiC grains. Huss and Smith, Marhas et al., and Barzyk et al. all report on the isotopic compositions of trace elements in single presolar SiC grains to constrain astrophysical processes in AGB stars. Henkel et al. use ToF-SIMS to obtain 3-D elemental and isotopic compositions of SiC grains. Finally, José et al. present theoretical calculations of nucleosynthesis in novae to aid in identifying and interpreting presolar grains from such sources, and Diehl et al. review the use of gamma-ray spectroscopy to understand stellar nucleosynthesis.

The second and largest section of the issue consists of papers that focus on understanding the origin and evolution of the solar nebula. SIMS has been widely used to constrain the formation of refractory inclusions, the earliest solids in the solar system, and to delineate the time scales of processes operating in the earliest solar nebula, and Ernst was instrumental in making this a viable technique for measuring trace element and isotopic compositions in individual mineral grains. The paper by Caillet Komorowski et al. reflects the synthesis of geochemical, isotopic, and petrographic information needed to understand the genesis of Ca-Al-rich inclusions (CAIs). The complexity of these objects is further underscored by two papers: one by Nakamura et al. on the condensation and aggregation of rare corundum and corundum-hibonite grains, and the other by Krot, who postulates the transport to and remelting of refractory inclusions in the chondrule-forming regions of the solar nebula. Five additional papers by Fagan et al., Itoh et al., Sugiura and Krot, Ushikubo et al., and Wang et al. report on isotopic measurements (Al-Mg, O isotopes) made on CAIs and/or related amoeboid olivine aggregates. Fagan et al. and Ushikubo et al. focus in particular on understanding the evidence for multiple episodes of alteration in the early solar nebula.

Despite years of study, the chronology of the early solar system is still not well understood, as is evident from continued work in this area. For example, several recent studies have suggested the early formation of differentiated asteroids before most chondrites, a subject that is addressed in the paper by Sokol et al. The timing of secondary alteration processes is the subject of a paper by Hoppe et al., who use the NanoSIMS to constrain the formation of carbonates from Orgueil. High-precision Pb isotopic dating is covered in two papers by Amelin and Krot, and Blinova et al.; this technique has the possibility of addressing some of the uncertainties inherent in early solar system chronology by providing absolute ages that can be calibrated against the relative ages provided by most short-lived radionuclide chronometers. Finally, Eugster et al. discuss the pre-compaction exposure histories of chondrules from ordinary chondrites.

The final section of this volume covers a more diverse range of papers relating to cosmochemistry. Several of these papers are united by the use of various new technologies to address outstanding problems in cosmochemistry. For example, Zega et al. outline applications of in situ sample extraction using focused ion beam scanning electron microscopy in the study of extraterrestrial materials; Busemann et al. use microRaman spectroscopy to characterize insoluble organic matter from primitive meteorites; and Bland et al. investigate the composition of micrometer size components in primitive chondrite matrix material. Kimura et al. carry out experimental work to investigate non-mass-dependent oxygen isotope fractionation produced in laboratory smokes. Finally, it is fitting that the last paper in this special issue not only makes use of early SIMS developmental work carried out by Ernst, but is also co-authored by him: Kurat et al. carry out SIMS trace element investigations of silicate-rich inclusions from iron meteorites in order to understand their origins. Ernst's active engagement in research at an age when many have already retired is an inspiration to his colleagues and friends, and we wish him all the very best in his continued efforts.

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