Revised

73255

Aphanitic Impact-melt Breccia

394.1 grams

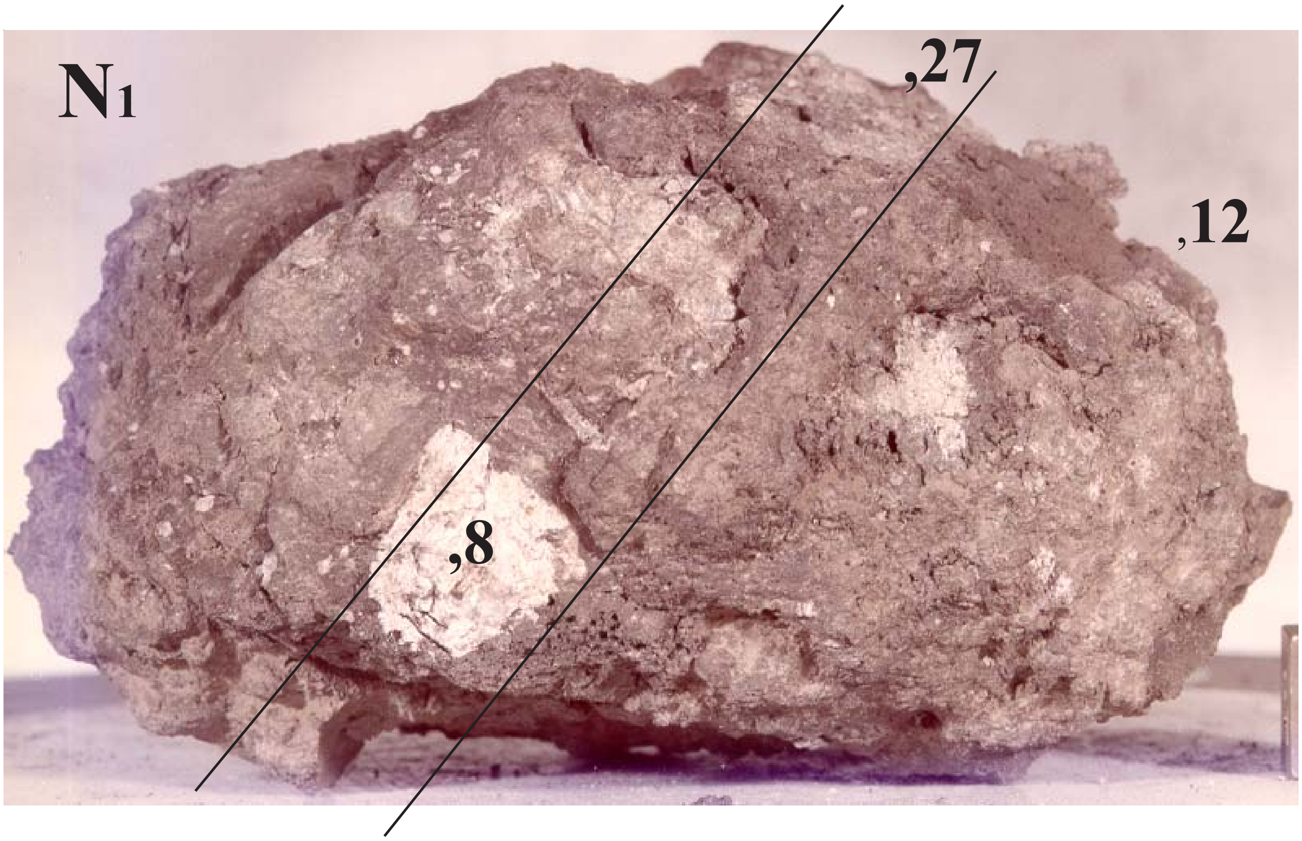


Figure 1: Photo of 73255 showing approximate position of slab (indicated by lines). Sample is about 8 cm across. White clast (,8) was on piece ,38 cut from slab (,27). NASA S73-16951.

Introduction

The best write-up of 73255 is probably the one found in the catalog by Ryder (1993). Ryder notes that 73255 "is essentially an agglomeritic bomb" with a clast-rich, non-vesicular core surrounded by a "rind" (up to 1 cm thick) of vesicular breccia that generally has a sharp contact with the interior core. The core is itself an agglomeration of melt breccias with numerous distinct clasts of various rock types. 73255 was studied by a consortium of scientists led by Odette James. It was shown to have been part of the Serenitatis ejecta blanket, because it is basically similar in chemical composition, age and lithology to highland materials from both the South and North Massifs at Apollo 17.

73255 was found on the rim of the 10 m crater on the landslide material off of the South Massif and has an exposure age (~90 m.y.) about the same as the other materials of the landside (Wolfe et al. 1981). The matrix of 73255 has an Ar plateau age of about 3.9

Mineralogical Mode of 73255

(summarized from James et al. 1978)

	Nonvesicular	Slightly Vesicular	Vesicular
Vesicles %	2	5	21-34
Groundmass	72.3 vol. %	77.2	66.4
Plagioclase > 5 microns	13.3	10.3	20.3
Mafic minerals > 5 microns	7.4	9.1	9.6
Lithic clasts > 5 microns	7	2.8	3.7

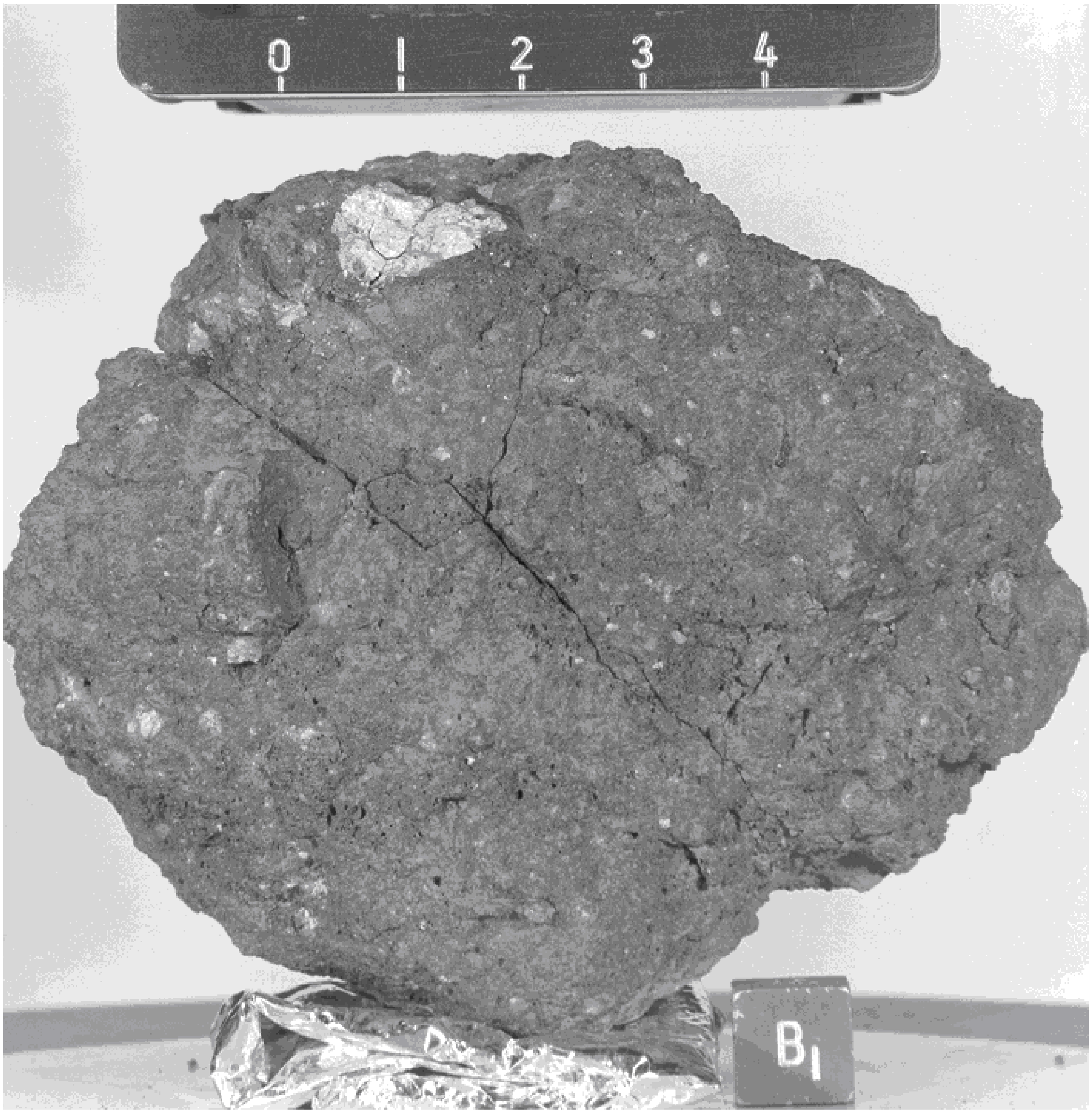


Figure 2: Bottom surface of 73255 (with ,8 "big white"). NASA S73-24194. Cube is 1 cm.

b.y., with at least one clast determined to be older - 4.23 b.y.

The anorthosite clasts in 73255 deserve more attention, because anorthositic materials are surprisingly rare in the Apollo 17 highland materials.

Petrography

Breccia 73255 is a fragment-laden, impact-melt rock containing a high percentage of relict rock clasts; including clasts of gabbronorite, pyroxene anorthosite, mare basalt, felsite and aphanitic microbreccia (James et al. 1978, Nord and James 1978, Blanchard and Budahn 1979, Morgan and Petrie 1979, Staudacher et al. 1979, Nord and McGee 1979, James and McGee 1980 and others).

The nonvesicular central portion (core) of 73255 is made up of a dark aphanitic matrix that includes irregular regions of a mottled lithology, itself containing patches of the dark aphanitic matrix mixed in a network of more friable, lighter-colored rock composed primarily of mineral fragments (figures 4 and 5).

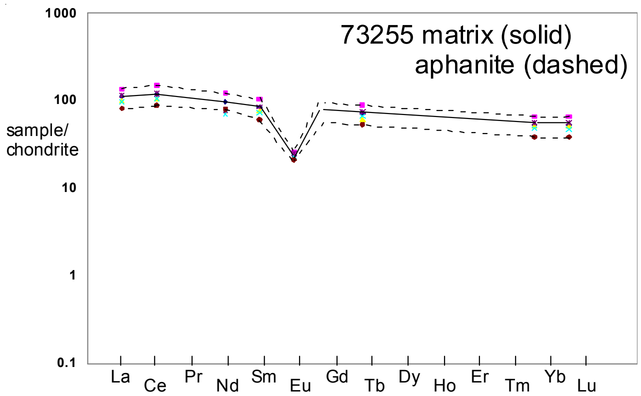


Figure 3: Chemical composition of matrix (average) and aphanitic clasts in 73255 (James et al. 1978).

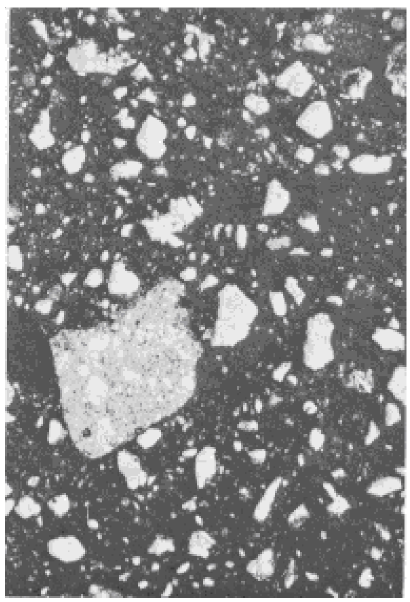


Figure 4: Photomicrograph of dark nonvesicular aphanitic groundmass of 73255. This is figure 2a from James et al. (1978). Width about 1 mm.

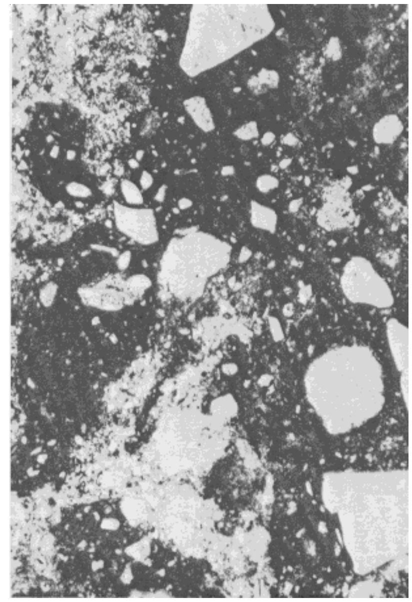


Figure 5: Photomicrograph of "mottled" lithology of 73255. This is figure 5 of James et al. (1978). Width about 1 mm.

Modally and chemically these various regions are found to be similar (James et al. 1978).

Spudis and Ryder (1980) recognized that 73255 is a sort of "melt bomb", apparently originally produced by the Serenitatis event. However, they note that additional cratering events may have shaped the landscape post-Serenitatis.

The numerous prominent lithic clasts found in 73255 have been the focus of much of the research on 73255. Although many have been analyzed for their bulk composition, most have not been studied for their mineral compositions. *It has proven difficult to match*

Table 1a. Chemical composition of 73255 (aphanite clasts).

reference	James et al. 1978				
weight	ave. C	ave. NV	ave. SV	ave. V	
SiO2 %	48	48.2	48.4	48.5	(a)
TiO2	0.91	1.03	1.06	1.03	(a)
Al2O3	17.6	17.8	17.6	17.5	(a)
FeO	9.08	9.41	9.35	9.45	(a)
MnO	0.12	0.13	0.12	0.15	(a)
MgO	11.7	11.4	11.1	11.2	(a)
CaO	11.1	11.3	11.3	11.3	(a)
Na2O	0.52	0.48	0.54	0.58	(a)
K2O	0.31	0.31	0.36	0.43	(a)
P2O5	0.2	0.22	0.2	0.16	(a)
Cr2O3	0.27	0.27	0.28	0.27	(a)
sum					
# spots	24	67	31	18	

technique: (a) broad beam electrom microprobe

Table 1b. Chemical composition of 73255 (matrix).

	bulk		matrix							aphanite			Average
reference	Eldridge74		James et al. 1978 (table 4)							Morgan and Petrie 79			
weight	392 g		,82-1 V	,82-2 N	,124-15 V	,124-4 N	,27-11 V	,27-11 N		,124	,130		
SiO2 %													
TiO2			0.87	0.92	0.96	1.06	0.94	1.02	(b)				0.96
Al2O3			17.3	18.4	17.1	17.9	18.5	18.3	(b)				17.9
FeO			9.4	8.9	9.7	10.1	9.1	9.5	(b)				9.45
MnO			0.14	0.12	0.15	0.15	0.13	0.13	(b)				0.14
MgO			12.6	11.2	13.5	12.9	11.3	11.3	(b)				12.1
CaO			10.2	11.2	10.4	11.2	10.8	11.6	(b)				10.9
Na2O			0.49	0.48	0.48	0.49	0.51	0.47	(b)				0.49
K2O	0.19	(a)	0.25	0.34	0.27		0.27	0.14	(b)				0.24
P2O5													
S %													
sum													
Sc ppm			20.5	19.8	20.9	23	20.3	22.3	(b)				21.1
V			68	63	76	67	71	79	(b)				70.1
Cr			2395	2260	2737	2395	2260	2395	(b)				2407
Co			27	26	27.4	28.2	25.2	29.2	(b)				27.2
Ni			167	175	148	206	160	208	(b)	149	188	(c)	175
Cu													
Zn										2.4	2.2	(c)	2.3
Ga													
Ge ppb										166	240	(c)	203
As													
Se										81	91	(c)	86
Rb													
Sr			131	145	140	150	140	160	(b)				144
Y													
Zr													
Nb													
Mo													
Ru													
Rh													
Pd ppb										6	7.8	(c)	6.9
Ag ppb										0.55	0.66	(c)	0.6
Cd ppb										5.1	4.6	(c)	4.8
In ppb										2	3	(c)	2.5
Sn ppb													
Sb ppb										1.13	1.25	(c)	1.2
Te ppb													
Cs ppm													
Ba			333	307	350	280	430	308	(b)				335
La			27.2	25.1	28	24.6	28.7	22.5	(b)				26
Ce			76.2	68.4	76.9	70.6	77.3	58.6	(b)				71
Pr													
Nd			50.7	43	50	45	41.7	33	(b)				44
Sm			12.8	11.7	13.5	11.9	13.4	10.3	(b)				12.3
Eu			1.36	1.33	1.27	1.32	1.43	1.21	(b)				1.32
Gd													
Tb			2.54	2.45	2.94	2.64	2.85	2.24	(b)				2.61
Dy													
Ho													
Er													
Tm													
Yb			9.27	8.46	9.37	8.4	9.14	7.27	(b)				8.65
Lu			1.35	1.22	1.38	1.26	1.38	1.11	(b)				1.28
Hf			8.8	8.5	8.2	9	9.4	8.7	(b)				8.8
Ta			1.3	1.1	1	1	1.2	1	(b)				1.1
W ppb													
Re ppb										0.383	0.482	(c)	0.43
Os ppb										5.2	5.6	(c)	5.4
Ir ppb										4.4	5.4	(c)	4.9
Pt ppb													
Au ppb										2.4	3.2	(c)	2.8
Th ppm	3.47	(a)	4.3	4.1	4.3	4.3	4.8	3.6	(b)				
U ppm	1	(a)								1.18	1.42	(c)	

technique: (a) radiation counting, (b) INAA, (c) RNAA

Table 1c. Chemical composition of 73255 (aphanite clasts).

reference	James et al. 1978							Morgan79	
weight	,110	,148	,135-5	,253-13	,27-101		Average	,27-46	
SiO2 %									
TiO2	1.02	1.01	1	0.85	0.82	(a)			
Al2O3	18.3	18.2	18.4	18	19	(a)			
FeO	9	9.7	9.7	9.3	9.5	(a)			
MnO	0.13	0.14	0.14	0.13	0.13	(a)			
MgO	11.8	11.7	11.6	11.6	11.4	(a)			
CaO	11	10.2	11	10.3	11.2	(a)			
Na2O	0.5	0.44	0.49	0.48	0.44	(a)			
K2O									
P2O5									
S %									
sum									
Sc ppm	19.7	21.3	22.1	20.8	22	(a)			
V	57	68	64	63	66	(a)			
Cr	2121	2463	2326	2326	2190	(a)			
Co	28.2	33.7	30	33	29	(a)			
Ni	180	210	209	236	237	(a)		167	(b)
Cu									
Zn								1.77	(b)
Ga									
Ge ppb								191	(b)
As									
Se								87	(b)
Rb									
Sr	212	153	160	189	164	(a)			
Y									
Zr									
Nb									
Mo									
Ru									
Rh									
Pd ppb								7.7	(b)
Ag ppb								0.75	(b)
Cd ppb								6.3	(b)
In ppb									
Sn ppb									
Sb ppb								2	(b)
Te ppb									
Cs ppm									
Ba	360	421	343	358	176	(a)			
La	31.8	23.3	22.8	26.9	19.1	(a)			
Ce	89.7	62.8	63.5	72.1	52.3	(a)			
Pr									
Nd	53.8	34.3	31.7	35.4	35.9	(a)			
Sm	15.4	11.2	10.8	12.6	8.79	(a)			
Eu	1.47	1.23	1.29	1.42	1.19	(a)			
Gd									
Tb	3.18	2.21	2.39	2.69	1.93	(a)			
Dy									
Ho									
Er									
Tm									
Yb	10.6	8.23	7.8	8.95	6.23	(a)			
Lu	1.59	1.24	1.15	1.33	0.93	(a)			
Hf	10.9	9.2	7.5	10.4	6	(a)			
Ta	1.7	1.1	1	1.1	0.9	(a)			
W ppb									
Re ppb								0.48	(b)
Os ppb								5.7	(b)
Ir ppb								5.3	(b)
Pt ppb									
Au ppb								3	(b)
Th ppm	5.6	4	3.9	4.6	2.9	(a)			
U ppm								1.31	(b)

technique: (a) INAA, (b) RNAA

Figure 6: Large white clast seen in figures 1 and 2. NASA S74-23041. This chalky white clast (,8) on exterior of 73255 was termed "anorthosite" by Blanchard and Budahn (1979). Width of clast is 1.5 mm.

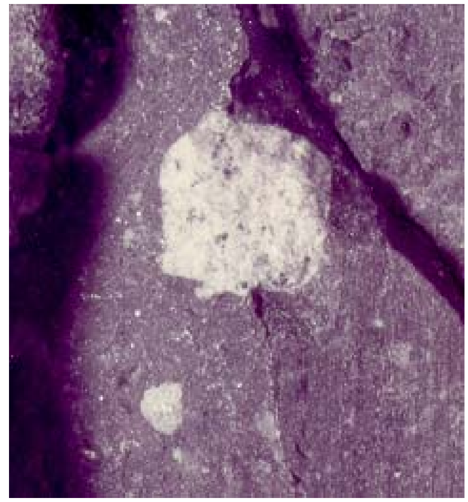


Figure 8: White Square clast on ,29 (interior). Size about 5 mm x 5 mm. NASA S 74-23127.

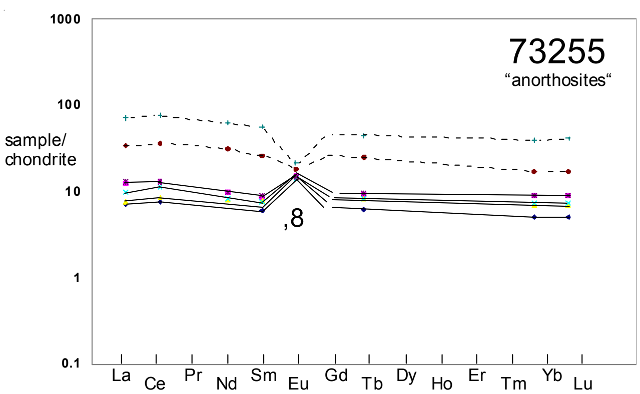


Figure 7: REE composition of white clasts in 73255 (data from table 2b). These clasts were termed "anorthosite" and "gabbroic anorthosite" by Blanchard and Budahn (1979). They were probably slightly "contaminated" by inseparatable breccia matrix.

photos, analyses and/or thin sections that go with each of the clasts. More work is indicated!

Significant Clasts (succinct summary)

***"Big White" Anorthosite Clast** (,8 ,38)*

A small chip (,8) was made of the large white clast (1.5 x 1.2 cm) on the surface of 73255, before the slab was cut and the early analysis showed it was anorthosite (Table 2b). The main portion remains on a piece (,38) cut from slab (figure 6). Notes in the data pack indicate that the plagioclase in this clast is mostly "powdered" and that it contains "granular" olivine (troctolite?). However, the photos show what appear to be large white grains. The analysis showed that it had a high Fe/Mg ratio, indicating that it is probably a "ferroan anorthosite". No mineral analyses are reported for this important clast. Ni content was low, verifying its *pristinity*. Additional material may be present on ,20 (figure 28).

***"White Square" Clast** (figure 8) in interior*

This bright white clast (square in outline) was exposed on ,29 and ,20 (figures 27, 28). It is 0.5 x 0.5 cm. It is not clear which analyses are of this clast.

***"White Elongate" Clast** (figure 31)*

Located on W1 side of slab (,38)? No data !

***Gabbronorite ,27-45** (figure 13)*

James and McGee (1979) and Nord and McGee (1979) studied a 9 x 8 x 7 mm clast (900 mg) from the E1 face of slab ,27 (figure 29?). This large clast is described by them as a granulated gabbronorite. It has rare relict texture of a plutonic rock with original grain size ~2 mm. The major minerals are 53% plagioclase ($An_{88.6}$), 40% orthopyroxene ($Wo_4,En_{71}Fs_{25}$), 5% augite ($Wo_{39}En_{48}Fs_{13}$)(figure 11) and ~0.5% ilmenite. Minor mineral phases include apatite, whitlockite, **Stanfieldite** (Ca-Mg-rich phosphate), chromite, troilite, metallic iron, armalcolite and rutile. Minute grains of K-spar and K-Si glass are also reported. Chemical analysis are tabulated (table 2a) are plotted in figures 9 and 10. This clast has been dated at 4.23 ± 0.05 b.y. by Sm-Nd mineral isochron (Carlson and Lugmair 1981) (figure 23).

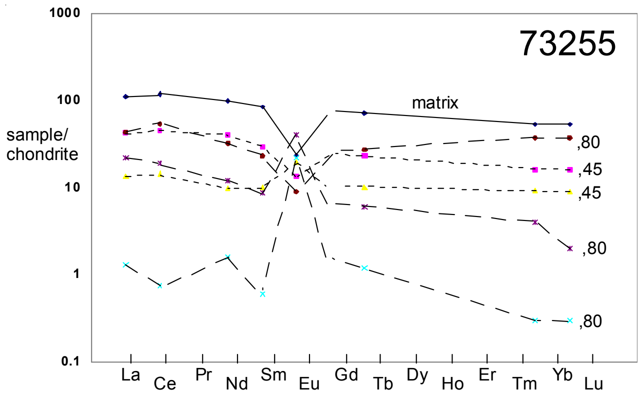


Figure 9: Chemical composition of gabbronorite (,27-45) and pyroxene anorthosite (,27-80) clasts in 73255 (data from Blanchard and Budahn 1979).

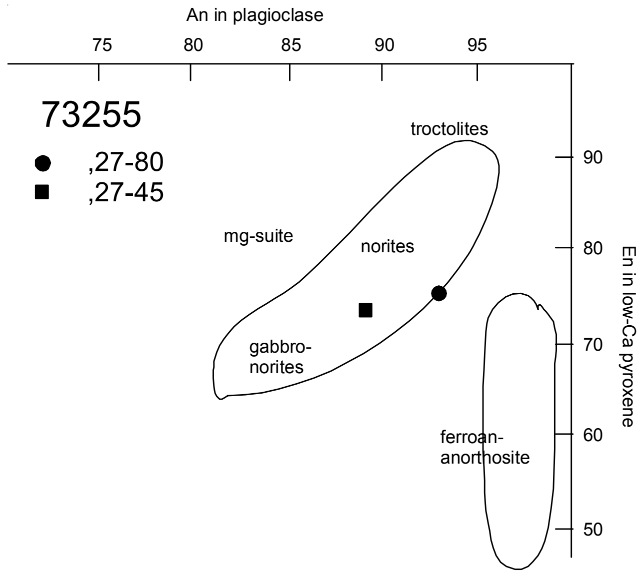


Figure 10: Plagioclase and mafic mineral composition diagram for norite clasts in 73255.

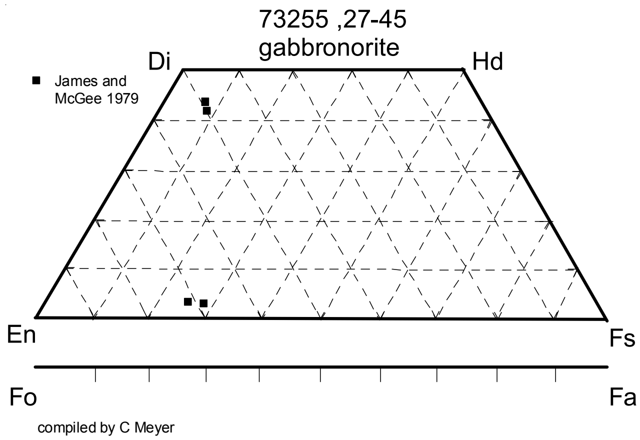


Figure 11: Pyroxene composition of gabbronorite clast ,27-45 in 73255 (from James and McGee 1979).

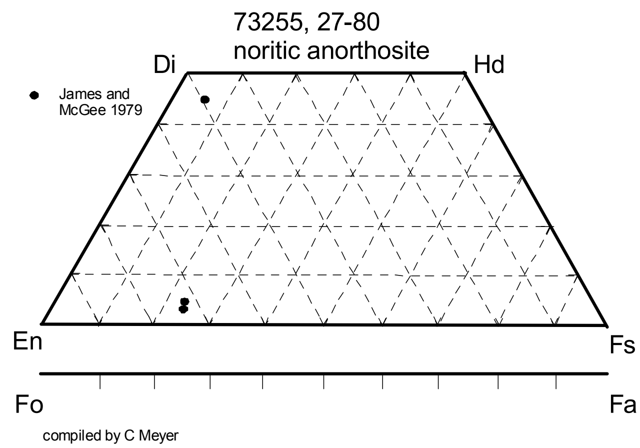


Figure 12: Pyroxene composition of "pyroxene anorthosite" clast 73255,27-80 (from James and McGee 1979).

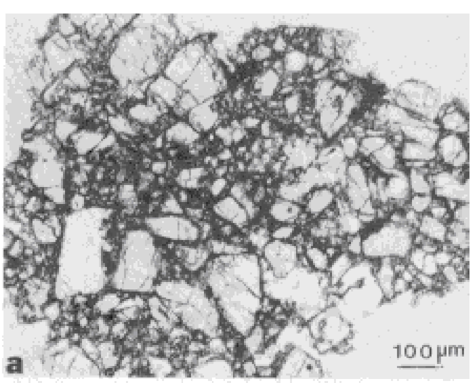


Figure 13: Thin section photomicrograph of gabbronorite clast 73255,27-45 (from Nord and McGee 1979).

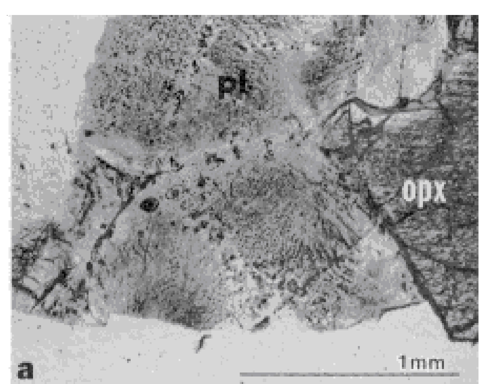


Figure 14: Thin section photomicrograph of "pyroxene anorthosite" clast 73255,27-80 (from Nord and McGee 1979).

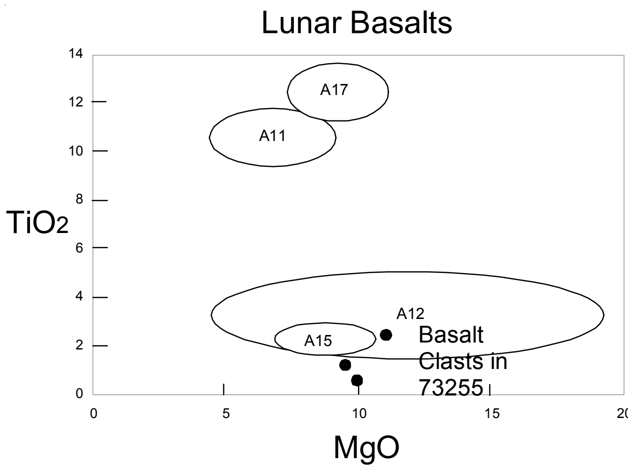


Figure 15 : Composition of basalt clasts in 73255 (data by Blanchard and Budahn 1979).

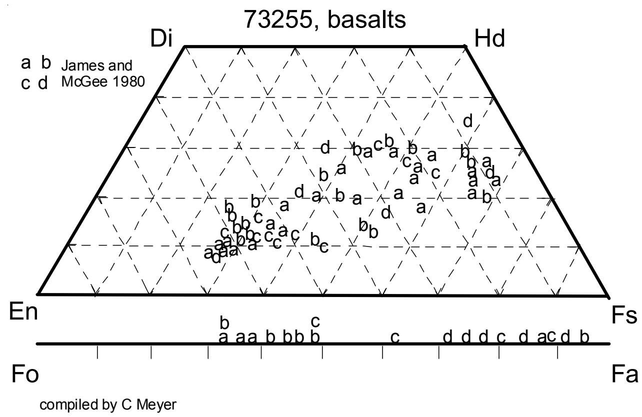


Figure 16: Pyroxene and olivine composition of mare basalt clasts in 73255 (from James and McGee 1979).

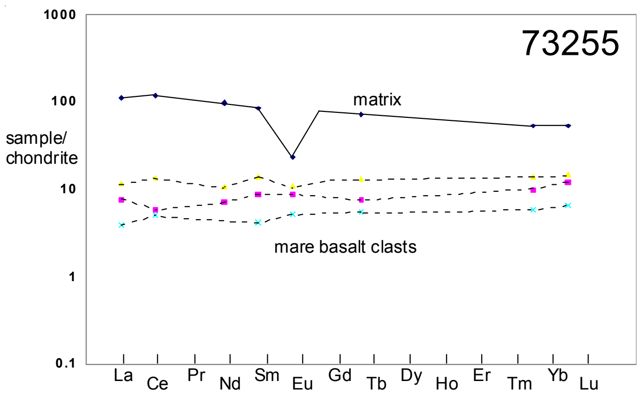


Figure 17: REE composition of basalt clasts in 73255 compared with matrix (data by Blanchard and Budahn 1979).

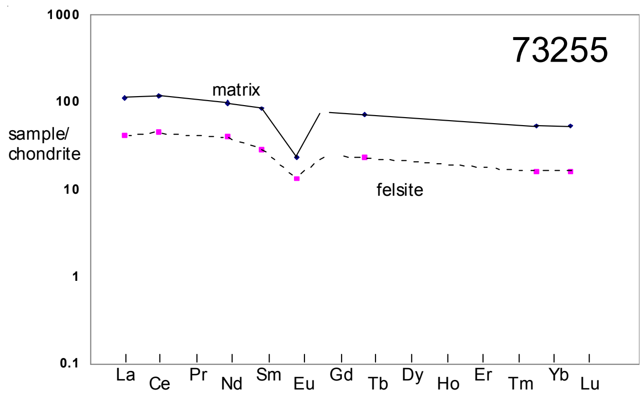


Figure 19: REE composition of small felsite clast in 73255 compared with matrix (data from Blanchard and Budahn 1979).

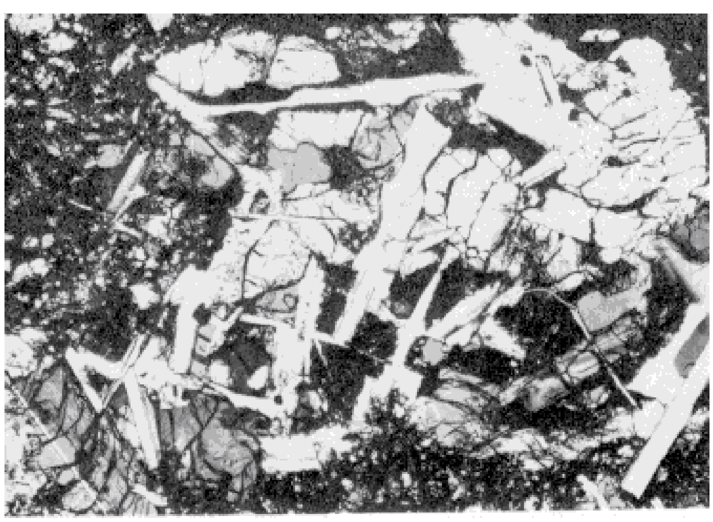


Figure 18: Photomicrograph of thin section of mare basalt clast 73255,253-4. Field of view is 1.75 mm. James and McGee (1980).

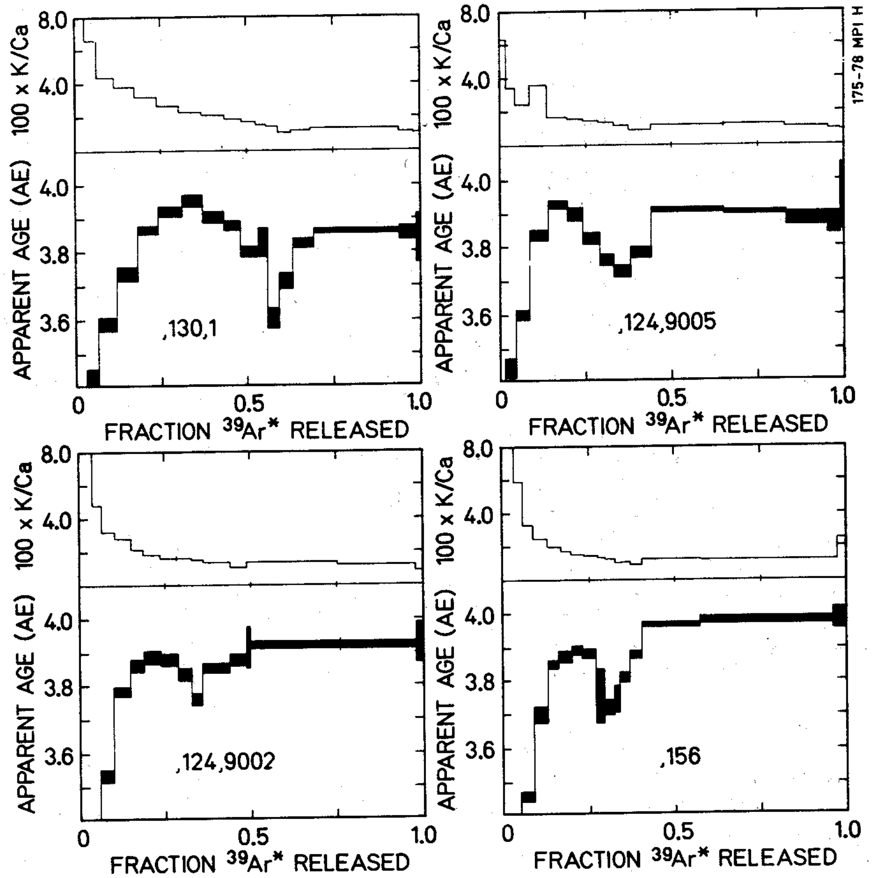


Figure 20: Ar/Ar release patterns of aphanitic melts in 73255 (Jessberger et al. 1978).

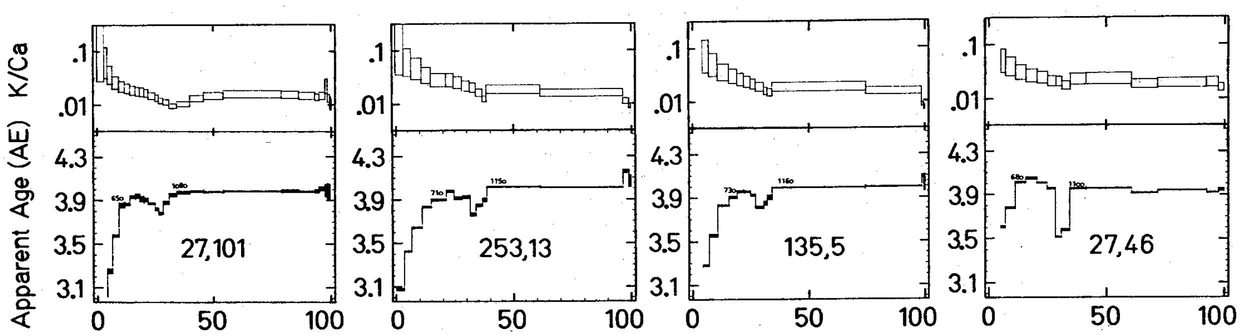


Figure 21: Ar/Ar release diagrams for aphanitic melts (Staudacher et al. 1979).

Pyroxene Anorthosite ,27-80 *(figure 14)*
James and McGee (1979) and Nord and McGee (1979) also studied a coarse-grained lithic clast, with “igneous texture”, about 0.5 cm across. It weighed about 250 mg, and was separated on a clean bench. This clast was estimated to have 83% plagioclase (An_{93}), 15% orthopyroxene ($Wo_{2.2}En_{73}Fs_{25}$), 1% augite

Summary of Age Data for 73255

	Ar/Ar	Sm-Nd	
Carlson and Lugmair 1981		4.23 ± 0.05 b.y.	gabbronorite
Jessberger et al. 1978	3.88 ± 0.03		matrix
Staudacher et al. 1979	3.87 ± 0.03		aphanaites
Staudacher	3.89 ± 0.03		felsite
Staudecker	3.9 - 4.2		gabbroic anorthosite

Note: Based on new decay constants.

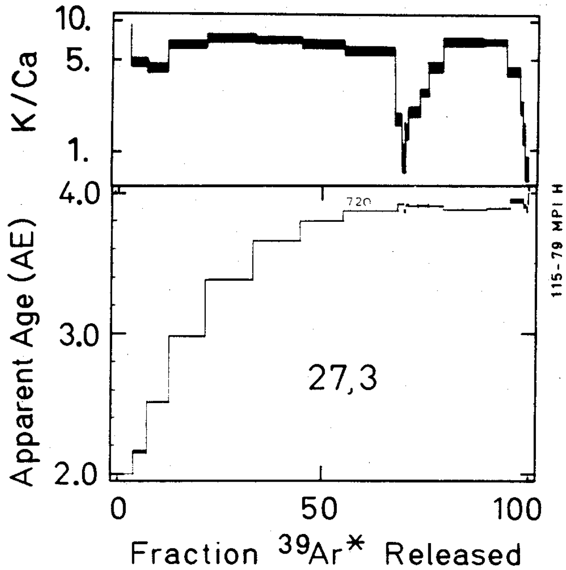


Figure 22: Ar/Ar release diagram for felsite clast 73255,27-3 (from Staudacher et al. 1979).

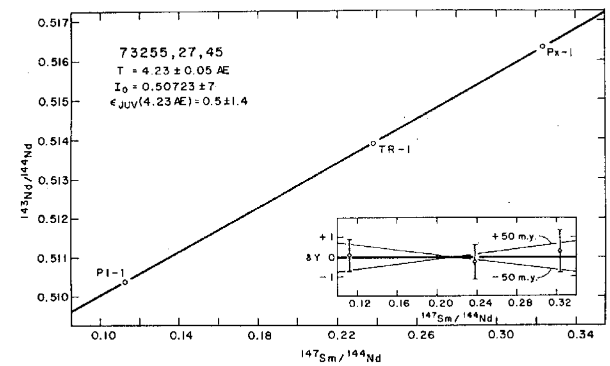


Figure 23: Sm-Nd mineral isochron for gabbronorite clast 73255,27,45 (from Carlson and Lugmair 1981).

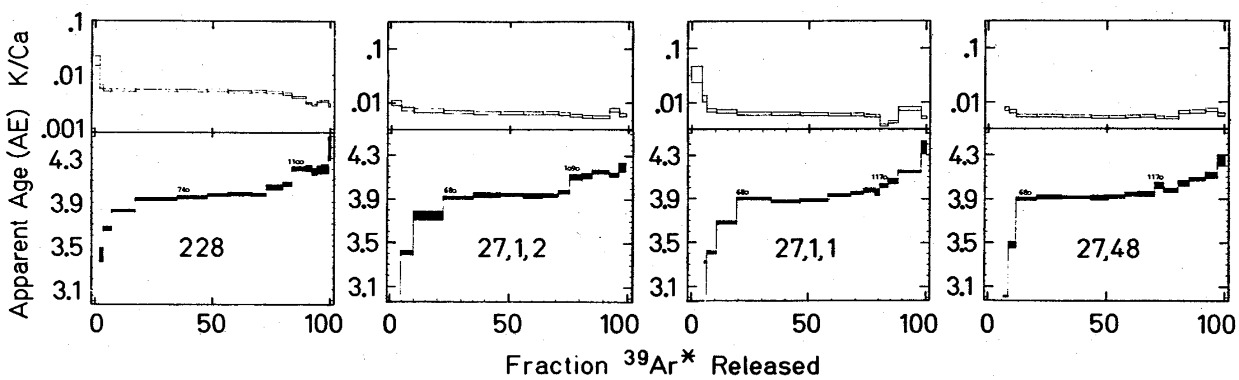


Figure 24: Ar/Ar release diagram for "gabbronorite" clasts in 73255 (Staudacher et al. 1979).

($Wo_{45}En_{46}Fs_9$)(figure 12) with 1% silica (quartz and cristobalite) and ~1% trace minerals (K-spar, chromite, rutile, metallic iron, apatite, whitlockite, baddeleyite, armalcolite, troilite, ilmenite and zirkelite). Whole rock analyses could not be obtained because of the coarse grain size, but analyses for plagioclase and mafic minerals are given in table 2a and figure 9 (they may be contaminated by breccia matrix). This clast is not a ferroan anorthosite (figure 10). It has not been dated.

Felsites ,27-3 and ,253-14

Nord and James (1978) described a tiny felsite clast found in thin section 73255,314. Blanchard and Budahn (1979) extracted a tiny (6 mg) felsite clast (,27-3) from slab ,27 and determined the composition (table 2a , figure 19). It was successfully dated by Staudacker et al. (1979) by Ar/Ar plateau as 3.89 ± 0.03 b.y. (figure 22). James and McGee (1980 abs) described the two felsite clasts (,27-3 and ,253-14) finding them similar to feliste clast 73215,43. They were originally a vermicular intergrowth of quartz and K-Ba-feldspar, but have been highly-shocked to produce glass and diaplectic feldspar.

***Mare Basalts** (figure 18)*

James and McGee (1980) studied 5 small mare basalt clasts extracted from the mottled lithology of 73255. They have low Ti content (figure 15) and are thought to be members of a single differentiated suite. All of the clasts have been fractured and granulated. Pyroxene and plagioclase (An_{95-97}) form a sub-ophitic texture. The earliest formed minerals were olivine and chromite. Pyroxene cores (pigeonite-sub-calcic augite) zone to ferro-augite (figure 16). The mesostasis contains cristobalite, skeletal ferro-augite, fayalite and devitrified glass. Three of these basalts were analyzed

Table 2a. Chemical composition of 73255 (felsite, basalt and norite clasts).

	felsite		gabbronorite		pyroxene anorthosite			basalts			
reference	Blanchard and Budahn 1979										
weight	,27-3		,27-45	,27-45	,27-80	,27-80	,27-80	,27-76	,27-24	,27-105	
SiO2 %	*75*	(b)			plag.	plag.	pyx.				
TiO2	0.26	(a)	0.68	0.52				2.1	1.54	0.34	(a)
Al2O3	12.3	(a)	9.5	15				14.2	13.8	14.2	(a)
FeO	3.1	(a)	12.1	9.2	0.17	0.14	13.3	16.6	17.1	15.4	(a)
MnO	0.04	(a)	0.18	0.14				0.26	0.26	0.23	(a)
MgO	0.2	(a)	18.7	14.8				11	9.5	10.1	(a)
CaO	0.5	(a)	7.1	9.8				11.5	11	10	(a)
Na2O	0.53	(a)	0.34	0.46	0.68	0.72	0.2	0.23	0.26	0.18	(a)
K2O	7.55	(a)		0.08		0.2					
P2O5											
S %											
sum											
Sc ppm	2.3	(a)	21.9	15.9	0.28	0.29	21.7	52.9	63.4	51.5	(a)
V	7	(a)	78	58				120	160	220	(a)
Cr			2053	1574	14	61	3558	3490	3200	4926	(a)
Co	1.5	(a)	23	20		10.5	31.3	26.5	22	36	(a)
Ni			35	35							
Cu											
Zn											
Ga											
Ge ppb											
As											
Se											
Rb											
Sr	215	(a)	140	135	300	220			50	95	(a)
Y											
Zr											
Nb											
Mo											
Ru											
Rh											
Pd ppb											
Ag ppb											
Cd ppb											
In ppb											
Sn ppb											
Sb ppb											
Te ppb											
Cs ppm											
Ba	5470	(a)									
La	20.3	(a)	9.77	3.15	0.313	5.28	10	1.82	2.75	0.92	(a)
Ce	50	(a)	27	8.7	0.45	11.7	32.8	3.5	8.2	3	(a)
Pr											
Nd	34	(a)	18	4.4	0.73	5.3	14.4	3.2	4.8		(a)
Sm	6.74	(a)	4.24	1.48	0.091	1.26	3.36	1.28	2.03	0.62	(a)
Eu	2.71	(a)	0.75	1.09	1.23	2.2	0.51	0.49	0.62	0.29	(a)
Gd											
Tb	1.52	(a)	0.84	0.37	0.044	0.22	0.98	0.27	0.47	0.2	(a)
Dy											
Ho											
Er											
Tm											
Yb	10.3	(a)	2.61	1.49	0.03	0.67	6	1.58	2.23	0.95	(a)
Lu	1.5	(a)	0.38	0.22	0.008	0.05	0.9	0.3	0.36	0.16	(a)
Hf	16	(a)	1.8	0.9		1.2	3.8	1.55	1.51	0.45	(a)
Ta	2.4	(a)	0.14	0.14		0.7			0.3		
W ppb											
Re ppb											
Os ppb											
Ir ppb											
Pt ppb											
Au ppb											
Th ppm	9.5	(a)	1.4	0.37		0.4	0.85		0.28		(a)
U ppm											

technique: (a) INAA, (b) calculated

Table 2b. Chemical composition of 73255 (other clasts).

	anorthosite			gabbroic anorthosite								
reference	Blanchard and Budahn 1979									Morgan and Petrie 1979		
weight	,8-1		,27-101	,253-12	,228	,27-1	,27-48	,154		,228-13	,27-12	
SiO2 %												
TiO2	0.02	(b)	0.27	0.1	0.26	0.18	0.28	1.47	(a)			
Al2O3	31.3	(b)	27.4	29.7	25	25.5	28.1	19.9	(a)			
FeO	3.24	(b)	4.4	3.5	5.7	5.2	4.1	9.4	(a)			
MnO	0.05	(b)	0.05	0.06	0.08	0.06	0.055	0.127	(a)			
MgO	3.24	(b)	7.9	4.4	6.7	6.6	6.3	9.9	(a)			
CaO	18.7	(b)	14	15.9	14.8	14.9	14.5	11.6	(a)			
Na2O	0.37	(b)	0.36	0.39	0.33	0.37	0.42	0.47	(a)			
K2O								0.28	(a)			
P2O5												
S %												
sum												
Sc ppm	5.44	(a)	5.7	7.7	11.7	8	7.9	22	(a)			
V					35	24	18	78	(a)			
Cr	380	(a)	684	479	1238	746	700	2030	(a)			
Co	6.5	(a)	24	4	20	32	18	26	(a)			
Ni	24	(a)	320	50	190	440	115	130	(a)	154	511	(c)
Cu												
Zn												
Ga										75	172	(c)
Ge ppb												
As												
Se										33	62	(c)
Rb												
Sr			220	180	130	175	165	190	(a)			
Y												
Zr												
Nb												
Mo												
Ru												
Rh												
Pd ppb										7.9	23	(c)
Ag ppb										0.56	0.77	(c)
Cd ppb										4.4	3.8	(c)
In ppb												
Sn ppb												
Sb ppb										2.5	1.68	(c)
Te ppb												
Cs ppm												
Ba			65		40	60	100	210	(a)			
La	1.67	(a)	2.92	1.79	2.32	3	7.9	16.7	(a)			
Ce	4.6	(a)	7.8	5.2	6.9	7.9	21.8	46	(a)			
Pr												
Nd			4.4	3.6	3.7	4.7	14	28	(a)			
Sm	0.88	(a)	1.26	1.15	1.11	1.33	3.8	8.2	(a)			
Eu	0.83	(a)	0.86	0.83	0.77	0.82	1.03	1.2	(a)			
Gd												
Tb	0.23	(a)	0.34	0.3	0.3	0.35	0.91	1.6	(a)			
Dy												
Ho												
Er												
Tm												
Yb	0.83	(a)	1.47	1.13	1.21	1.45	2.85	6.5	(a)			
Lu	0.12	(a)	0.22	0.17	0.18	0.22	0.42	1	(a)			
Hf	0.58	(a)	1.2	0.98	0.96	1.1	3.5	7.5	(a)			
Ta			0.36		0.18	0.2	0.6	1.1	(a)			
W ppb												
Re ppb										0.582	2	(c)
Os ppb										8.3	26	(c)
Ir ppb										6.5	21	(c)
Pt ppb												
Au ppb										2.7	9.3	(c)
Th ppm	0.27	(a)	1	0.63	0.55	0.9	2.5	3.2	(a)			
U ppm										0.25	0.27	(c)

technique: (a) INAA, (b) AA, (c) RNAA

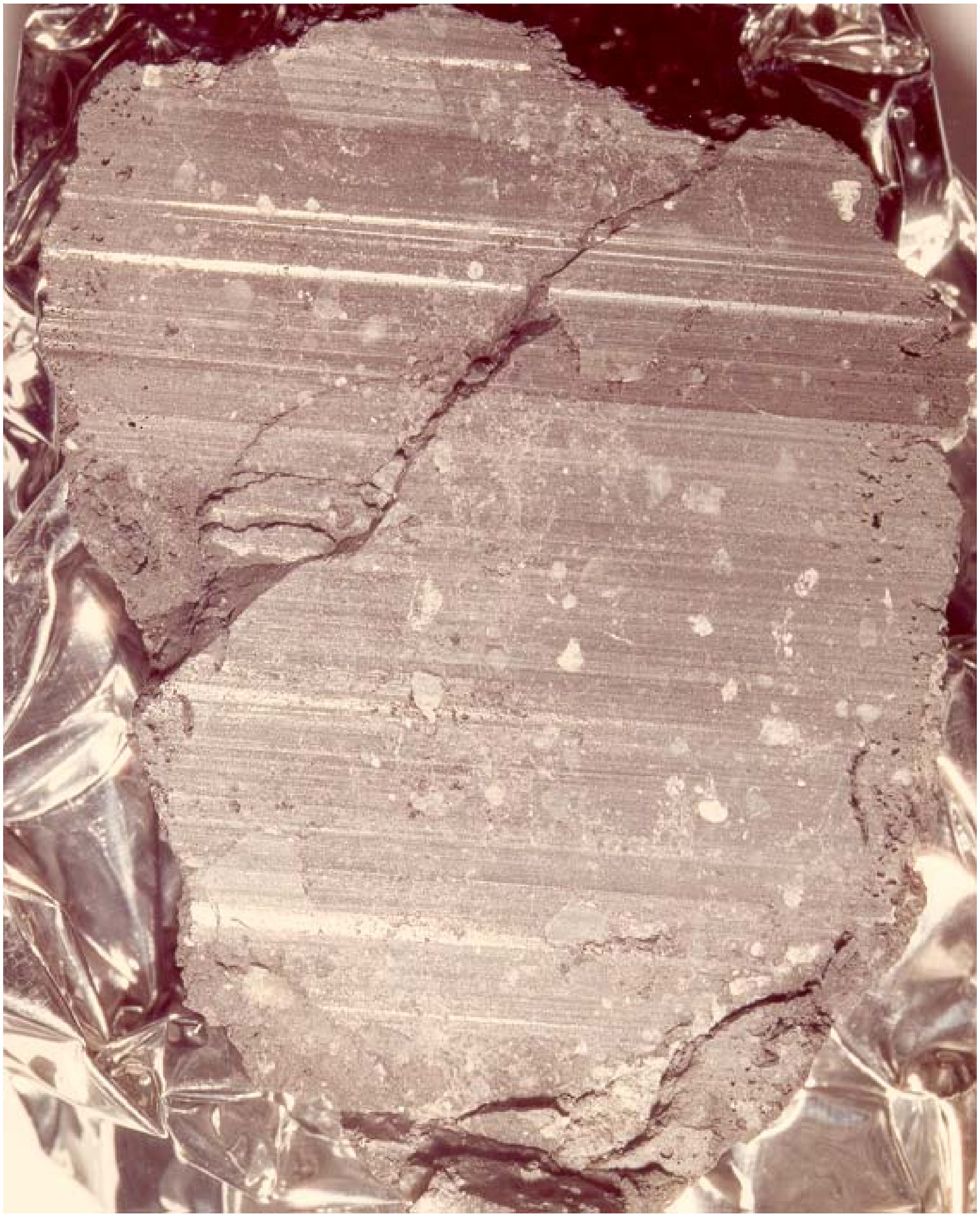


Figure 25: Photo of sawn surface of 73255,12 (butt end). NASA S74-22926. Note saw marks and vesicular "rind".

by Blanchard and Budahn (1979) (Table 2a, figures 15 and 17). Since they are included within the breccia, and the breccia itself is identified as Serenitatis eject, they most be older than about 3.9 b.y. Only a few mare basalt clasts were found in highland breccias.

Chemistry

The chemical composition of the bulk rock, the aphanitic matrix (both vesicular and non-vesicular) and the fine-grained aphanitic clasts is similar and it is the same as for the other aphanitic breccias from the landslide (table 1, figure 3).

The meteoritic siderophile elements relate 73255 to the other samples of Serenitatis (Morgan and Petrie 1979).

Figure 26: Photo of slab of 73255,27. NASA S74-23052. This side faces ,12 (figure 25). Cube is 1 cm.

Radiogenic age dating

The matrix and the aphanitic clasts have been dated at ~3.88 b.y. by Ar/Ar (figure 20, 21). The felsite clast also gave an age of 3.89 (figure 22). Pyroxene, plagioclase and whole rock analyses gave a Sm-Nd mineral isochron for the gabbronorite clast (,27-45) with age 4.23 ± 0.05 b.y. (figure 23). Argon release plateaus for "gabbronorite clasts" showed an old high-temperature release, indicating that they were reset (figure 24). Eichorn et al. (1979) reported additional age studies by laser release Ar/Ar analysis.

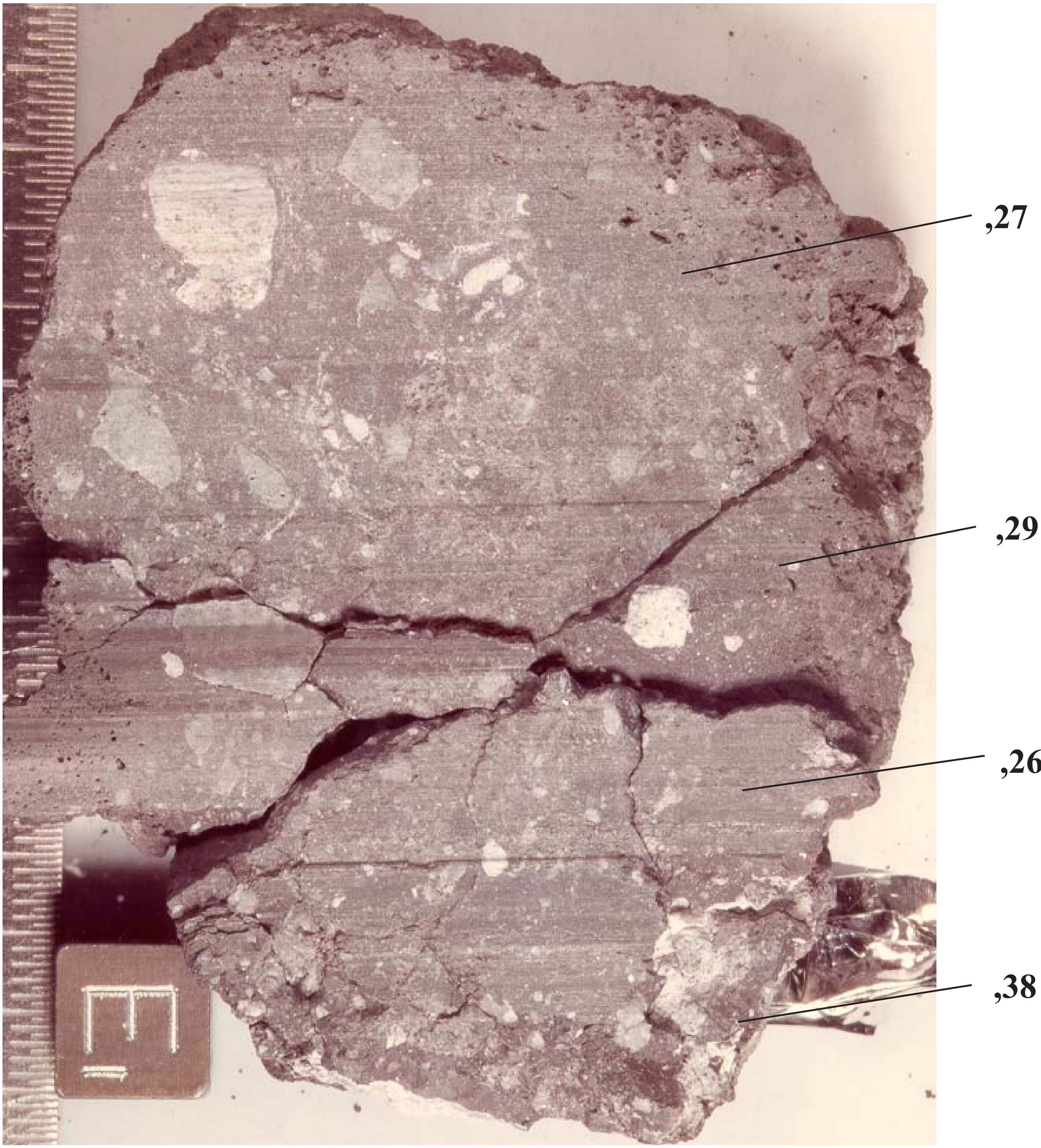


Figure 27: Photo of slab 73255,27 and pieces. Cube is 1 cm. NASA S74-23135. This surface faces the end piece ,17 (figure 28).

Cosmogenic isotopes and exposure ages

O'Kelley et al. (1974) reported the cosmic ray induced activity of 73255: ^{22}Na = 88 dpm/kg., ^{26}Al = 75 dpm/kg., ^{54}Mn = 86 dpm/kg. and ^{56}Co =56 dpm/kg. James and Marti (1977 abs) reported an exposure age of 149 m.y. by ^{81}Kr, but Jessberger et al. (1978) and Staudacher

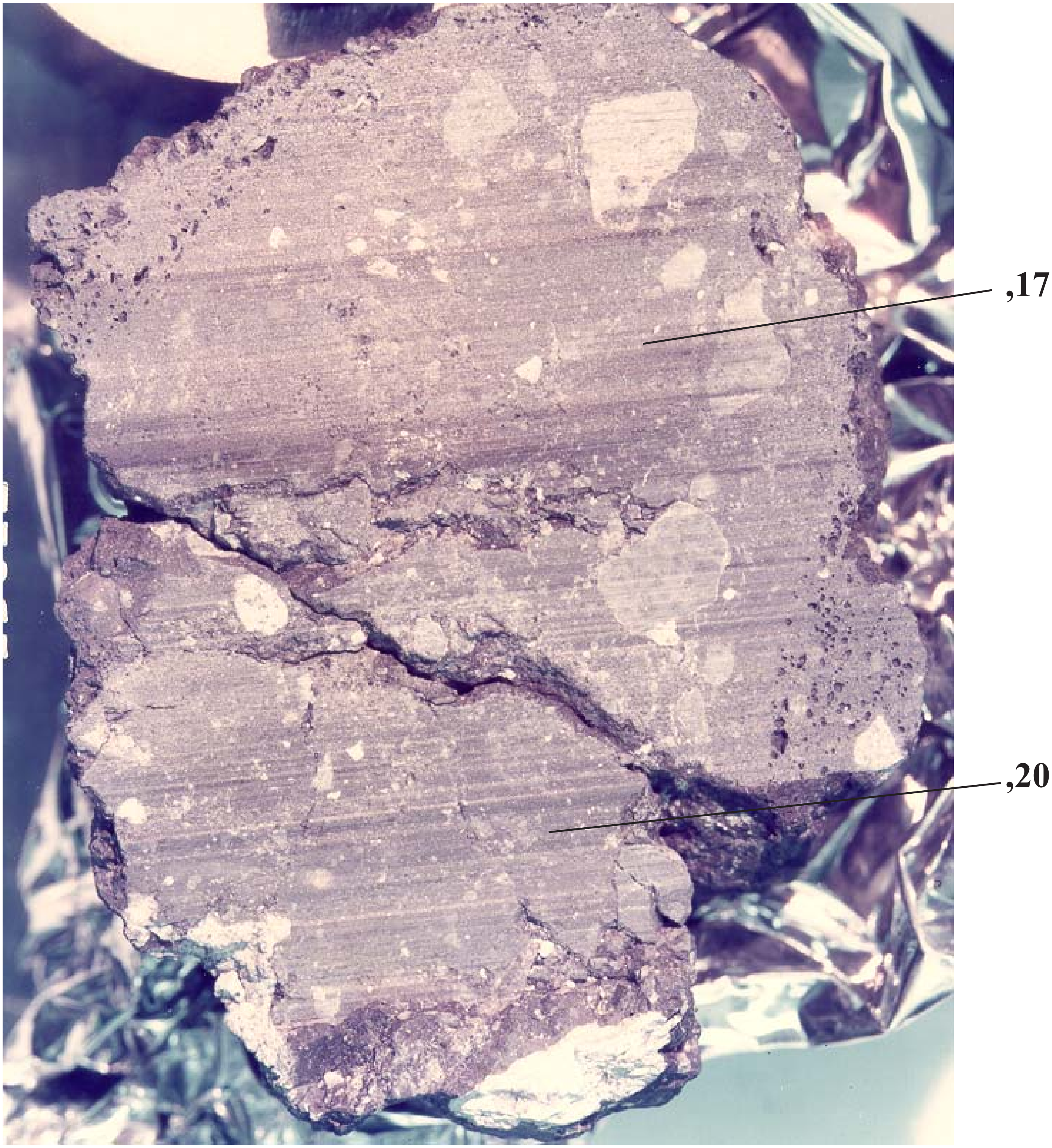


Figure 28: Photo of end piece 73255,17 and ,20. This side faces slab ,27. NASA S74-22995. Large clasts are about 1 cm each. White clast at bottom may be part of ,8 (?).

et al. (1979) determined many ^{38}Ar exposure ages over the range of 71 to 97 m.y. (average 90 m.y.).

Other Studies

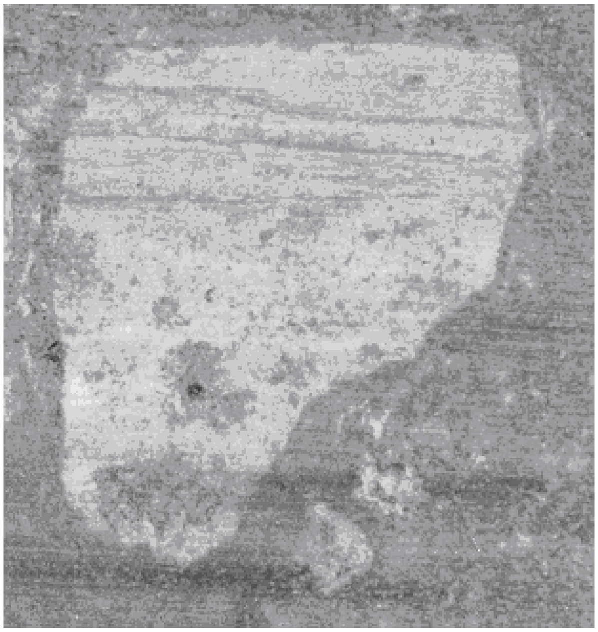


Figure 29: Large mottled white clast exposed by saw cut on both ,17 and ,27 (slab). Size about 1 cm. NASA S74-26057.

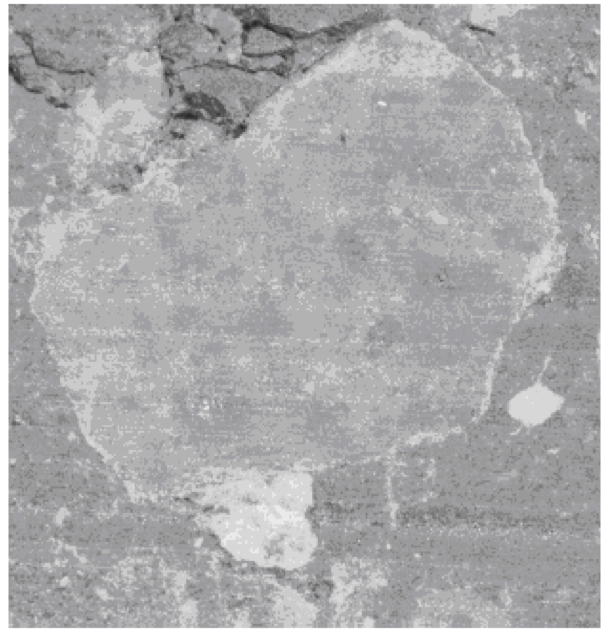
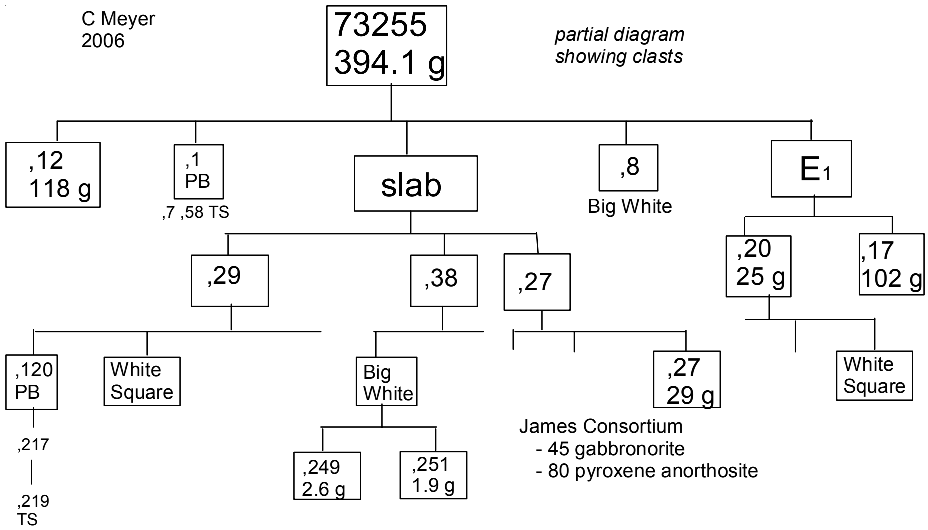


Figure 30: Largest light grey aphanitic clast exposed by saw cut on ,17 and ,27. NASA S76-26054. Size about 1 cm.

Figure 31: Interior elongate white clast on back side of slab (W1). NASA S74-23051. Cube is 1 cm. (see figure 26)



Processing

In 1974 a slab was cut through the middle of 73255, however the slab and the butt ends broke into pieces (figures 25-28). Slab ,27 was further subdivided (in air, on a clean bench) by Blanchard and James and was the primary focus of most of the research. Clasts were individually extracted and analyzed by the James Consortium. There are 127 thin sections of 73255.

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