LUNAR METEORITES: A GLOBAL GEOCHEMICAL DATASET. R. A. Zeigler[1], K. H. Joy[2], T. Arai[3], J. Gross[4], R. L. Korotev[5], F. M. McCubbin[1]. [1]NASA – Johnson Space Center, Houston TX 77058, [2]SEAES, University of Manchester, Manchester, UK; [3]Planetary Exploration Research Center, Chiba Institute of Technology, Chiba, Japan. [4]Rutgers University, Piscataway, NJ 08854; [5]Washington University in St. Louis, St. Louis MO, 63130.

Introduction: To date, the world's meteorite collections contain over 260 lunar meteorite stones representing at least 120 different lunar meteorites. Additionally, there are 20-30 as yet unnamed stones currently in the process of being classified. Collectively these lunar meteorites likely represent 40-50 distinct sampling locations from random locations on the Moon. Although the exact provenance of each individual lunar meteorite is unknown, collectively the lunar meteorites represent the best global average of the lunar crust. The Apollo sites are all within or near the Procellarum KREEP Terrane (PKT), thus lithologies from the PKT are overrepresented in the Apollo sample suite. Nearly all of the lithologies present in the Apollo sample suite are found within the lunar meteorites (high-Ti basalts are a notable exception), and the lunar meteorites contain several lithologies not present in the Apollo sample suite (e.g., magnesian anorthosite).

Chapter Summary: This chapter will not be a sample-by-sample summary of each individual lunar meteorite. Rather, the chapter will summarize the different types of lunar meteorites and their relative abundances, comparing and contrasting the lunar meteorite sample suite with the Apollo sample suite. This chapter will act as one of the introductory chapters to the volume, introducing lunar samples in general and setting the stage for more detailed discussions in later more specialized chapters.

The chapter will begin with a description of how lunar meteorites are ejected from the Moon, how deep samples are being excavated from, what the likely pairing relationships are among the lunar meteorite samples, and how the lunar meteorites can help to constrain the impactor flux in the inner solar system. There will be a discussion of the biases inherent to the lunar meteorite sample suite in terms of underrepresented lithologies or regions of the Moon, and an examination of the contamination and limitations of lunar meteorites due to terrestrial weathering.

The bulk of the chapter will use examples from the lunar meteorite suite to examine important recent advances in lunar science, including (but not limited to the following: (1) Understanding the global compositional diversity of the lunar surface; (2) Understanding the formation of the ancient lunar primary crust; (3) Understanding the diversity and timing of mantle melting, and secondary crust formation; (4) Comparing KREEPy lunar meteorites to KREEPy Apollo samples as evidence of variability within the PKT; and (5) A better understanding of the South Pole Aitken Basin through lunar meteorites whose provenance are within that Terrane.

Chapter changes since the NVM II 2016 Workshop: There are no significant changes to the content of the chapter since the 2016 NVotM 2 conference.