

69955
Cataclastic Anorthosite
75.9 grams

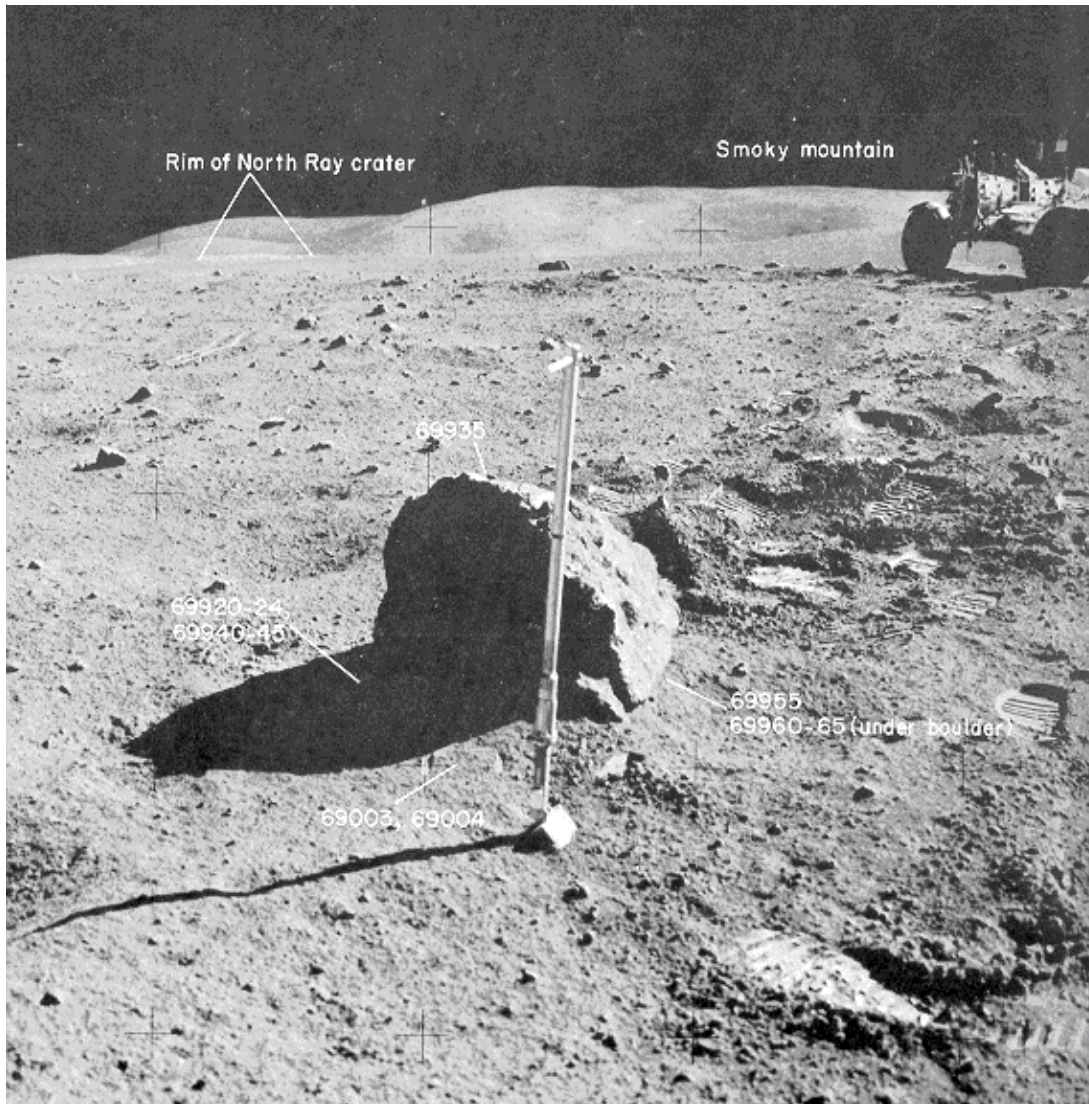


Figure 1: Boulder at station 9, Apollo 16 showing position of samples 69935 (breccia, top) and 69955 (anorthosite, bottom). This boulder is thought to be from South Ray Crater (Sutton 1981), because it is perched, without a fillet, on the regolith. Boulder is about 0.5 meter in size.

Introduction

Lunar sample 69955 was chipped from the bottom of a 0.5 meter-sized boulder found perched on the lunar regolith (Sutton 1981). Hence, 69955 was a clast in a breccia (represented by 69935). This boulder (figure 1) may have been derived from South Ray Crater (Sutton 1981) or secondary craters from the SRC event (Drozd et al. 1974) at about ~ 2 m.y. See transcript in section on 69935.

Petrography

Petrographic descriptions of 69955 are found in the catalogs by Butler (1972) and Ryder and Norman (1980). The sample is almost entirely made of plagioclase (figures 2 and 3). It was noted that the plagioclase had a greasy luster in hand specimen.



Figure 2: Photo of 69955. NASA S72-40124. Scale at top is in cm.

McGee (1993) described a portion as: “a rock that is relatively coarse-grained, shocked cataclastic anorthosite. Most of the plagioclase has been converted to maskelynite. Less shocked (still birefringent) patches of plagioclase within the maskelynite are as much as 3 mm across. Pyroxene grains are 0.1-0.08 mm across and have no visible exsolution lamellae. Some relict intergranular texture is preserved in lithic clasts. Plagioclase compositions have a relatively large range. Low-Ca pyroxene compositions are heterogeneous and have a trimodal distribution. High-Ca pyroxene compositions have a fairly narrow range. Rare olivine ($Fe_{0.1}$) with included chromite, is present.”

Photos show a thin (2 mm) flat black glass vein running the length of the sample.

Mineralogy

Olivine: not analyzed

Pyroxene: McGee (1993) analyzed pyroxene in 69955 (figure 5). Note the very low Ca orthopyroxene.

Plagioclase: Ryder and Norman (1980) reported that some plagioclase was ~ 5 mm across and some maskelynite is present. Meyer (1979) and McGee (1993) reported trace element analyses of plagioclase (figure 6).

Ilmenite: not reported

Metal: Misra and Taylor (1975) reported Ni and Co contents of metallic iron in 69955, but they show meteoritic values and may be from the glass vein. Hunter and Taylor (1981) reported trace rust and schreibersite.

Chemistry

Krahenbuhl et al. (1973) showed that 69955 was generally poor in meteoritic siderophiles as well as other trace elements. Analyses by Rose et al. (1973) and Laul and Schmitt (1973) show the rock is almost entirely plagioclase (figure 4).

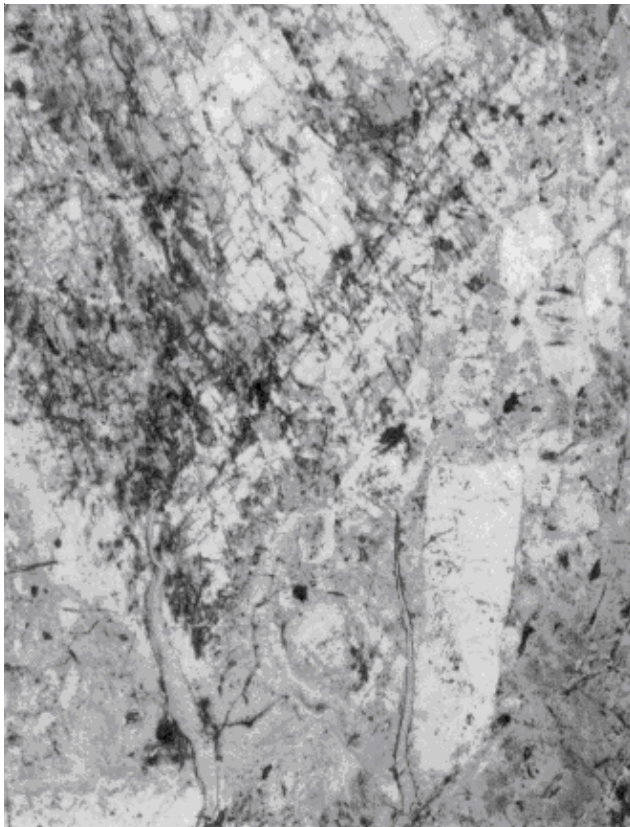


Figure 3: Photomicrograph of thin section 69955,27 (partially crossed polarized light). From Ryder and Norman (1980). Width of field is 2 mm.

Cosmogenic isotopes and exposure ages

Drozd et al. (1974) reported cosmic ray exposure ages $^{81}\text{Kr} = 4.23 \pm 0.21$ and $^{21}\text{Ne} = 2.13 \pm 0.51$ m.y. Fruchter et al. (1978, 1981) reported the cosmic-ray-induced activity of $^{26}\text{Al} = 70$ dpm/kg. and $^{53}\text{Mn} = 148$ dpm/kg., finding that the radiation history is not consistent with origin of the boulder from South Ray Crater.

Processing

There are 5 thin sections of 69955. Figure 7 shows how it was broken, not sawn.

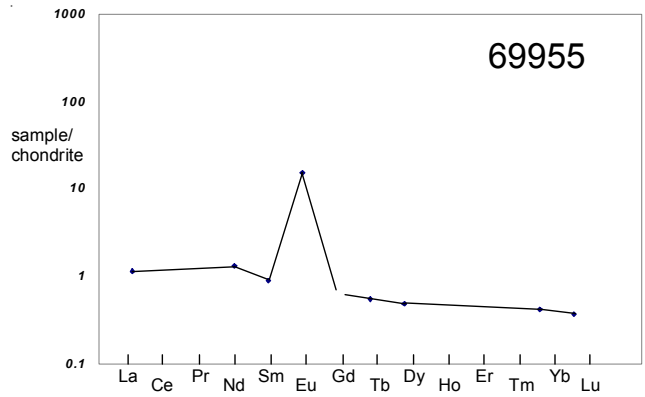


Figure 4: Normalized rare-earth-element diagram for 69955 (data by Laul and Schmitt 1973).

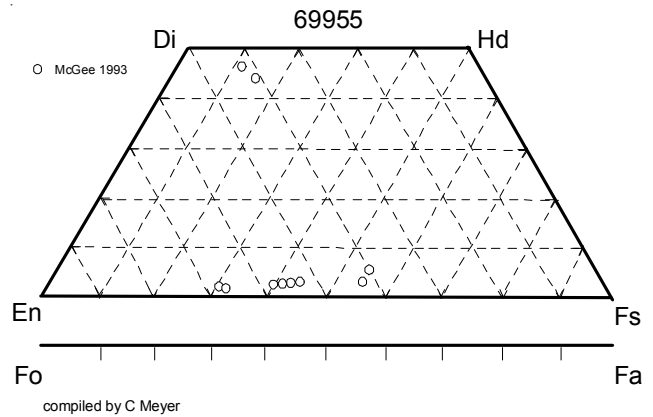


Figure 5: Composition of pyroxene in 69955 (McGee 1993).

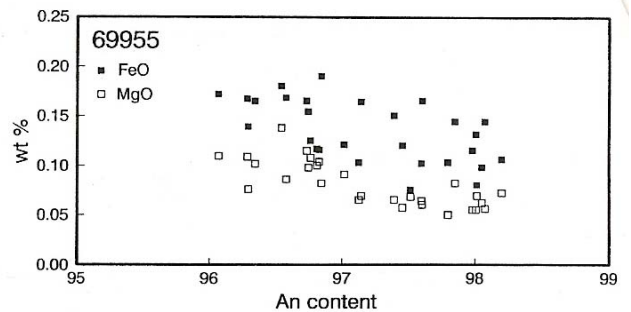


Figure 6: Trace element sin plagioclase (McGee 1993).

Table 1. Chemical composition of 69955.

reference weight	Rancitelli 73 75.8 g	Rose 73	Laul 73 516 mg	Krahenbuhl73	
SiO ₂ %		44.1	(b)		
TiO ₂		0.01	(b)	0.04	(c)
Al ₂ O ₃		35.15	(b)	35.5	(c)
FeO		0.36	(b)	0.49	(c)
MnO		0.01	(b)	0.011	(c)
MgO		0.23	(b)		
CaO		19.3	(b)	18.9	(c)
Na ₂ O		0.42	(b)	0.4	(c)
K ₂ O	<0.0108	(a) 0.02	(b)	0.01	(c)
P ₂ O ₅		0.01	(b)		
S %					
sum					
Sc ppm			0.84	(c)	
V			7	(c)	
Cr		350	(b) 48	(c)	
Co			0.8	(c)	
Ni		43	(b)		9.8 (d)
Cu		1.1	(b)		
Zn					0.37 (d)
Ga		1.2	(b)		
Ge ppb					22 (d)
As					
Se					9.8 (d)
Rb		0.7	(b)		0.15 (d)
Sr		135	(b)		
Y					
Zr					
Nb					
Mo					
Ru					
Rh					
Pd ppb					
Ag ppb					0.58 (d)
Cd ppb					37 (d)
In ppb					
Sn ppb					
Sb ppb					0.21 (d)
Te ppb					1 (d)
Cs ppm					0.011 (d)
Ba		11		10	(c)
La				0.27	(c)
Ce					
Pr					
Nd				0.6	(c)
Sm				0.13	(c)
Eu				0.87	(c)
Gd					
Tb				0.02	(c)
Dy				0.12	(c)
Ho					
Er					
Tm					
Yb				0.068	(c)
Lu				0.009	(c)
Hf				0.024	(c)
Ta				0.01	(c)
W ppb					
Re ppb					0.0278 (d)
Os ppb					
Ir ppb					0.289 (d)
Pt ppb					
Au ppb					0.307 (d)
Th ppm	0.14	(a)			
U ppm	0.038	(a)		0.03	(c) 0.026 (d)

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

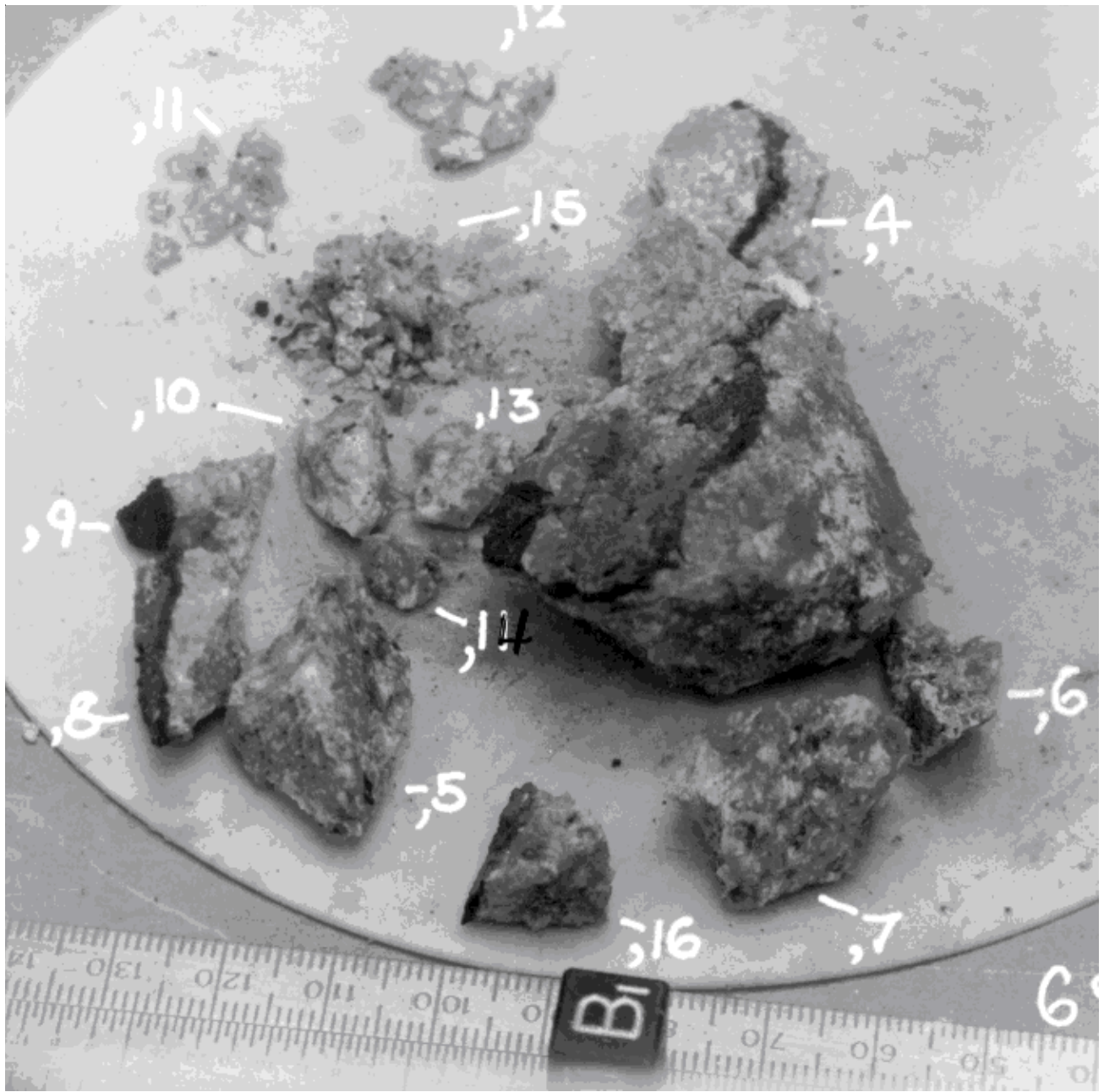
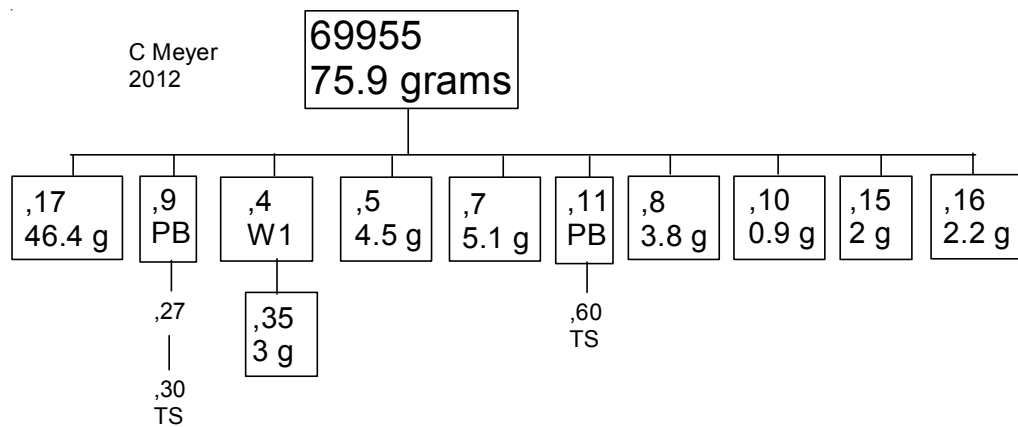


Figure 7: Processing 69955. NASA S73-22189. Cube is 1 cm.



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