THE MILLER RANGE NAKHLITES: A SUMMARY OF THE CURATORIAL SUBDIVISION OF THE MAIN MASS IN LIGHT OF NEWLY FOUND PAIRED MASSES. K. Righter[1] and K. M. McBride[1], [1]Mailcode KT, NASA JSC, 2101 NASA Pkwy., Houston, TX 77058 (kevin.righter-1@nasa.gov)

Introduction: The 2003-2004 ANSMET team recovered a 715.2 g nakhlite from the Miller Range (MIL) region of the Transantarctic Mountains (MIL 03346). This was the first nakhlite for the US Antarctic meteorite program, and after the announcement in 2004 [1], JSC received over 50 requests for this sample for the Fall 2004 Meteorite Working Group meeting. Since then it has been subdivided into >200 splits, and distributed to ~70 scientists around the world for study. The 2009-2010 ANSMET team recovered three additional masses of this nakhlite [2], making the total amount of mass 1.871 kg (Table 1). Given that the original find (MIL 03346) has been heavily studied and these new masses are available, we will present a comprehensive overview of the subdivision of the original mass as well as the scientific findings to date.

Table 1: Summary of Miller Range nakhlites

Meteorite	Year found	Mass (g)
MIL 03346	2003	715.2
MIL 090030	2009	452.6
MIL 090032	2009	532.2
MIL 090136	2009	171.0
Total		1871.0

Background: Nakhlites are a group of 8 coarse-grained clinopyroxene-rich rocks that contain minor amounts of olivine and mesostasis. They are thought to represent a series of cumulate igneous rocks from a shallow magma chamber on Mars [3]. Studies of these rocks have thus lead to a better understanding of a wide variety of processes on Mars such as magma genesis, and subsequent surficial processes (weathering and alteration) at the martian surface.

Subdivision of MIL 03346: MIL 03346 was subdivided in three main stages: initial processing, slab allocations, and NE butt end allocations. Small pieces were derived for the initial characterization of the sample, including a 2.1 g chip that was potted to make thin sections (Figure 1). Due to the large number of individual samples requested, bandsaw slabbing was considered the best way to preserve as much of the original mass as possible for future study and also to document the individual meteorite chips allocated (Figure 2). After the slab was totally subdivided and allocated (Figure 3), the NE butt end was subdivided (Figure 4). The slab and butt end have been entirely subdivided and only small portions remain as chips and fines. The allocated mass from initial processing, the slab, and the NE butt end are summarized in Table 2.

Table 2: summary of major subdivisions of MIL 03346

portion	Allocated mass	# PI splits	# TS butts
Initial proc.	13.15	0	5
slab	46.46	49	7
NE butt end	32.05	8	1

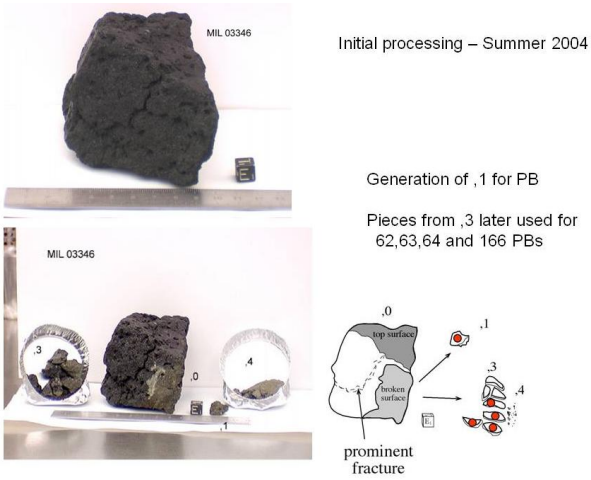

Figure 1: MIL 03346 main mass (top) and subsequent initial processing (bottom) which ultimately led to 5 potted butts for thin and thick sections. Red dots are pieces used to make potted butts for thin sections.

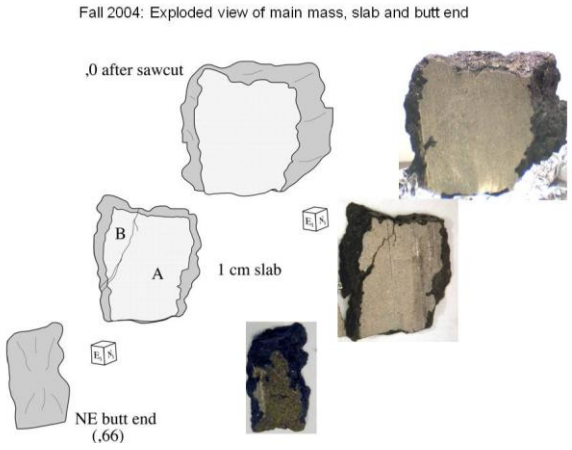

Figure 2: expanded view of MIL 03346 in sketch form (left) and photo form (right) showing the derivation of three main splits after bandsawing.

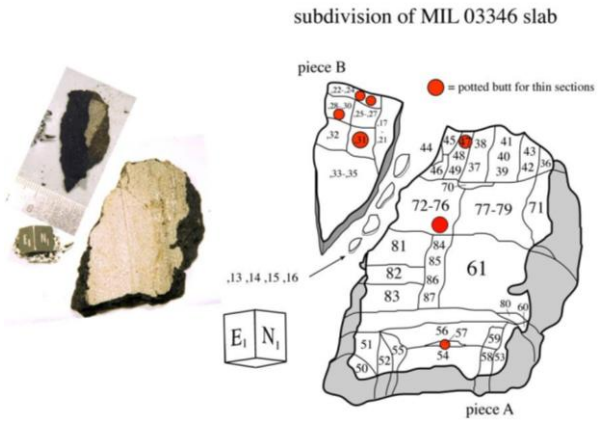

Figure 3: Detailed subdivision of the two pieces generated during the slabbing (A and B which broke along a major fracturee). Piece B sketch and photo are bottom and top views, respectively, but the piece A views are the same.

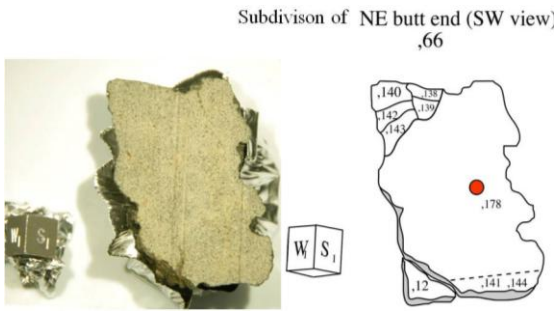

Figure 4: Subdivision of NE butt end as of Summer 2008. Red dots are pieces used to make potted butts for thin sections.

There remains a 447 g piece of the main mass left for future study, and a total of ~ 600 g of material that has not been allocated yet. Clearly many additional studies are possible with the remaining mass.

Summary of scientific findings: With the 57 thin/thick sections produced and the allocation of 63 chips to individual reserachers, the following information has been learned about MIL 03346. It crystallized 1.3 Ga ago [4-6], from a shallow oxidized magma [7-9] that may have had a deeper origin [10,11]. The textures and chemical compositions suggest it cooled quickly in a thin flow or dike [12-15]. After emplacement, it was shocked only mildly based on its density and magnetism [16-18]. Weathering at the surface of Mars produced Cl-amphibole, jarosite, and other oxidized minerals [19-22]. The pyroxenes have been used to better understand remote sensing at the surface of Mars [23].

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