LUNAR METEORITE NORTHWEST AFRICA (NWA) 11421: X-RAY TOMOGRPAHY & PRELIMINARY PETROLOGY. A. H. Treiman[1] & D. M. Coleff[2]: [1]Lunar Planetary Institute, 3600 Bay Area Blvd., Houston TX 77058. treiman@lpi.usra.edu. [2]ARES, Mail Code XI2, Johnson Space Center, Houston TX 77058.

Introduction: Lunar meteorite NWA 11421 is provisionally placed with the "NWA 8046 clan" of similar stones (the "Algerian Megafind") of which at least 33 kg has been recovered [1,2]. NWA 11421 and pairs are feldspathic regolith breccias, with angular fragments of plagioclase-rich clasts in a dark glassy matrix [1,2]. Most members of this clan contain < 5.5% FeO and < 0.3 ppm Th [2]. To date, there have been no petrographic studies reported of these lunar meteorites. An 11.7 gm sample of NWA 11421 was purchased from Marcin Cimala, holder of the main mass – this sample is consistent in all respects with the formal meteorite description [1]. This particular sample was selected because it appeared to contain a fragment of dunite.

Methods: The sample was examined under a binocular microscope and significant clasts noted. To guide efficient cutting and dissection of the sample, we obtained an X-ray tomogram of it at the Micro-XCT Laboratory, ARES Division, Johnson Space Center [3]. The scan was performed on a Nikon XTH320, micro-focus, X-ray instrument. The scan was done at 195 kV with a 1 mm Cu filter, and a voxel resolution of 18 μm. Transmitted X-rays were detected with flat panel Perkin-Elmer 1620 detector (400 x 400 mm with 2000 x 2000 pixels). A total of 3141 projections were taken, which were optimized in software to reduce redundancy. Exposure was 0.353 frames/sec (2829 milliseconds) using 8 frames per projection frame averaging. Thick sections that expose important clasts will be manufactured at the LPI; electron microprobe analyses will be obtained at ARES/JSC.

Preliminary Petrography: As described [1], our sample consists of light-toned clasts in a dark matrix. All visible clasts appear to be granulitic – composed of many grains smaller than <0.5 mm. Most clasts are anorthositic, white or light gray to the eye, with variable proportions of smaller dark grains. One anorthositic fragment contains yellow grains, which are likely to be olivine. Several clasts, including the largest (~1.5 cm across), are likely troctolites – sub-equal proportions of olivine and plagioclase. One clast, focus of this investigation, appears to be dunite. It is exposed on the surface, and is ~ 0.5 x 0.3 x 0.2 cm as measured on the surface and by tomography. The clast is composed of many greenish-yellow grains, with a few smaller opaque grains (chromite?). The largest clast of the sample is itself a feldspathic breccia, distinct from the rest of the sample in having less dark matrix.

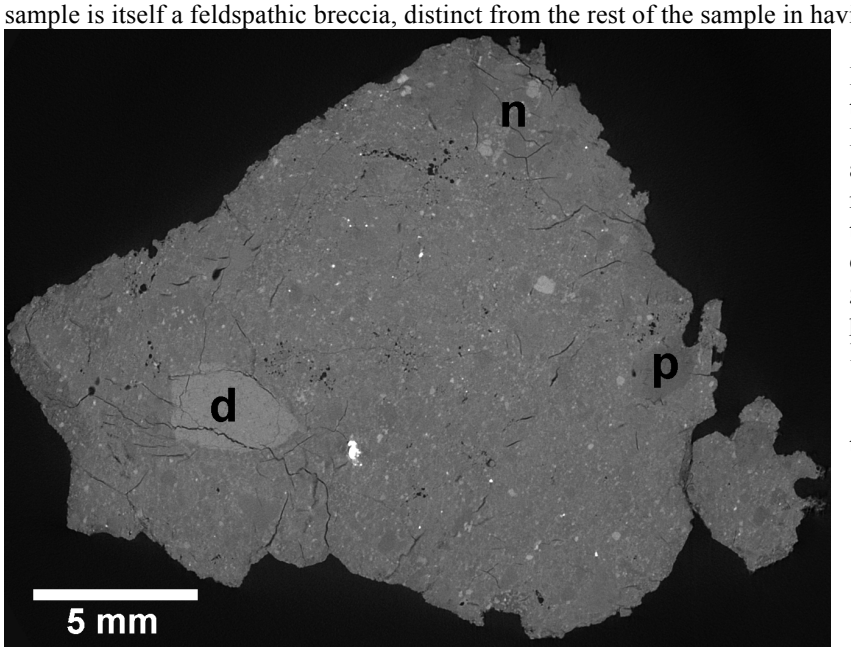

Figure 1: X-ray tomograph slice through the sample of NWA 11421. Lighter tone indicates greater X-ray attenuation (i.e., average atomic number). Brightest spot at lower center is likely sulfide or metal. 'd' is the dunite clast. 'p' is a fragment of plagioclase. 'n' is a clast dominated by pyroxene and plagioclase, with a little olivine – likely a norite.

We appreciate support and assistance from R. Zeigler, ARES/JSC.

Implications: Lunar dunites are rare [4], and of potential importance as possible fragments from Mg-suite intrusions [5] and as possible fragments of mantle material [6,7]. Mg-suite rocks are rare in meteorite breccias, and unambiguous mantle fragments are not known – perhaps this dunite fragment will be useful beyond its size.

References: [1] Meteoritical Bulletin 106. [2] Korotev, R. (2018) http://meteorites.wustl.edu/lunar/stones/nwa8046.htm. [3] Zeigler R.A. et al (2017) *LPSC 48th*, Abstr. 2772. [4] Shearer C.K. et al. (2015) *MaPS 50*, 1449-1467. [5] Dymek R.F., et al. (1975) *Proc. LPSC 6*, 301-341. [6] Schmitt H.H. (2016) *LPSC 47th*, Abstr. 2339. [7] Miljković K. et al. (2015) *EPSL 409*, 243-251.