ON THE NEED FOR AN ATLAS OF CHONDRULE TEXTURES. R.K. Herd[1], P.A. Hunt[1], K.E. Venance[1], [1]Geological Survey of Canada, Natural Resources Canada, 601 Booth Street, Ottawa, ON K1A 0E8: herd@nrcan.gc.ca , pahunt@nrcan.gc.ca , kvenance@nrcan.gc.ca

Introduction: Chondrites of all kinds are a major class of meteorites whose detailed provenance is poorly understood and complex. These extraterrestrial rocks are probably from asteroids, comets or other planetesimals; they preserve information from the very earliest stages of our solar system. They are classified and named based in part upon their structure, mineralogy and texture, and in part upon their bulk chemistry and mineral chemistry. Understanding their origin is critically dependent on understanding the origin of their chondrules and other constituents, how these have become associated, and what processes are documented by their lithology and petrology. In reality they comprise a wide range of rock types, with highly variable characteristics, linked by the presence of chondrules in each type. The major groups of ordinary chondrites (OC), carbonaceous chondrites (CC) and enstatite chondrites (EC), for example, are actually quite different from one another in their structure and lithology, and in their texture and mineralogy, even though they all contain chondrules or chondrule-like objects. Few studies have examined the internal textures of chondrules with a view to interpreting their origin and that of the chondrites that contain them, and to compare chondrules from different groups and petrologic grades. Chemical and isotopic analyses dominate chondrite studies; textural studies are relatively scarce.

Background: Chondrites can be compared to terrestrial rocks; they contain evidence that extraterrestrial "igneous"(melting, quenching, crystallization, re-melting), "sedimentary" (agglomeration), and "metamorphic" (cataclasis, re-crystallization) processes have acted upon them. They contain structures and textures produced by these processes. Petrological expertise used to describe and interpret terrestrial rocks can be adapted to derive important data from chondrites, but the chondrites, their chondrules and their other components need therefore to be imaged in detail before other analyses are done. The derivative chemical and isotopic data need to then be interpreted in the context of the textural and mineralogical characteristics of the analyzed objects within the meteorites, not independent of those characteristics. This requires a more rigorous textural documentation and classification of chondrites and chondrules than is currently common practice.

Method: We have developed a systematic approach to the petrology of chondrites involving digital images (photomosaics of polished thin sections and back-scattered electron (BSE) images of chondrules and their internal textures), followed by electron-microprobe analyses. We have documented both archetypical and atypical chondrules. All of the data collected during this systematic approach is available as digital files for future research. We have studied and interpreted both CC and OC, the latter ranging in petrologic grade from 3 to 6 [1].

Results: For those meteorites we have studied there now exist many digital files. These are available for sharing and discussion within the meteoritical community. We have derived our own conclusions about the significance of chondrule textures in each meteorite studied, and we have begun to systematize chondrule types and subtypes based on textures and mineralogy rather than on chemical composition. We have discussed these textures with colleagues and concluded (perhaps erroneously – please correct if so!) that no systematic reference exists to assist either newly interested researchers or experienced ones.

Conclusion: There is a need for an atlas of chondritic meteorites to serve as a reference for research. A recent publication on zircon textures in terrestrial rocks provides a useful analogy: "The paper presents a selection of both the most typical, but also of the less common, features seen in zircon, categorized according to the different geological processes responsible for their formation"[2]. A similar reference on the features seen in chondrules, perhaps categorized by the different extraterrestrial processes (thought to be) responsible for their formation, is necessary. We propose a community effort among those researchers interested in sharing such information. The advent of digital imaging techniques means that digital photomicrographs and scanning-electron microscope images derived from systematic textural studies can be readily shared and discussed. We are proposing to do this through a dedicated web site and list.

References: [1] Herd, R.K. et al. (2004) *Workshop on Chondrites and the Protoplanetary Disk, 63-64.*[2] Corfu , F. et al. (2003) *Reviews in Mineralogy & Geochemistry, 53, 469-500.*