

**INTRODUCTION:** 15299 is a regolith breccia consisting of glass, mineral, and lithic fragments in a glassy matrix. The clasts are rarely large as large as a centimeter (Figs. 1, 2) and define a foliation or lineation (Fig. 3). The sample is friable from abundant penetrative fractures. Some of these fractures contain glass.

15299 was collected about 25 m west-southwest of the Rover parking spot. It was not buried, had no fillet, and appeared to the astronauts to have struck the surface about 30 cm east of its collection site. The sample is dark gray, blocky, and angular (Fig. 1). Its lunar orientation is unknown, and its surface too fragile to allow detection of zap pits.

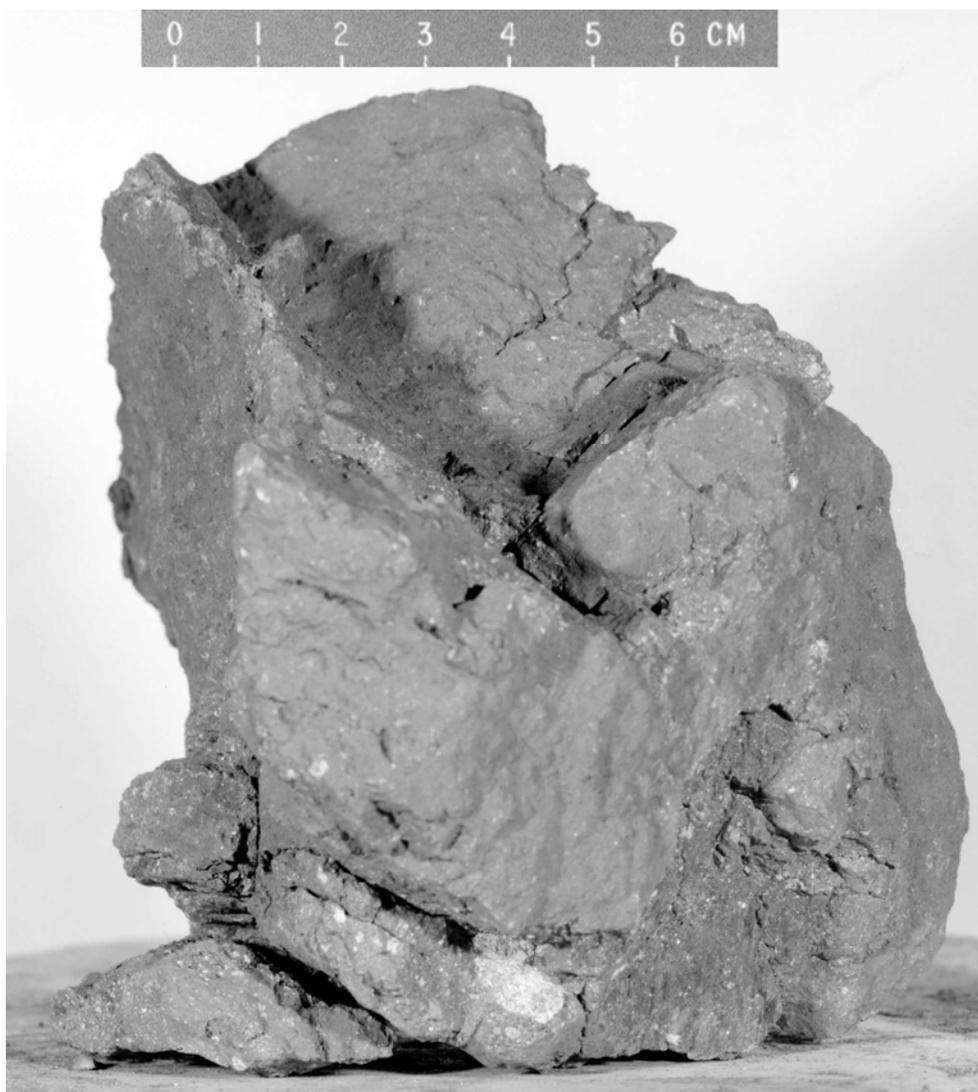


Figure 1. Pre-split photograph. S-71-44434

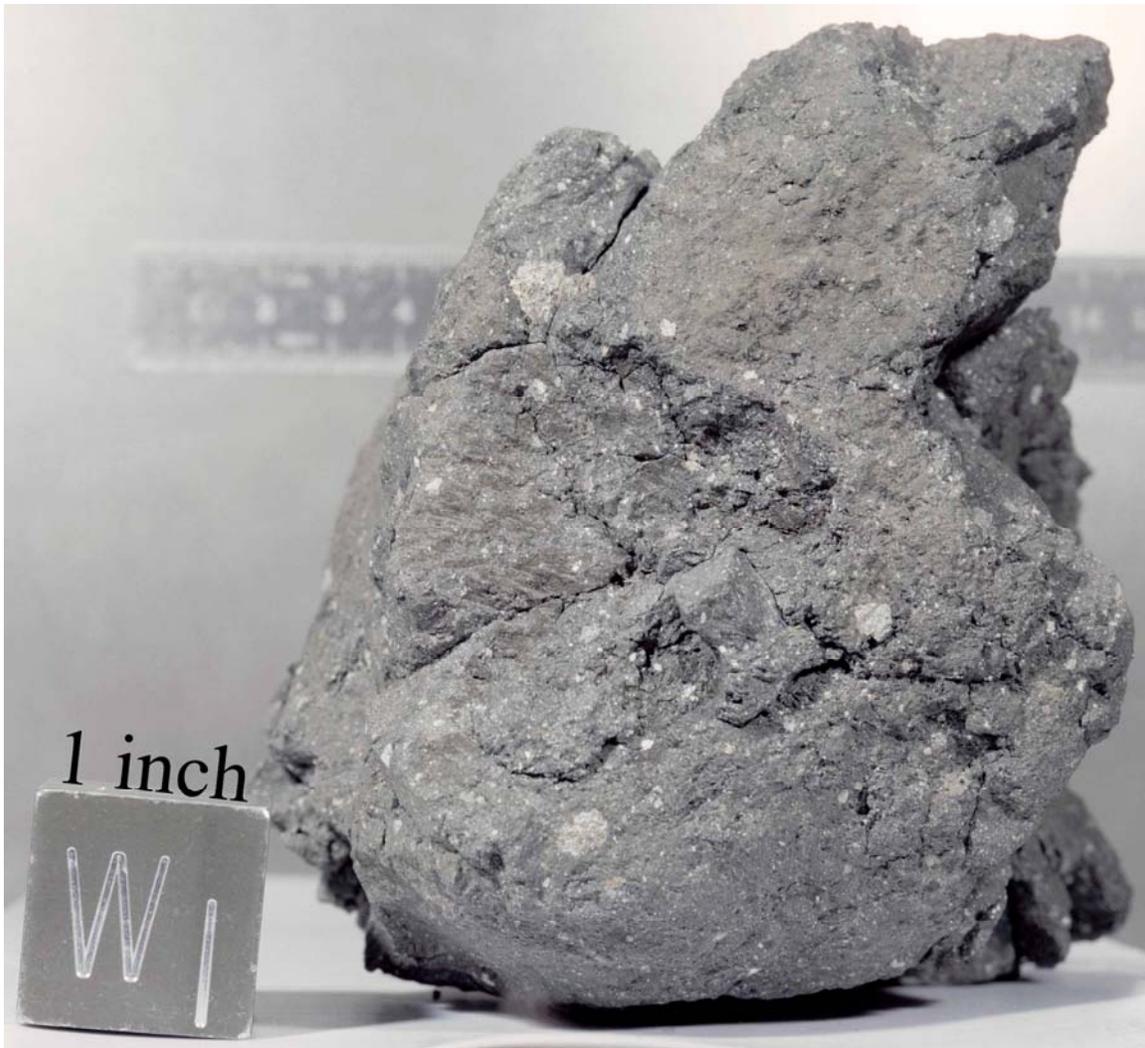


Figure 2. Close up of matrix of 15299,0. S-74-32566

**PETROLOGY:** 15299 has a gray brown matrix containing conspicuous, generally small white clasts and some pale green, red brown, and orange glasses are visible. McKay and Wentworth (1984) found 15299 to have a compact intergranular porosity, a low fracture porosity, very rare agglutinates, minor spheres, and minor shock features. McKay et al. (1984) determined an  $I_s/FeO$  of 22 to 34, which Korotev (1984 unpublished) reported as 32, i.e., submature. Wentworth and McKay (1983) determined a bulk density of  $2.49 \text{ gm/cm}^3$ . In thin section a foliation is apparent (Fig. 3), formed by alignment of elongated lithic and glass fragments and the long axis of ellipsoidal glass balls. According to Nagle (1982a) the fabric is that expected of subcrater lithification. Nagle (1982b) tabulated data on grain rounding, packing, and clast orientations.

Juan et al. (1972) described thin section ,106 as consisting of 70% glassy matrix, 12% subangular to subrounded lithic clasts (including mare, older breccia, and anorthositic varieties), 11% mineral clasts, 3% glass fragments, and 4% glass spheres. Many of the clasts and mineral fragments show shock effects(undulatory extraction, etc.). Juan et

al.(1972) preferred the hypothesis that 15299 is a welded breccia formed in a base surge, i.e., thermal sintering. The largest clast visible in Fig. 1 is a mare basalt.



Figure 3. Photomicrograph of matrix in 15299,154 showing foliation.

**CHEMISTRY:** Several analyses of the breccia have been made (Table 1, Figure 4), and these show a similarity with soils from Station 6. The data of Wanke et al. (1973) is revised from earlier publication (Wanke et al., 1972), and that of Kothari and Goel (1973) includes more replicates than their early publication (Kothari and Goel, 1972). The sample analyzed by Baedecker et al.(1978) had its surface "sand blasted" to reduce contamination. S.R. Taylor et al. (1973) calculated that 15299 consists of a mixture of 15.8% "highland basalt" and 84.2% low-K Fra Mauro.

Merlivat et al, (1974) measured H<sub>2</sub> and H<sub>2</sub>O and provide hydrogen isotopic data from extraction at different temperatures. They found that 6% of the total water was extracted above 700°C. Filleux et al. (1978) measured carbon in the near-surface and surface of two exterior pieces of 15299, finding lower "volume" carbon than did Moore et al. (1972, 1973).

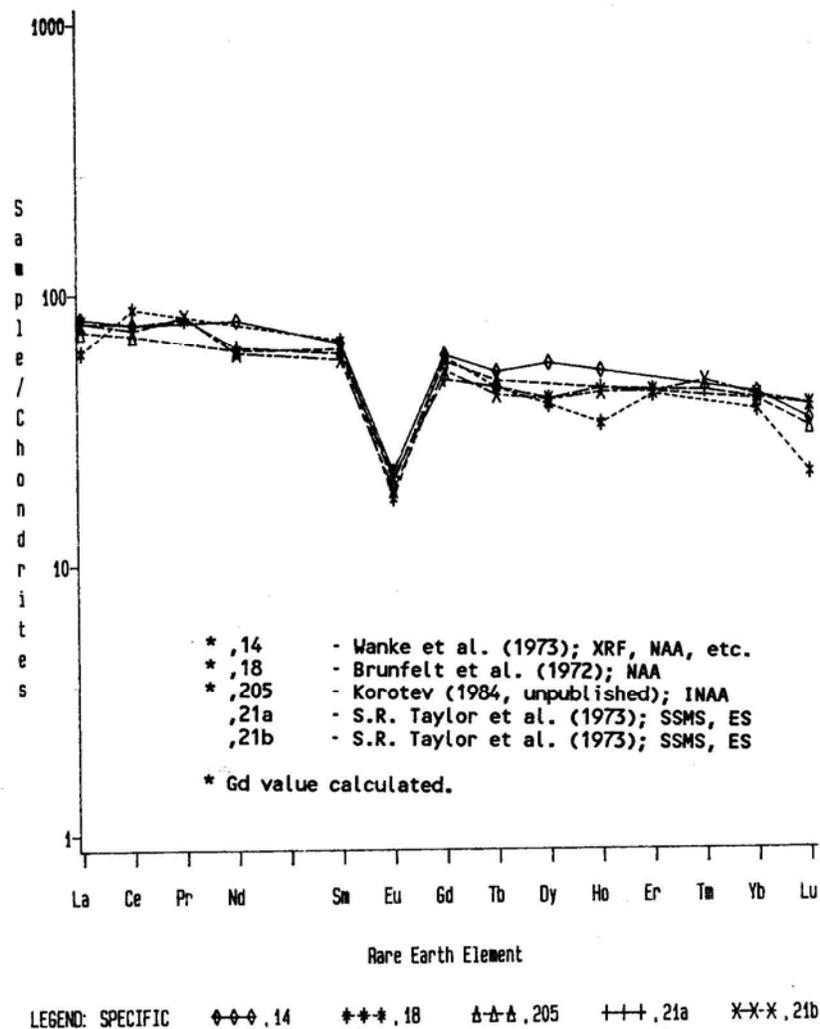


Figure 4. Rare earths in 15299 matrix samples  
a) Brunfelt et al. (1972); b) S.R. Taylor et al. (1973), "total;"  
c) S.R. Taylor et al. (1973), "matrix;" d) Wanke et al. (1973);  
e) Korotev (1984, unpublished).

TABLE 15299-1.

	,13	,18	,21a	,21b	,14	,17	,14	,2
Wt % SiO2	45.90		46.9		46.4			
TiO2	1.49	1.21	1.33		1.5			
Al2O3	18.50	16.48	17.9		16.27			
FeO	11.65	11.7	10.9		11.96			
MgO	10.08		10.1		11.08			
CaO	10.90	10.8	11.6		11.8			
Na2O	0.430	.047	0.45		0.478			
K2O	0.224		0.17		0.1960			
P2O5								
(ppm) Sc		22.2	16.0	16.0	23.2			
V		104	45.0	24.0				
Cr	2340	1570	2000	1750	2290			
Mn	1180	950			1200			
Co	71	39.3	44.0	40.0	39.6			
Ni	244	230	195	215	150		239	
Rb	5.0	4.5	5.0	4.7				
Sr	265	100						
Y			82.0	76.0				
Zr			385.0	393.0				
Nb			27.0	27.0				
Hf	9.8	7.0	7.6	8.7				
Ba	221	320	300					
Th	3.5	3.72	4.31				4.271	
U	0.97	0.99	1.2				1.175	
Pb		2.6	3.0				3.031	
La	20	26.0	26.0	27.0				
Ce	78	68.0	65.0	68				
Pr		9.1	9.3					
Nd		38.0	36.0	48				
Sm	12.2	10.8	10.3	11.9				
Eu	1.21	1.45	1.3	1.51				
Gd		11.9	12.9					
Tb	2.09	2.1	1.97	2.4				
Dy	12.2	12.9	12.8	17.4				
Ho	2.3	3.1	3.0	3.6				
Er	8.4	8.7	8.6					
Tm		1.3	1.4					
Yb	7.3	8.1	8.3	8.5				
Lu	0.73	1.3	1.3	1.15				
Li	15							
Be								
B								
C								
N						74c		
S								
F								
Cl								
Br								
Cu	3	5.5	4.7	4.2				
Zn	35	14					17.7	
(ppb) I								
At								
Ga	10000	4300	3800	2200			4500	
Ge							410	
As		170						
Se		330						
Mo								
Tc								
Ru								
Rh								
Pd								
Ag	38	19						
Cd							49	
In		4					3.8	
Sn			220	280				
Sb								
Te								
Cs		220	190	180				
Ta		1080			1060			
W		910	190	230				
Re								
Os								
Ir		6.0					7.8	
Pt								
Au	6	3.9					2.2	
Hg								
Tl								
Bi								
	(1)	(2)	(3)	(3)	(4)	(5)	(6)	(7)

References and methods:

- (1) Juan et al. (1972b); AAS, colorimetric
- (2) Brunfelt et al. (1972); NAA
- (3) S.R. Taylor et al. (1973); SSMS, ES
- (4) Wanke et al. (1973); XRF, NAA, etc.
- (5) Kothari and Goel (1973); NAA
- (6) Baedecker et al. (1973); RNAA
- (7) Silver (1973); ID/MS

Notes:

- (a) Referred to as "total".
- (b) Referred to as "matrix".
- (c) Weighted mean of four replicates.

RADIOGENIC ISOTOPES: Silver (1973) provided Pb isotopic data (as well as U, Th, and Pb abundances), finding 15299 to be similar to local soils.

PHYSICAL PROPERTIES: Dran et al. (1973) tabulated fracture and albedo data for 15299 under a list of "metamorphic characters".

PROCESSING AND SUBDIVISIONS: ,1 was removed from the sample and sawn into several pieces (Fig. 5) from which many of the allocations were made. Subsequently the remaining sample was sawn to produce end piece ,161 (372.7 g), now in remote storage, and ,0 (1131.8 g). The 1-cm white mare basalt clast in Figure 1 (called clast 74) has also been subdivided and allocated.

Many thin sections were made from potted butts ,9, ,10 and ,11 (Fig. 5) and from ,162 which was a split from the major sawing. Most of those from ,11 and ,162 are in educational packages. ,197 is a thin section of basalt clast 74, and thin section ,200 is mainly matrix but also contains part of the clast.

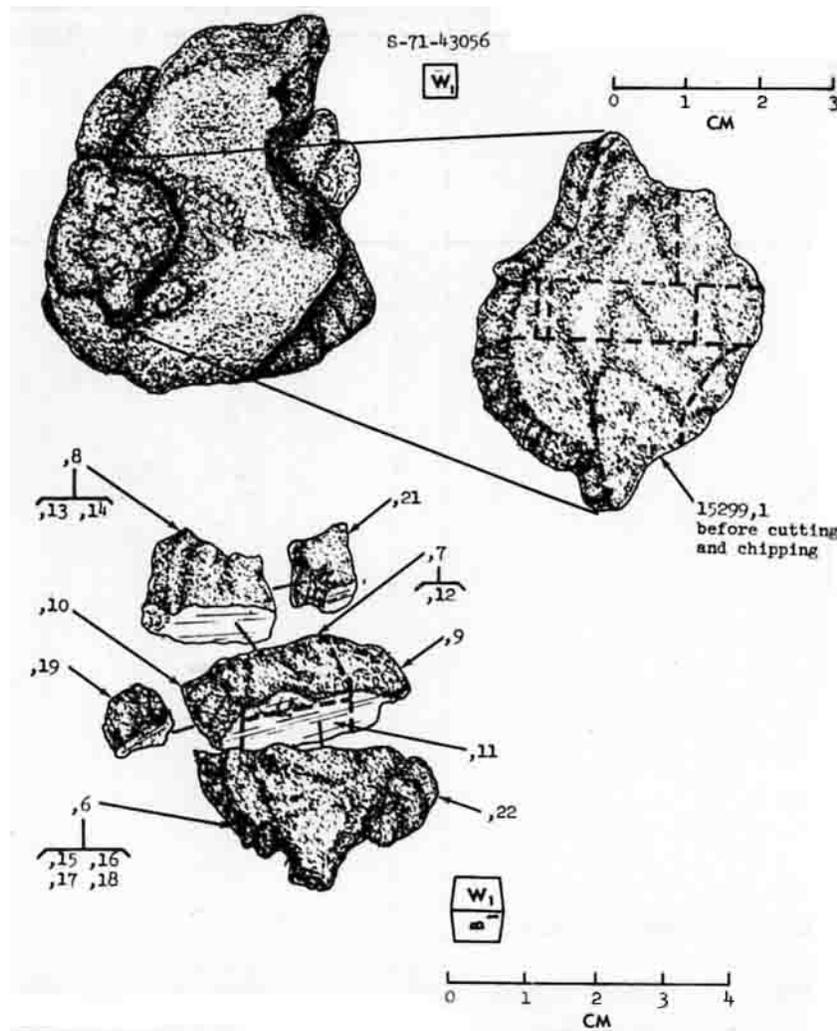


Figure 5. Splitting of ,1.