

**INTRODUCTION:** 15308 is a dark, fine-grained highlands breccia which appears to be a glassy impact melt containing a few highlands clasts (Fig. 1). It would appear that the prominence of one of the clasts in some thin sections is the cause of the previous designation of the rock as a feldspathic, coarse highlands lithology, i.e., anorthositic norite (e.g., Simonds et al., 1975; Dowty et al., 1973b). The glass is of aluminous basaltic composition. The sample is coherent, uniform, lacks zap pits, and the matrix contains perhaps 1% tiny vugs. Macroscopically the breccia looks like the dark portion of 15455 and 15445, to which it is chemically quite similar. The sample was collected with the soil sample at the rake site on the north east rim of Spur Crater.

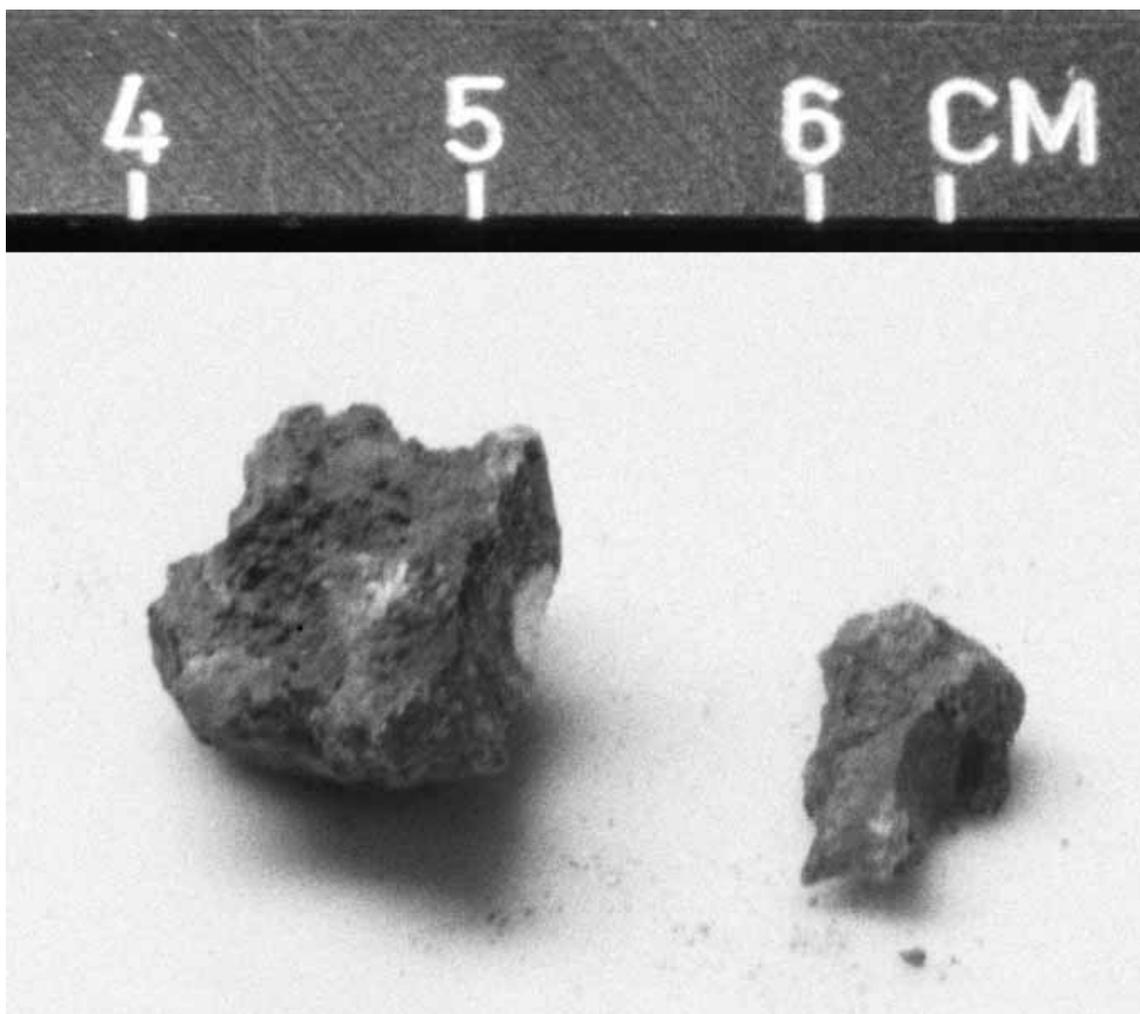


Figure 1. Macroscopic view following chipping into ,0 and ,1. A white clast is prominent on the chipped face of ,0. S-71-58133

**PETROLOGY:** There is some confusion as to the nature of 15308. According to Dowty et al. (1973b) it is a severely shocked anorthositic norite with some parts almost completely melted--relatively unshocked areas have a coarse "primary" texture with large plagioclase crystals, Simonds et al. (1975) referred to it as a cataclastic annealed rock with either a poikilitic or a granulitic texture (similar to 77017 or 76235) and about 70% plagioclase. Neither of these descriptions appears to be compatible with the macroscopic description of the rock as a dark, aphanitic breccia, nor with the bulk rock chemical analysis (following section). It is probable that the glassy melt matrix of thin section 15308,2 (Fig. 2) is the dominant lithology of the rock. The melt is brown, partly feathery crystallized or devitrified glass, and with few mineral clasts, which are mainly plagioclase. This melt contains about 50 or 60% plagioclase (which agrees with the bulk rock chemical analysis, following section). 15308,2 contains four main lithic clasts, all plagioclase-rich breccias. The largest (Fig. 2) corresponds with the Dowty et al. (1973b) description of the anorthositic norite lithology, and is similarly shot through with troilite. It contains relict but fine-grained cumulate textures (curvilinear boundaries) and ilmenite occurs in grains as big as the plagioclase and pyroxenes, i.e., about 500 microns; each ilmenite grain consists of numerous individual blebby patches. The anorthositic norite of Dowty et al. (1973B) contains armalcolite, Zr-armalcolite, troilite, and ilmenite, in addition to the dominant plagioclase and orthopyroxene. Iron metal is absent. Dowty et al. (1972) mentioned veins with troilite on grain boundaries. Small augites with exsolution lamellae are present in the anorthositic norite in 15308,2. Mineral analyses for the anorthositic norite were presented by Hlava et al. (1973) and Nehru et al. (1973, 1974) and are shown in Figure 3. Hlava et al. (1973) included analyses of olivine. The MgO in the ilmenite (5.5% to 6.9%) is much higher than in ilmenites in ferroan anorthosites such as 15362 (Nehru et al., 1974), and the spinel compositions contrast with those in mare basalts. The other three lithic clasts immersed in the glassy matrix of 15308,2 are all very plagioclase-rich breccias, clearly of highlands origin.

**CHEMISTRY:** A bulk rock analysis was made by Murali et al. (1977), from dark chips and fines selected to represent the bulk rock (Table 1). The analysis is fairly similar to melts such as 15455 and 15359. It has an aluminous basaltic composition, and a KREEP rare-earth pattern, although at low abundances of rare earths (Fig. 4). The analysis contrasts sharply with the more aluminous, less magnesian defocussed beam analysis by Dowty et al. (1973b) (Table 2) which, as explained above, probably represents a large white clast.

**PROCESSING AND SUBDIVISIONS:** ,1 was chipped from ,0 (Fig. 1). It contains a prominent white clast, and was consumed in making thin sections ,1; ,2; ,5; and ,6. The chemical analysis (,3) was made from chips and fines produced during this chipping. ,0 is now 1.34 grams.

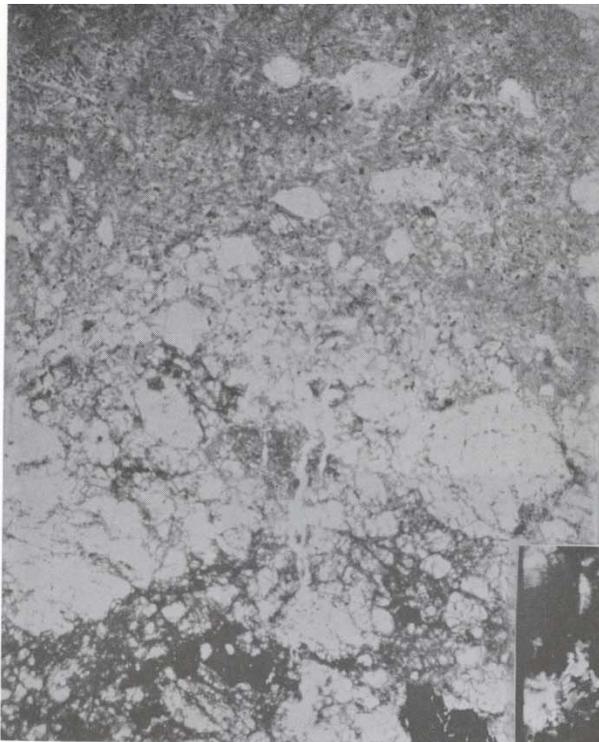


Fig. 2a



Fig 2b

Figure 2. Photomicrographs of 15308,2. a) view showing glassy melt matrix (top), and ilmenite-bearing, cataclastic anorthositic norite clast (bottom). Transmitted light. Width about 2 mm. b) view of part of the anorthositic norite clast, showing cataclasis, relict "cumulate" textures, and ilmenite (black, lower center). Crossed polarizers. Width about 600 microns.

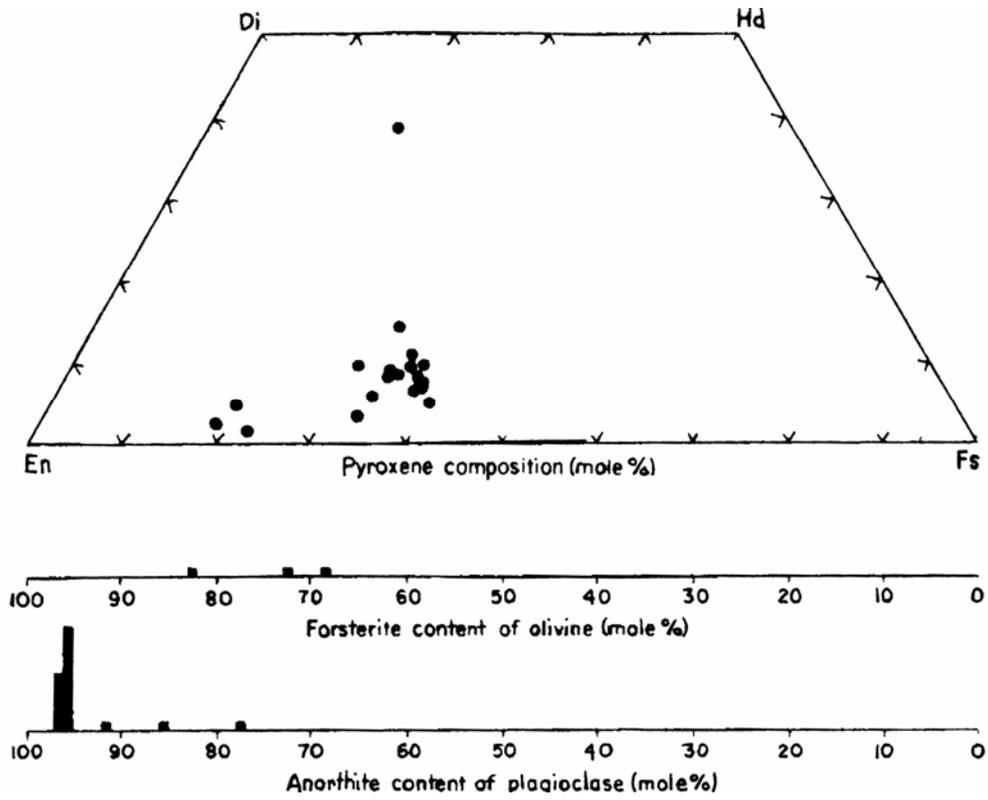


Figure 3a. Mineral compositions for 15308, probably mainly anorthositic norite clast (Dowty et al., 1973b).

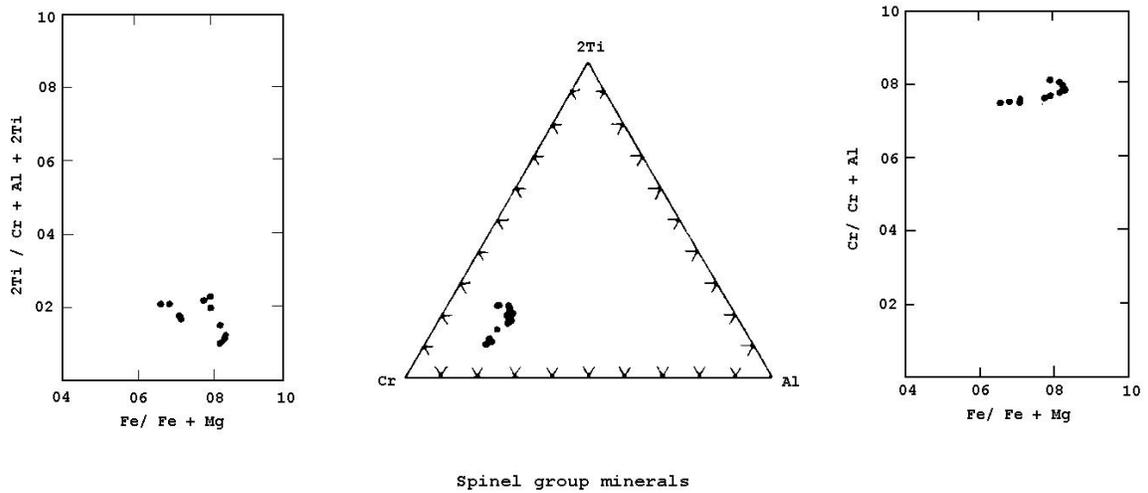


Figure 3b. Mineral compositions for 15308, probably mainly anorthositic norite clast (Dowty et al., 1973b).

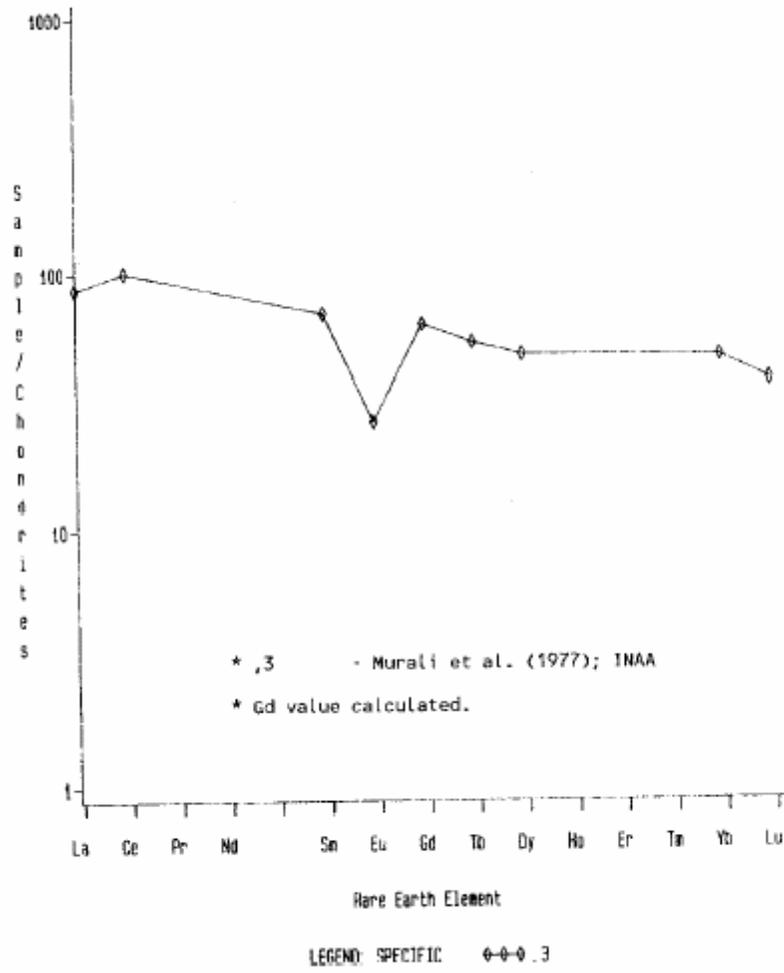


Figure 4. Bulk rock rare earths.

TABLE 15308-1. Chemical analysis of bulk rock

		,3
Wt %	SiO <sub>2</sub>	
	TiO <sub>2</sub>	1.3
	Al <sub>2</sub> O <sub>3</sub>	18.7
	FeO	8.7
	MgO	13.4
	CaO	10.1
	Na <sub>2</sub> O	0.58
	K <sub>2</sub> O	0.26
	P <sub>2</sub> O <sub>5</sub>	
(ppm)	Sc	14.5
	V	41
	Cr	1080
	Mn	810
	Co	23
	Ni	149
	Rb	
	Sr	
	Y	
	Zr	405
	Nb	
	Hf	10.7
	Ba	277
	Th	5.1
	U	
	Pb	
	La	28.6
	Ce	88
	Pr	
	Nd	
	Sm	12.5
	Eu	1.82
	Gd	
	Tb	2.5
	Dy	15
	Ho	
	Er	
	Tm	
	Yb	9.3
	Lu	1.28
	Li	
	Be	
	B	
C		
N		
S		
F		
Cl		
Br		
Cu		
Zn		
(ppb)	I	
	At	
	Ga	
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	As	
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	Ru	
	Rh	
	Pd	
	Ag	
	Cd	
	In	
	Sn	
	Sb	
	Te	
	Cs	
	Ta	1400
	W	
	Re	
	Os	
	Ir	
	Pt	
	Au	1.2
	Hg	
	Tl	
Bi		

Reference and method:

- (1) Murali et al. (1977);  
INAA

TABLE 15308-2. Microprobe defocused beam analysis of  
15308 whiteclast (?) (Dowty et al., 1973b).

Wt%	SiO <sub>2</sub>	44.1
	TiO <sub>2</sub>	1.24
	Al <sub>2</sub> O <sub>3</sub>	27.3
	FeO	5.9
	MgO	6.7
	CaO	13.3
	Na <sub>2</sub> O	0.63
	K <sub>2</sub> O	0.17
	P <sub>2</sub> O <sub>5</sub>	0.11
	ppm	Mn
Cr		3150