HAROLD (a) AND HAROLD (b): TWO NEW METEORITES FROM NESS COUNTY, KANSAS.

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Introduction: On May 12, 2012 Paquita Rupp brought three oriented chondrites to a talk being given as part of an education/public outreach program [1] by Cascadia Meteorite Laboratory (CML) lab member Dick Pugh at the Rice Northwest Museum of Rocks and Mineral in Hillsboro Oregon. The stones had been given to Ms. Rupp by her grandfather Columbus Dunbar Craven, who had told her these were meteorites he'd picked up on the family farm in Ness County, Kansas after a fall sometime in the 1890s. According to her grandfather, the night sky "turned bright as day" and the next morning he'd picked up a "full bushel basket" of meteorites. Ms. Rupp provided a map showing the location of the 640 acre Craven farm, and said that one of the three stones had been cut before being given to her, and that she had kept the three stones on a bookshelf for 50 years (as of 2012). Ms. Rupp allowed CML to cut slices off two of the three stones; both were clearly equilibrated chondrites, although they differed in overall appearance (darker gray-brown with a large shock vein vs. lighter yellowish-brown).

Classification: Mineral chemical data for both stones were obtained in the same analytical shift to ensure no instrument bias. The two stones, named Harold (a) and Harold (b), are L6 chondrites, with overlapping but slightly different Fa and Fs contents for olivine and low-Ca pyroxene [2]. In thin section, Harold (a) is lighter in color, more heavily weathered (W2) and less heavily shocked (S3) than Harold (b) (W1, S5). The difference in weathering can be used as a proxy for terrestrial ages (e.g., [3]), indicating that the two stones represent two different falls.

Pairing Problems: Much of the literature on Ness County meteorites dates from the early 1900s and suffers from imprecise descriptions and a lack of chemical data. The first meteorite from the area was recovered in 1894 [4] and has been tentatively identified at various times as an L6, LL6, and L4 chondrite [5]. This stone was paired with other stones from the area based on similar appearance in hand specimen [6], although three of the other stones have since been recognized as discrete individuals [2]. Prior to the classification of Harold (a) and Harold (b), there were 7 meteorites recognized from Ness County: Bazine Creek (L4), Beeler (LL6), Brownell (L6), Franklinville (L6), Ness County (1894) (L6), Ness County (1938) (H4), Ness County (c) (OC) [2]. Currently, 26 poorly characterized meteorites are recognized as Ness County (1894) [6]. Two studies suggest that these represent either at least three different falls [5] or one heterogeneously shocked fall [7]. The latter conclusion assumed that the three meteorites had the same terrestrial age, based on weathering grade. However, terrestrial age dating of chondrites in the Yucca DCA indicates that two chondrites from the same area can have the same weathering grade, but still represent two different falls [8], leaving the possibility of multiple falls. Given the current state of the literature, it was not possible to pair either Harold (a) or Harold (b) with any of the other Ness County stones.

An 1894 Fireball?: The description of the Oakley (stone) (H6) chondrite from Logan County, Kansas appears to be the first documentation of an 1894 fireball [9]. The finder of the Oakley (stone) meteorite said that he observed a bright fireball on February 20, 1894 at about 11:00 pm which appeared to "come from the N.E." However, based on the sizes of recovered stones, several papers attempting to match the Ness county meteorites to a strewn field have assumed a southeast to northwest trajectory (e.g., [7]). The story passed from Ms. Rupp's grandfather suggests that there was at least one very bright fireball over Ness county during the 1890s, which we speculate led to the recovery of previously fallen meteorites. Read [5] relates two anecdotes: one person picked up a "wagon-load" of meteorites, while another ploughed up enough to pay for a quarter acre land (around 300 meteorites). These stories are similar to the one told to Ms. Rupp, and suggest that far more than the two to three dozen catalogued Ness county meteorites were recovered.

Conclusion: Three dozen meteorites from Ness county Kansas have been catalogued, including 26 considered to be paired with the Ness County (1894) chondrite. The latter have not been adequately characterized and may include material from more than one fall. The classification of Harold (a) and Harold (b) as probable distinct meteorites and anecdotal information raises the possibility that there may be a significant number of additional and unpaired Ness county stones yet to be discovered and catalogued.

References: [1] Hutson M. L. et al. (2006) *LPS XXXVII*, Abstract #1095. [2] The **Meteoritical Bulletin Database**, https://www.lpi.usra.edu/meteor/. [3] Al-Kathiri A. et al. (2005) *Meteoritics & Planetary Science* 40:1215-1239. [4] Prior G.T. (1923) **Catalogue of Meteorites,** British Museum of Natural History. [5] Read W. F. (1972) *Meteoritics* 7:417-428. [6] Grady M. M. (2000) **Catalogue of Meteorites**, 5th ed, The Natural History Museum. [7] Rubin A. E. and Read W. F. (1984) *Meteoritics* 19:153-160. [8] Hutson M. et al. (2013) *Meteoritics & Planetary Science* 48:365-389. [9] Preston H. L. (1900) *American Journal of Science* 9:410—412.

Dedication: This work is dedicated to the memory of CML member Richard Norman (Dick) Pugh (1940-2020). Harold (a) and (b) are additional meteorites that can be credited to Dick's outreach program.