A FIRST LOOK AT THE PETROGRAPHY OF THE BUZZARD COULEE (H4) CHONDRITE, A RECENTLY OBSERVED FALL FROM SASKATCHEWAN. M. L. Hutson[1], A. M. Ruzicka[1], E. P. Milley[2], and A. R. Hildebrand[2], [1]Cascadia Meteorite Laboratory, Department of Geology, Portland State University, 17 Cramer Hall, 1721 SW Broadway, Portland OR 97207-0751, USA (mhutson@pdx.edu), [2]Department of Geosciences, University of Calgary, 2500 University Drive NW, Calgary, Alberta, T2N 1N4, Canada (ahildebr@ucalgary.ca) .

Introduction: On November 20, 2008 a bright fireball was observed across the three Canadian Prairie provinces. Between November 27 and December 6, 2008 more than one hundred individual pieces of this fall were recovered in Saskatchewan, Canada [1]. Here we briefly discuss the classification of this meteorite, which has been officially named Buzzard Coulee (M. Weisberg, pers. comm.). We also describe some notable features observed in this meteorite.

Hand Specimen Observations: A large number of specimens show immature ablation surfaces that are dark gray in color. Many of the samples also display broken surfaces that lack a fusion crust. Poorly to moderately-well developed slickensides are seen on the broken surfaces of larger fragments. Almost all of the samples examined in hand specimen lack any evidence of a brecciation texture. On the broken surface of one sample, we observed an angular clast that is slightly lighter gray than the rest of the meteorite. Additionally, light-colored inclusions up to ~0.5 cm across are present on the broken surfaces of a few of the samples.

Classification: Optical, BSE, and EMPA data were obtained on two thin sections (BC1 and BC2) of Buzzard Coulee. Fig. 1 shows an overview of BC1.

Chondrite class and petrographic type. Orthopyroxene ($Fs_{16.1±0.8}$, $Wo_{1.6±1.0}$, n=59) and olivine ($Fa_{17.8±0.3}$, n=92) compositions indicate that Buzzard Coulee is an H-group chondrite (e.g., [2]). Olivine (PMD Fa = 1.22) and orthopyroxene (PMD Fs = 4.06) grains are equilibrated (Fig. 2). Chondrules are readily delineated to well-defined, but not sharply defined (Figs. 1 and 3). Small pyroxenes with lamellar structure, and diopsidic rims on orthopyroxene grains are present. The spread in clinopyroxene compositions in Fig. 2 most likely represents a mixing line between diopside (circled in red – $Fs_{5.8±0.7}$, $Wo_{44.8±1.3}$, n=4) and orthopyroxene. Turbid glass is widely present in chondrule mesostases (Figs. 3 and 4), and also in small objects between chondrules. The presence of turbid glass, the PMD Fs value for orthopyroxene, and the overall texture suggests that Buzzard Coulee is a type 4 chondrite (e.g., [2]). However, some clear glass appears to be present (Fig. 4), suggesting that Buzzard Coulee may be transitional from a type 3 to a type 4 chondrite.

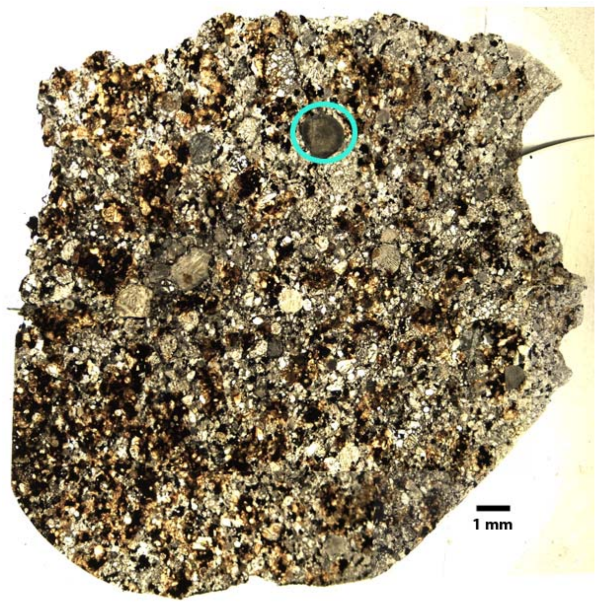

Fig 1. Petrographic thin section (BC1) of Buzzard Coulee. A large cryptocrystalline chondrule is circled.

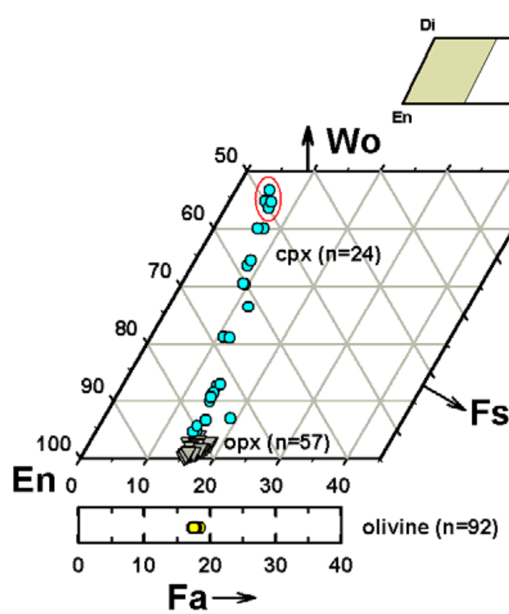

Fig 2. Olivine and pyroxene compositions in Buzzard Coulee.

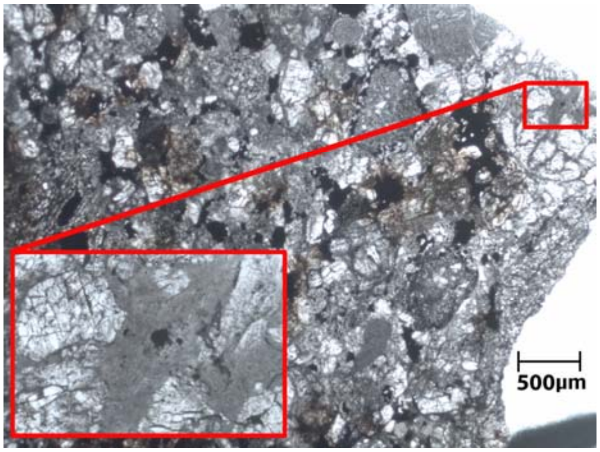

Fig 3. A view in transmitted light from the coarser portion of BC1. Inset shows partially devitrified glass in a porphyritic pyroxene chondrule.

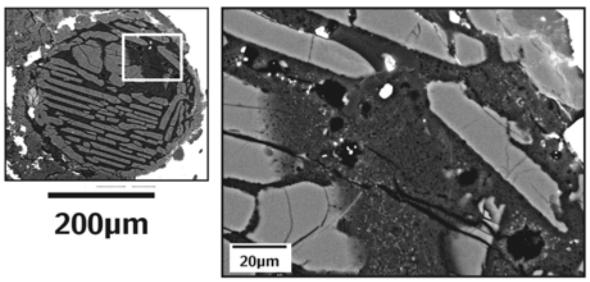

Fig. 4. BSE image of a mixture of turbid and clear glass in the mesostasis of a barred olivine chondrule. The white areas are opaques, light gray is olivine, dark gray is glass, medium gray (upper right) is pyroxene.

Shock stage and weathering grade. Olivine grains show predominantly undulose extinction with irregular fractures. No evidence for localized melting was observed. On this basis, Buzzard Coulee has been assigned to shock stage S2 [3]. As a fresh fall, Buzzard Coulee's weathering grade is W0 [4].

Petrography: Two different chondrite textures are visible in Fig 1. Relatively well-defined chondrules are easily seen in the upper half of the thin section, whereas the lower half appears finer-grained. The boundary between these two regions is indistinct.

Cryptocrystalline chondrules. Buzzard Coulee contains numerous cryptocrystalline and partly cryptocrystalline chondrules and chondrule fragments, ranging from ≤ 50 µm to > 1 mm in diameter. Although present throughout both thin sections BC1 and BC2, they are especially abundant in the finer-grained region of BC1 (Figs. 1 and 5), far more so than expected for an ordinary chondrite [5]. Microprobe traverses were obtained for eight cryptocrystalline chondrules, including the largest in the section (circled in Fig 1). The latter is orthopyroxene normative with a slight feldspathic component. Five of the smaller chondrules are also rich in normative orthopyroxene and have slight but variable proportions of normative feldspar. One of the eight chondrules analyzed was olivine-rich with a slight feldspathic component. The remaining chondrule is partly cryptocrystalline, but contains fine-grained (≤ 10 µm wide) acicular to elongate, zoned plagioclase (~Ab_{28}, An_{72}) set in a groundmass containing olivine and pyroxene. No systematic radial chemical trends were observed in the traverses.

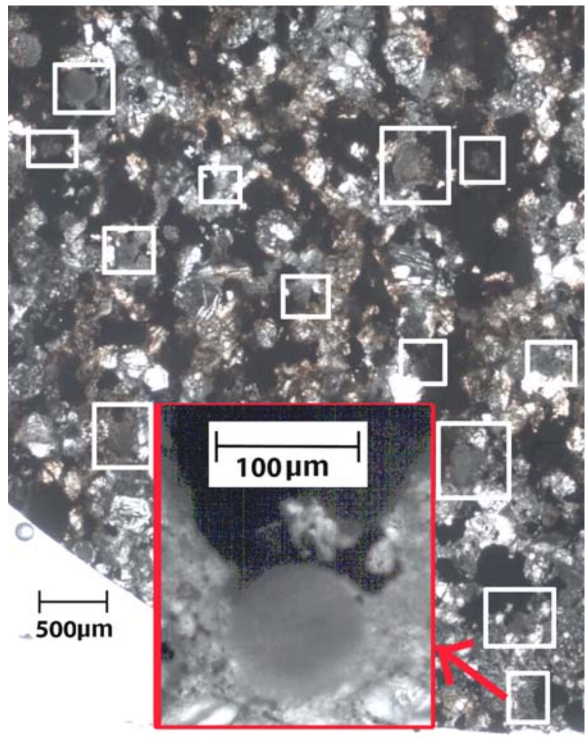

Fig. 5. Transmitted light image of a region along the bottom left of Fig. 1. White boxes surround some of the cryptocrystalline chondrules in this region.

Light-colored inclusion. Section BC2 contains one of the light-colored inclusions visible in hand specimen. The inclusion has an igneous texture and consists of a mixture of high- and low-calcium pyroxene and a silica polymorph. This mineral assemblage resembles some large igneous inclusions previously identified in ordinary chondrites (e.g. [6]).

References: [1] Hildebrand A. R. et al. (2009). *This volume*. [2] Sears D. W. G. and Dodd R. T. (1998). In Kerridge J. F. and Matthews M. S. eds., *Meteorites and the Early Solar System*, 3-31. [3] Stöffler D. et al. (1991) *GCA*, *55*, 3845-3867. [4] Wlotzka F. (1993) *Meteoritics*, *28*, 460. [5] Gooding J. L. and Keil K. (1981) *Meteoritics*, *16*, 17-43. [6] Ruzicka A. et al. (1998) *GCA*, *62*, 1419-1442.