MEASUREMENT OF A METEORITE VOLUME USING A NON-CONTACT 3D LASER SCANNER. R. K. Herd[1], S. J. Miller[2], I. Christie[2], [1]Curator - National Collections, Geological Survey of Canada, Natural Resources Canada, 601 Booth Street, Ottawa ON K1A 0E8 herd@nrcan.gc.ca , [2]Neptec Design Group, 302 Legget Drive, Ottawa ON K2K 1Y5, smiller@neptec.com, ichristie@neptec.com .

Introduction: The ability to accurately measure the volume of a meteorite using a non-contact method is highly desirable. Standard methods of volume measurement employ immersion techniques that may physically and chemically contaminant samples, significantly affecting results of later research. We describe a process of acquiring 3D surface data of a meteorite sample and building a 3D model from a finite set of scans. The various sources of error in the data acquisition and model generation are considered. The quality of the volume measurement is investigated with various spatial sampling settings to determine an optimum accuracy to speed ratio. Suggestions to provide automation of the process are included.

3D Scanning Technology: An auto-synchronous 3D laser scanner has been developed by Neptec Design Group. The scanner is space flight qualified (on NASA shuttle mission STS-105) [1]. The scanner has a spatial accuracy of 200um at a standoff distance of 1.2 m with a wide field of view (30x30 degrees). This technology has been selected as a tool to assist rock classification at terrestrial and extraterrestrial sites, and in other terrestrial applications [2]. Previous work with the scanner has produced some high quality 3D models of meteorites [2]. The models are used to capture the high spatial detail of the surface of the meteorite as shown in Figure 1.

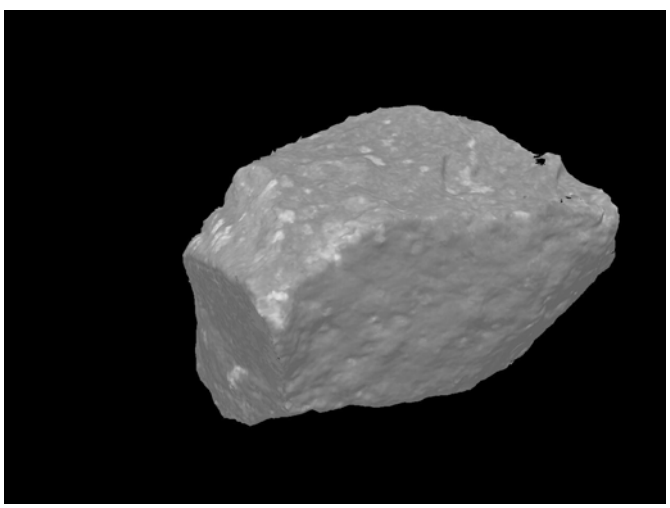

FIGURE 1: St-Robert, Forcier 1 sample: 2290 gm, .695 L.

Summary: The ability to build closed 3D volumetric models means that densities of fragile or reactive materials, like meteorites, can be calculated by weighing them and imaging them. Closed 3D volumetric models can be used to reproduce casts of original objects. Laser camera images and models of valuable objects can be stored, and shared amongst investigators, without compromising the real objects' security and integrity. There are clearly potential uses of this technique in many disciplines.

References: [1] Samson, C. et al. (2002) *12th Ann. CASI Conf., Ottawa, Nov. 12-14,* Paper 125. [2] Herd, R.K. et al. (2003) *LPS XXXIV,* #1718.