DRAFT

65315

Cataclastic Anorthositic with glass coat

300 grams

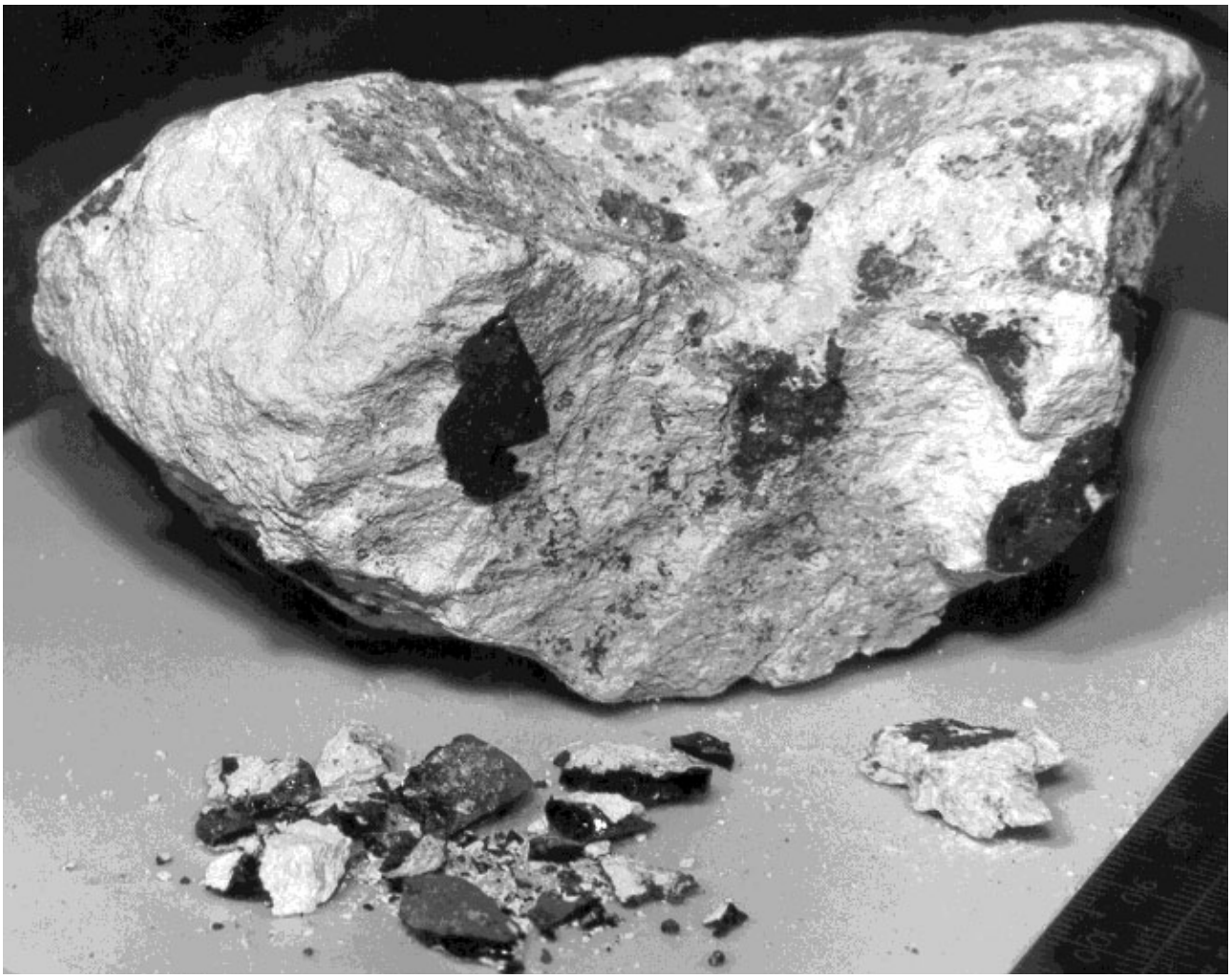

Figure 1: Photo of 65315. Sample is about 8 cm across. This side was glass coated. NASA S72-42565.

Introduction

65315 is a chemically pristine lunar anorthosite that has been crushed, but not highly shocked. It had a black glass coating on one side (possibly all sides) that has broken off during meteorite bombardment and during the trip to earth and processing in laboratory (figure 1 and 2). The other side is covered with micrometeorite pits and the sample is generally rounded (figure 3). 65315 was placed in the bag with the rake samples from that location (lower slope of Stone Mountain).

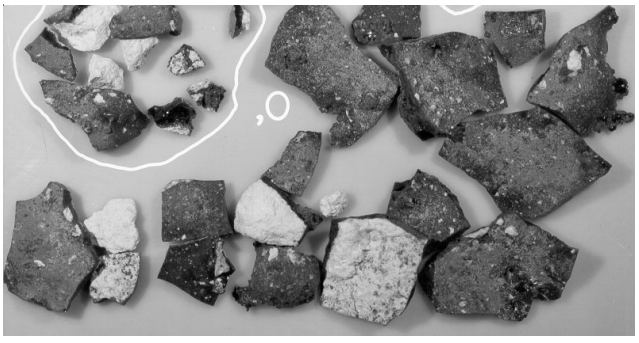

Figure 2: Sample 65366. Additional glass chips found in same bag and probably from 65315. NASA S82-29748. Each about 1 cm.

65325 and 65327 (from the same sample bag) both have textures and mineralogy similar to 65315 and 65366

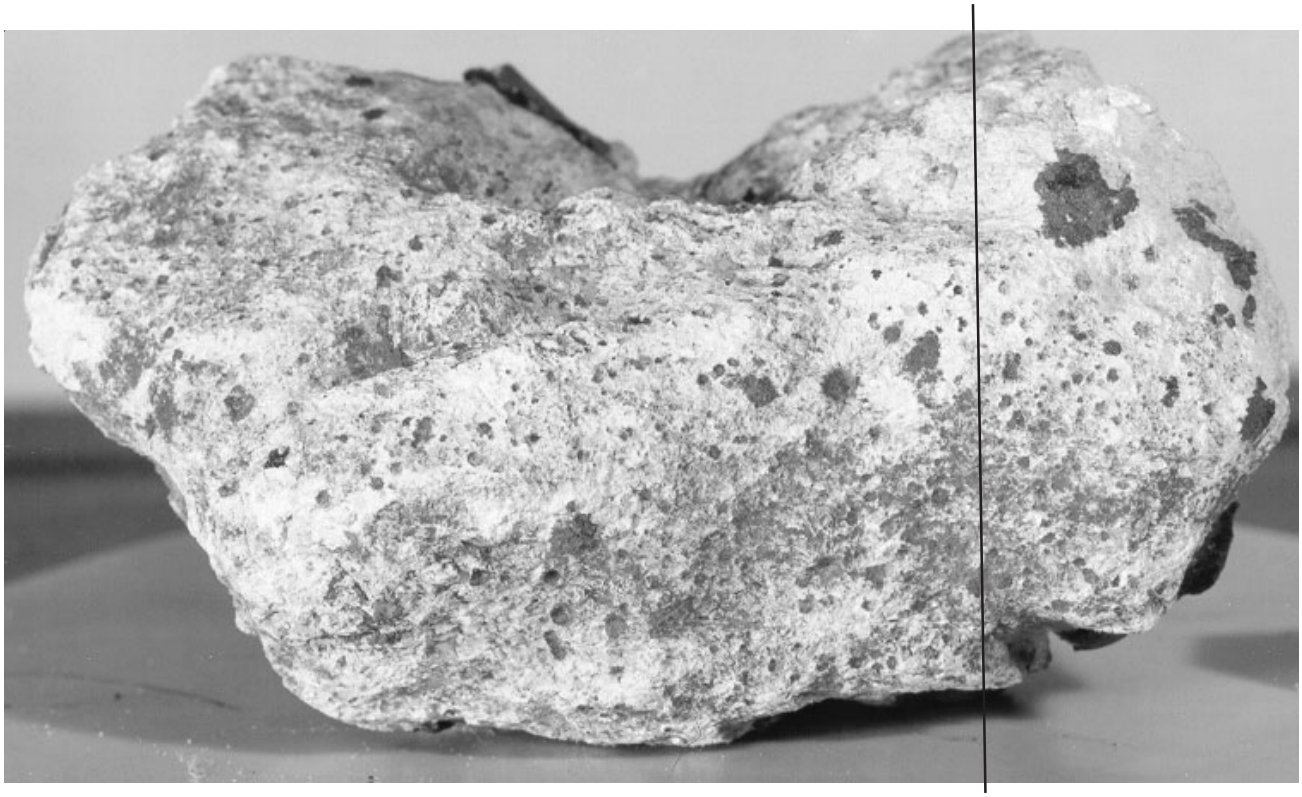

Figure 3: Photo of 65315. NASA S72-39419. Sample is about 8 cm across. Note abundant micrometeorite pits and patina on this surface. Location of saw cut is indicated..

(figure 2) is probably the glass coating that was originally attached to 65315.

Petrography

65315 is a badly crushed, ferroan anorthosite with relic plagioclase grains up to 4 mm long. The only mafic mineral reported is pyroxene which is found at grain boundaries. All grains exhibit undulose extinction (due to shock) but shock melting and/or recrystallization was not observed (Ryder and Norman 1980).

Mineralogy

Olivine: none

Pyroxene: Dixon and Papike (1975) found the pyroxene was $Wo_{43}En_{41}$ and Wo_2En_{65} (figure 5).

Plagioclase: Dixon and Papike (1975) determined plagioclase to be homogeneous at $An_{97.5}$. Meyer (1979) determined trace element content of plagioclase.

Glass: See et al. (1986) and Morris et al. (1986) studied the glass coating.

Metal: Mehta and Goldstein (1980) studied the metal particles from the glass.

Mineralogical Mode for 65315

	Dixon and Papike 1975
Plagioclase	98.5 %
Orthopyroxene	1.2
Clinopyroxene	0.2
Opaque	0.3

Chemistry

Wanke et al. (1974) and Ebihara et al. (1992) determined the chemical composition of this anorthosite, while Morris et al. (1986) and See et al. (1986) analyzed the glass coating (figure 7).

Radiogenic age dating

Stettler et al. (1974) were not able to get a plateau in the Ar release (figure 8).

Cosmogenic isotopes and exposure ages

Stettler et al. (1974) and Eberhardt et al. (1975) determined exposure ages of 1.8 m.y. and 1.6 m.y. respectively by ^{38}Ar. Eberhardt et al. (1975) found 1.5 ± 0.7 m.y. by ^{81}Kr and Gopalan and Rao (1976) reported 1.5 m.y. by ^{21}Ne. Finally, Eugster et al. (1984)

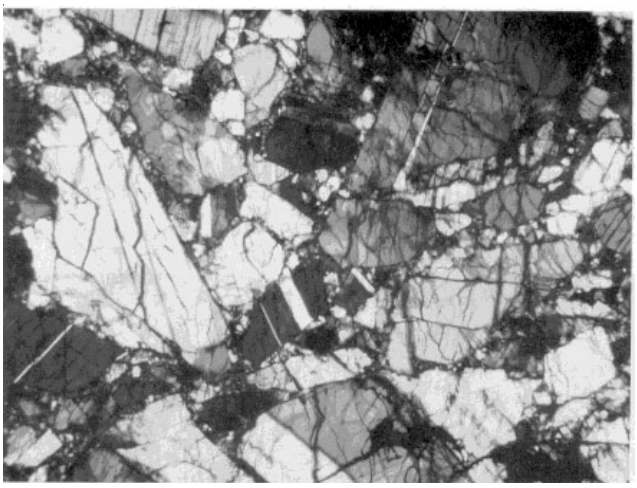

Figure 4: Thin section photomicrograph of 65315,4 with crossed polarized light. Field of view is 2 mm. (from Ryder and Norman 1980)

determined the age by ^{81}Kr was 1.3 0.7 b.y. – linking it to the ejecta from South Ray Crater.

Other Studies

Leich et al. (1974) found significant amounts of F on the surface of 65315 (probably contamination). Filleux et al. (1977) looked for solar wind-implanted carbon (without success). Nagel et al. (1976) and Hartung et al. (1978) studied the glass linings of micrometeorite pits. Gopalan and Rao (1976) studied the solar cosmic ray interaction with this friable sample.

Processing

65515 was sawn (figure 9) and the end piece was broken for distribution (figure 10).

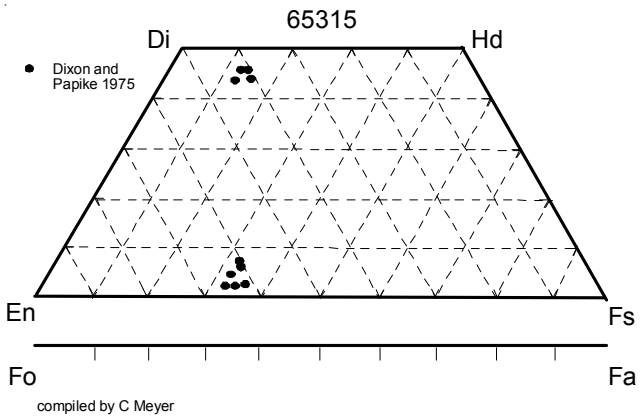

Figure 5: Pyroxene composition of 65315 (from Dixon and Papike 1975).

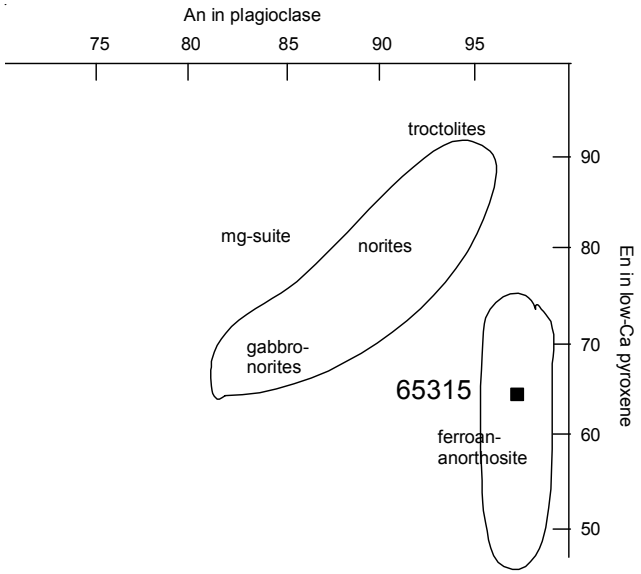

Figure 6: Composition of plagioclase and orthopyroxene in 65315 (from Dixon and Papike 1975) compared with rock types found in lunar highlands.

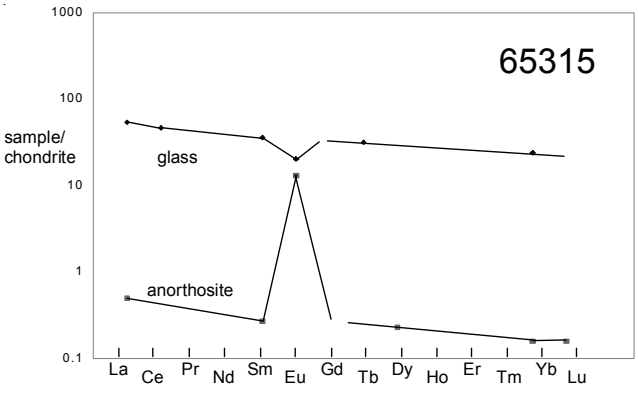

Figure 7: Normalized rare-earth-element diagram for 65315 (data from Wanke et al. 1974 and Morris et al. 1986).

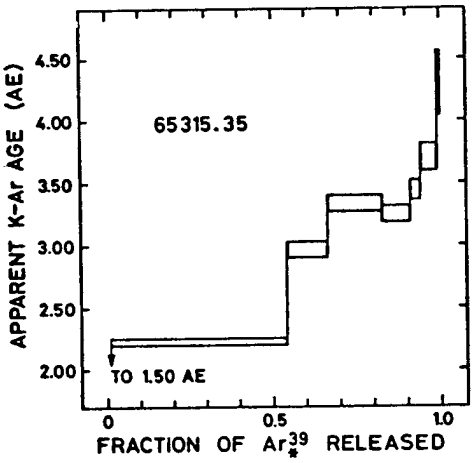

Figure 8: Ar40/39 diagram for 65315 (Stettler et al. 1974).

Table 1. Chemical composition of 65315 (and 65366).

	glass	glass							
reference	Morris 86			See 86		Wanke 74		Ebihara 92	
weight	65315	*65366*		anor					
SiO2 %	44.59	44.54	(a)	44.3	(c)	44.3	(b)		
TiO2	0.4	0.38	(a)	0.01	(c)	0.01	(b)		
Al2O3	25.7	25.56	(a)	34.87	(c)	34.86	(b)		
FeO	6.34	6.48	(a)	0.31	(c)	0.31	(b)		
MnO	0.07	0.08	(a)	0.01	(c)	0.008	(b)		
MgO	7.8	7.9	(a)	0.25	(c)	0.25	(b)		
CaO	14.42	14.39	(a)	19.07	(c)	19.1	(b)		
Na2O	0.42	0.4	(a)	0.3	(c)	0.3	(b)		
K2O	0.11	0.07	(a)	0.01	(c)	0.007	(b)		
P2O5						0.01	(b)		
S %									
sum									
Sc ppm	6.46	6.9	(b)			0.39	(b)		
V									
Cr	923	1013	(b)						
Co	67	73	(b)			0.58	(b)		
Ni	1103	1416	(b)			1.4	(b)	<1.22	(d)
Cu						2.1	(b)		
Zn						93	(b)	53	(d)
Ga						3.25	(b)		
Ge ppb								4.59	(d)
As						2	(b)		
Se								6.78	(d)
Rb						0.17	(b)	0.087	(d)
Sr						167	(b)		
Y						0.3	(b)		
Zr						15	(b)		
Nb						0.2	(b)		
Mo									
Ru									
Rh									
Pd ppb								<0.49	(d)
Ag ppb								0.89	(d)
Cd ppb								279	(d)
In ppb								21.6	(d)
Sn ppb									
Sb ppb								0.3	(d)
Te ppb								0.93	(d)
Cs ppm						0.015	(b)	0.0089	(d)
Ba	***441***	151	(b)			4.8	(b)		
La	12.6	11.8	(b)			0.12	(b)		
Ce	28.5	33.6	(b)					0.251	(d)
Pr									
Nd								0.22	(d)
Sm	5.32	5.6	(b)			0.04	(b)		
Eu	1.14	1.05	(b)			0.74	(b)	0.748	(d)
Gd									
Tb	1.15	1.21	(b)					0.0057	(d)
Dy						0.056	(b)		
Ho									
Er									
Tm									
Yb	3.85	3.65	(b)			0.026	(b)	0.0137	(d)
Lu	0.53	0.52	(b)			0.004	(b)	0.0019	(d)
Hf	3.74	3.82	(b)			0.49	(b)		
Ta		0.51	(b)						
W ppb						0.019	(b)		
Re ppb								0.0019	(d)
Os ppb								<0.07	(d)
Ir ppb								0.011	(d)
Pt ppb									
Au ppb						1	(b)	<0.0025	(d)
Th ppm	2.54	2.85	(b)						
U ppm	0.81	0.5	(b)			<0.0006	(b)	0.00094	(d)

technique: (a) emp, (b) INAA, (c) tabulation, (d) RNAA

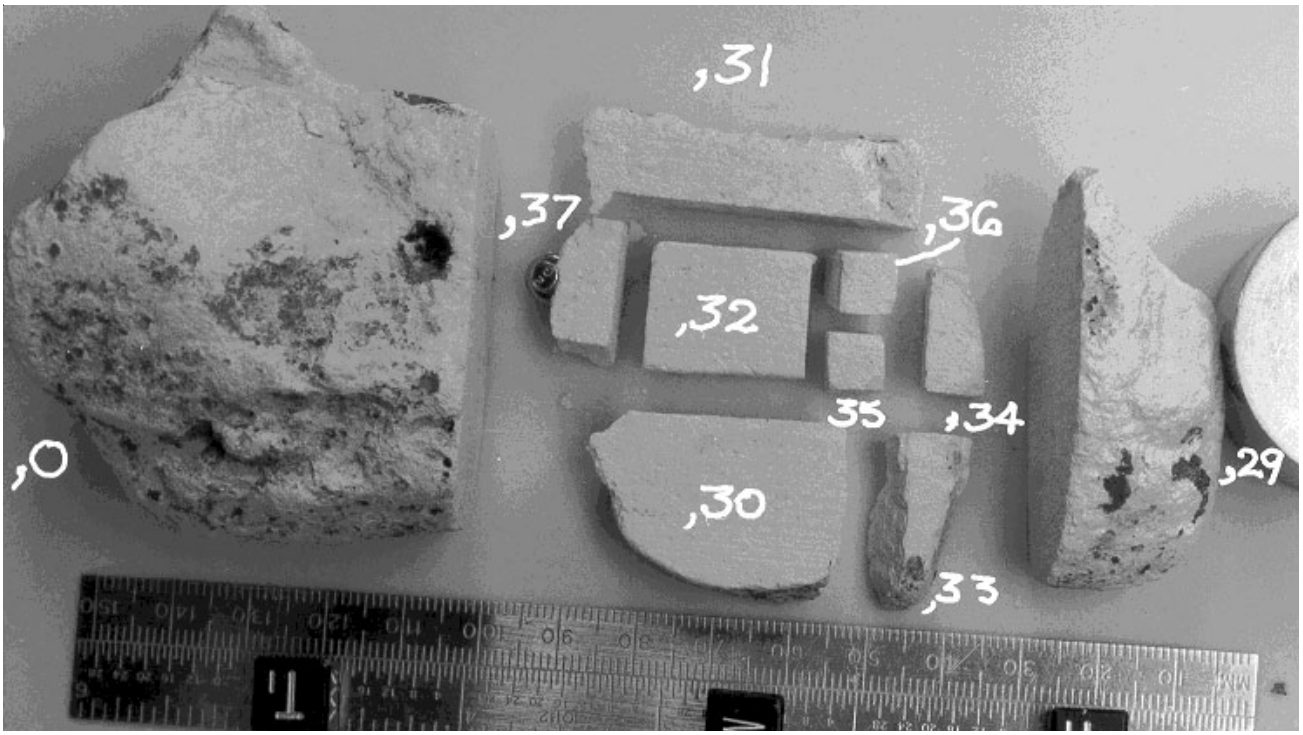

Figure 9: Group photo of 65315 after saw cut. Cube is 1 cm. NASA S73-28310.

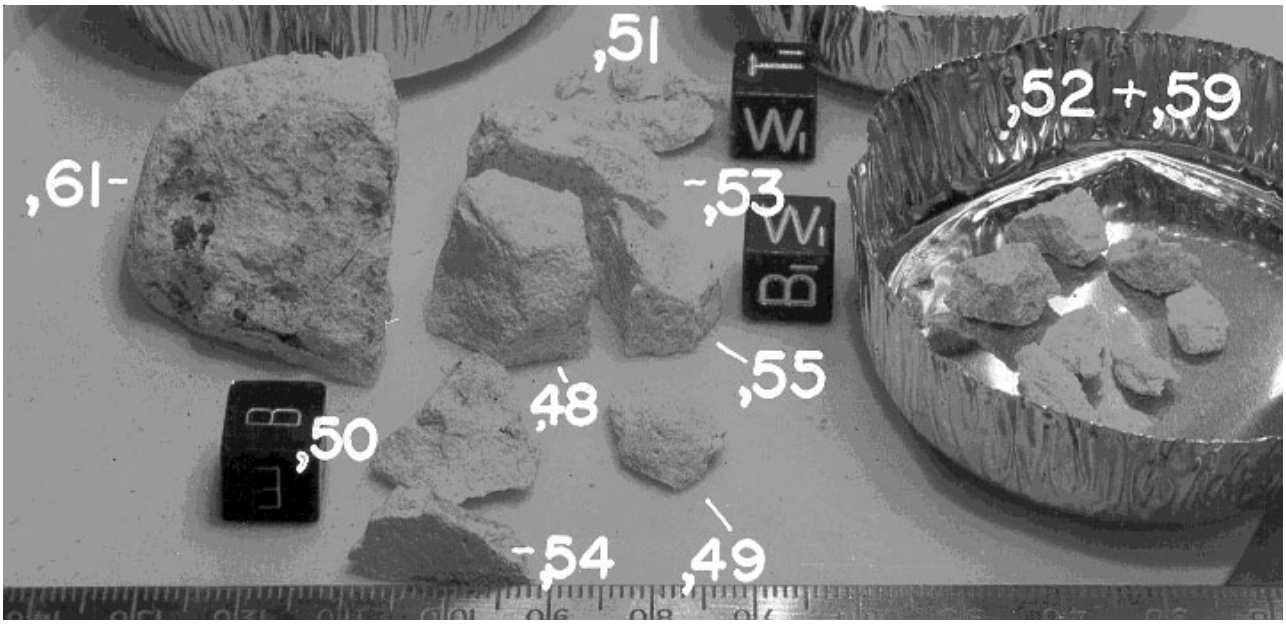

Figure 10: Splitting of 65315,29. Cubes are 1 cm. NASA S73-28409.

Figure 11: Sawn surface of 65315,46. Scale 3 cm across. NASA S73-28409.