Innovative, Collaborative Research on Specimens from the National Meteorite Collection of Canada

Richard K. Herd[1,2]
[1]Natural Resources Canada, Earth Sciences Sector, 601 Booth Street, Ottawa ON K1A 0E8
herd@nrcan.gc.ca

Claire Samson[2]
[2]Department of Earth Sciences, Carleton University, Ottawa ON K1S 5B6

and

Iain M. Christie
Neptec Design Group, 302 Legget Drive, Kanata, ON K2K 1Y5

Summary

The National Meteorite Collection of Canada (NMTC), housed within Natural Resources Canada, Earth Sciences Sector, Ottawa, includes 2700 fragments and masses of 1100 different meteorites. Specimens from the collection have been utilized by local scientists and engineers for hardware, software, analytical and method development related to space exploration. This has led to a recognition of the utility of meteorites to help build a larger skilled community of planetary scientists in Canada in anticipation of manned and robotic missions to the Moon, Mars, asteroids and comets, and sample returns from there. The successful collaboration can be linked to initiatives from the NMTC, Carleton University (CU) and the Neptec Design Group, a NASA prime contractor, since 2002. These include:

Use of 3D laser imaging of terrestrial rock samples, and meteorites, to help develop image libraries for use in recognition of the nature of solid objects in extraterrestrial environments (meteorites and igneous, sedimentary and metamorphic rocks as outcrops or boulders) (Herd et al. 2003).

Non-destructive measurement of petrophysical properties of meteorites especially volume/density and magnetic susceptibility. The first digitally determined meteorite volume was achieved along with ways to use the magnetic response of stony meteorites to help in their classification (Smith et al. 2006a,b).

U-Pb investigation of a suite of H6 chondrites for cooling history (Blinova et al. 2007).

Investigation of a new system of nomenclature for ordinary chondrites to help elucidate their origin and that of their contained chondrules. (Dixon 2009; Cooke 2010).

Thus co-operation among federal government, university and industrial partners has resulted in novel uses of meteorite samples and increased awareness that meteorites can be used for “planetary exploration without the commute”, and to prepare for that commute.

References

Blinova, A., Amelin, Y., and Samson, C., 2007, Constraints on the cooling history of the H-chondrite parent body from phosphate and chondrule Pb-isotopic dates from Estacado: Meteoritics and Planetary Science, 42 (7-8), 1337-1350.

Cooke, A.M.D., 2010, Contrasting the mineralogy and textures of chondrules from Saratov and other similar meteorites: B.Sc. thesis, Department of Earth Sciences, Carleton University, Ottawa.

Dixon, L., 2009, A detailed investigation of the mineralogy and textures of the L4 ordinary chondrite Saratov: towards a new classification scheme for chondrules: B.Sc. thesis, Department of Earth Sciences, Carleton University, Ottawa, 133 pages.

Herd, R., Spray, J. Samson, C., Miller, S., and Christie, I., 2003, 3D imaging and modelling with a space-qualified laser camera system: development of terrestrial applications and potential for planetary exploration: In Lunar and Planetary Science XXXIV, Abstract # 1718, Lunar and Planetary Institute, Houston (CD-ROM).

Smith, D.L., Ernst, R.E., Samson, C., and Herd, R., 2006a, Stony meteorite characterization by non-destructive measurement of magnetic properties: Meteoritics and Planetary Science, 41 (3), 355-373.

Smith, D.L., Samson, C., Herd, R., Christie, I., Sink, J-E., DesLauriers, A., and Ernst, R., 2006b, Measuring the bulk density of meteorites non-destructively using 3D laser imaging: Journal of Geophysical Research, 111, p. E10002.