

**64475 and 64476**  
Dilithologic Breccia  
1032 and 125 grams

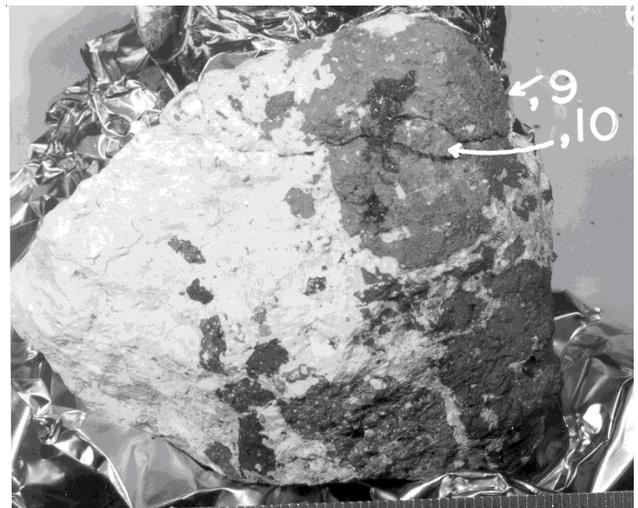


*Figure 1: Photo of 64475 (N1). NASA S72-43081. Sample is 9 cm across. This surface is unpitted.*

**Introduction**

These two samples were collected at station 4, Apollo 16, and returned together in doc bag 398. Station 4 was at a boulder field on Stone Mountain (figures 3, 4 and 5). The samples may be from South Ray Crater (where “dilithic” samples seem to come from). Their orientation is known from surface photography and the top side of 64475 has numerous micrometeorite craters. They are both “black and white” rocks with veins of dark impact melt rock intruding white cataclastic anorthosite (figures 1, 2 and 11).

These samples don’t seem to have been properly studied.



*Figure 2: Photo of 64476. Sample is 6 cm across. NASA S93-40241.*

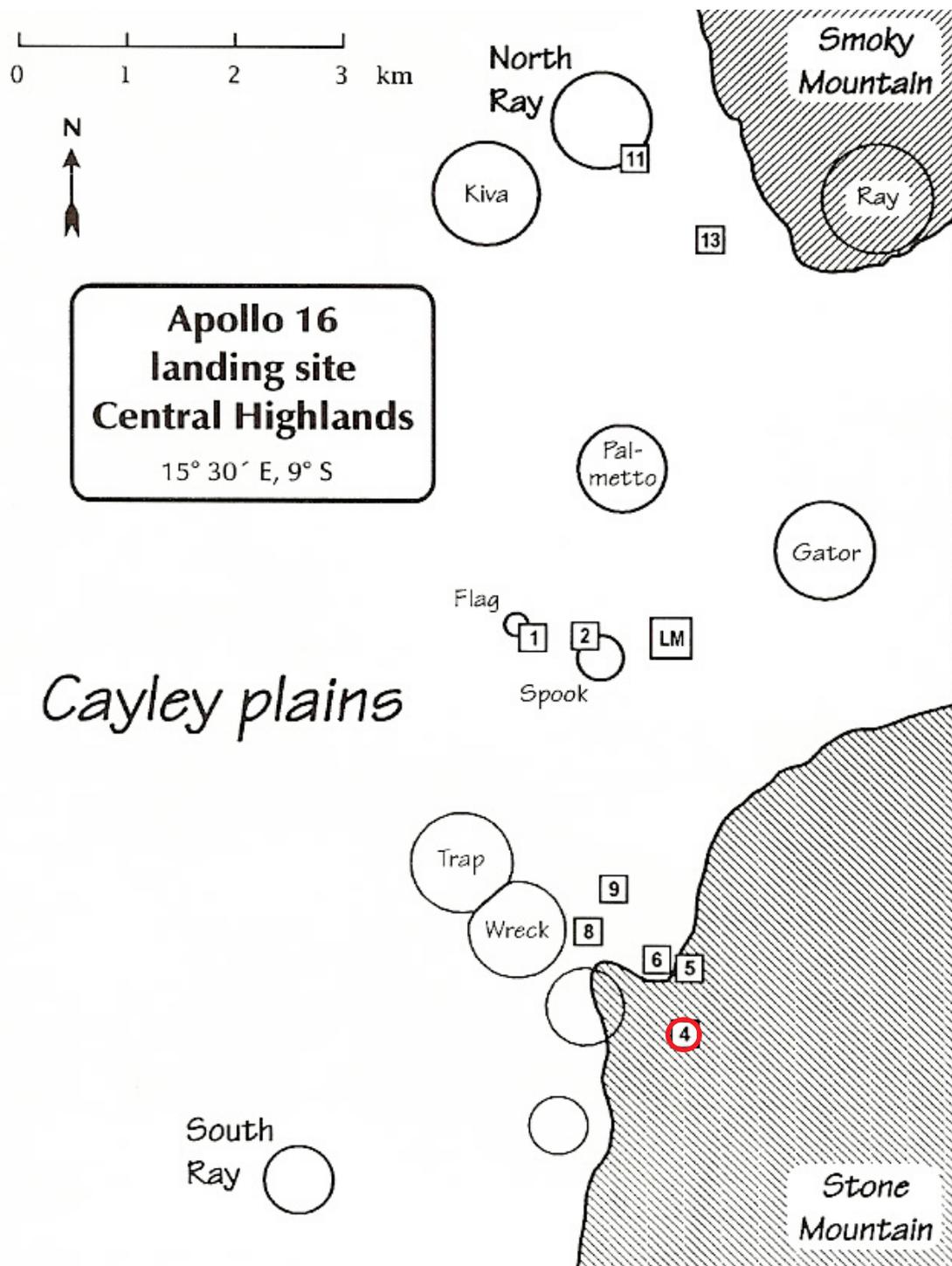


Figure 3: Map of Apollo 16 traverses (from Korotev).

### **Petrography**

Ryder and Norman (1980) provide descriptions of 64475 and 64476. Some of the anorthositic clasts in 64475 were studied by McKinley et al. (1983). Anorthositic clasts with coarse-grained cumulus texture and with granulitic texture are described by McKinley

et al. (figure 7), but analyses are not given. See thin section photomicrographs in McKinley et al.

Hunter and Taylor (1981) reported “rust” and schreibersite in both 64475 and 64476.

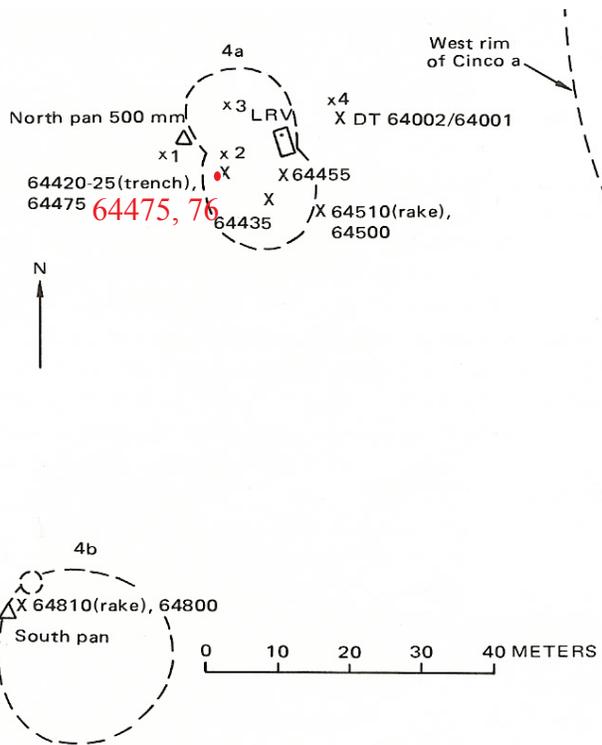


Figure 4: Map of station 4, Apollo 16.

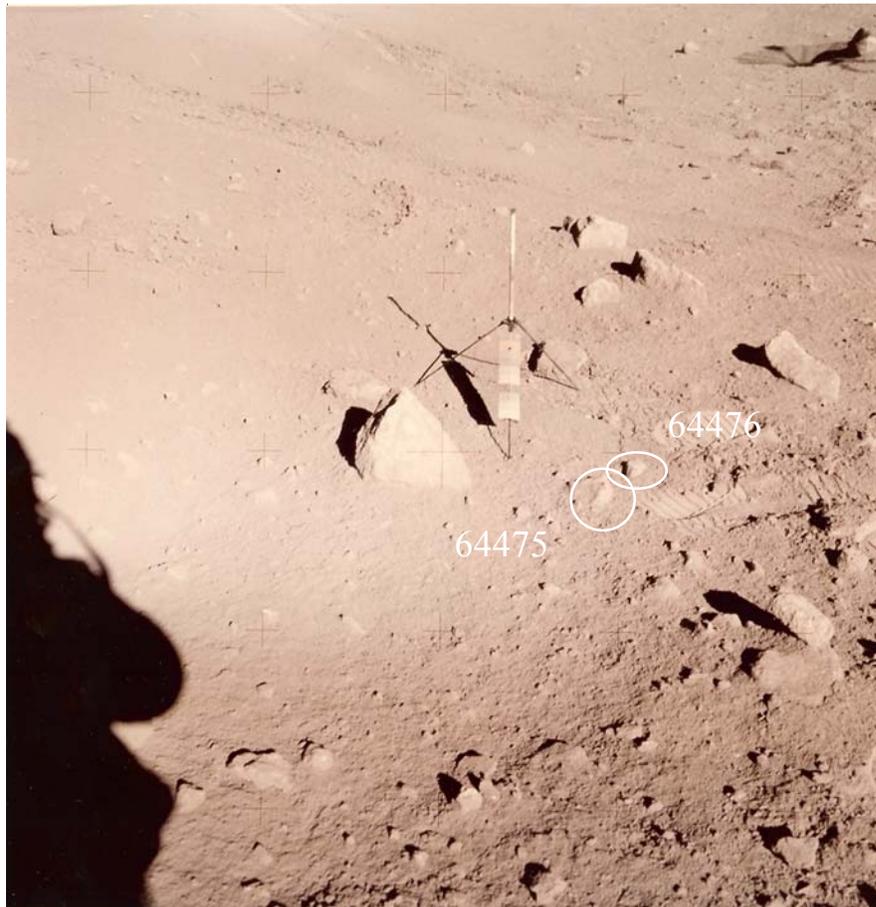


Figure 5: Location of 64475 and 64476 at station 4, Apollo 16. AS16-107-17454

Wilshire and Moore (1974) suggest that the dark phase was originally the matrix of the rock, but that at a later time portions of the white cataclastic anorthosite were mobilized giving the appearance that the white material is invading the dark (figure 6).

### Chemistry

Scoon (1974) analyzed a chip containing both lithologies and McKinley et al. (1983) provided trace element analysis of the melt rock litholog (table 1). 64475 has very high Ni, Ir and Au content. Clark and Keith (1973) determined bulk U, Th and K in 64476 (whole sample). Moore and Lewis (1976) reported 55 ppm carbon and 92 ppm nitrogen.

The analyses of the 'melt rock' lithology is fairly common among various Apollo 16 dilithologic breccias (McKinley et al. 1983; James et al. 1984).

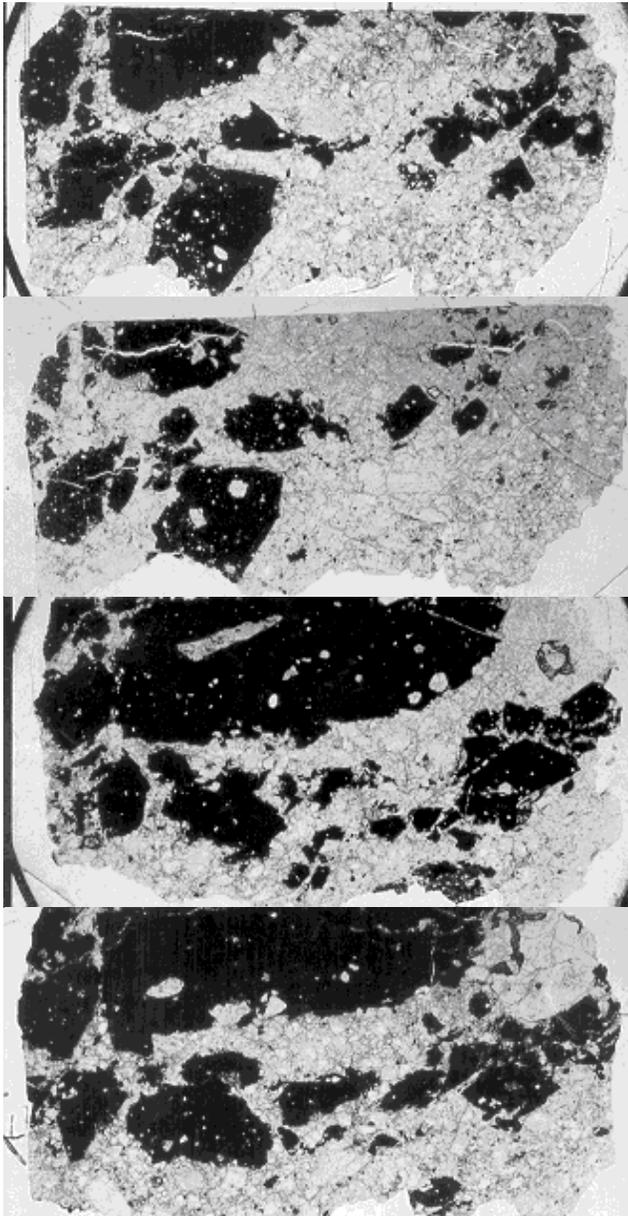


Figure 6: Photomicrographs of 4 thin sections of 64475 (,64 ,65 ,60 and ,61). 2.5 cm across.

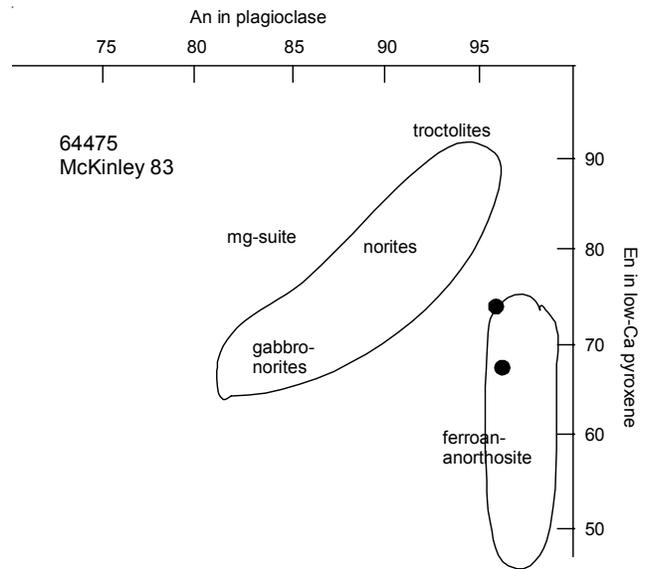


Figure 7: Composition of plagioclase and pyroxene in anorthositic portion of 64475 (McKinley et al. 1983).

### **Cosmogenic isotopes and exposure ages**

Clark and Keith (1973) determined the cosmic-ray-induced activity of 64476 as  $^{26}\text{Al} = 132 \text{ dpm/kg.}$ ,  $^{22}\text{Na} = 48 \text{ dpm/kg.}$  and  $^{46}\text{Sc} = 1.5 \text{ dpm/kg.}$  Bogard and Gibson (1975) reported a young cosmic ray exposure age of around 1 m.y., but within accuracy, the same as other samples from South Ray Crater.

### **Other Studies**

Stephenson et al. (1974) attempted to determine the remanent magnetization of chips of 64475.

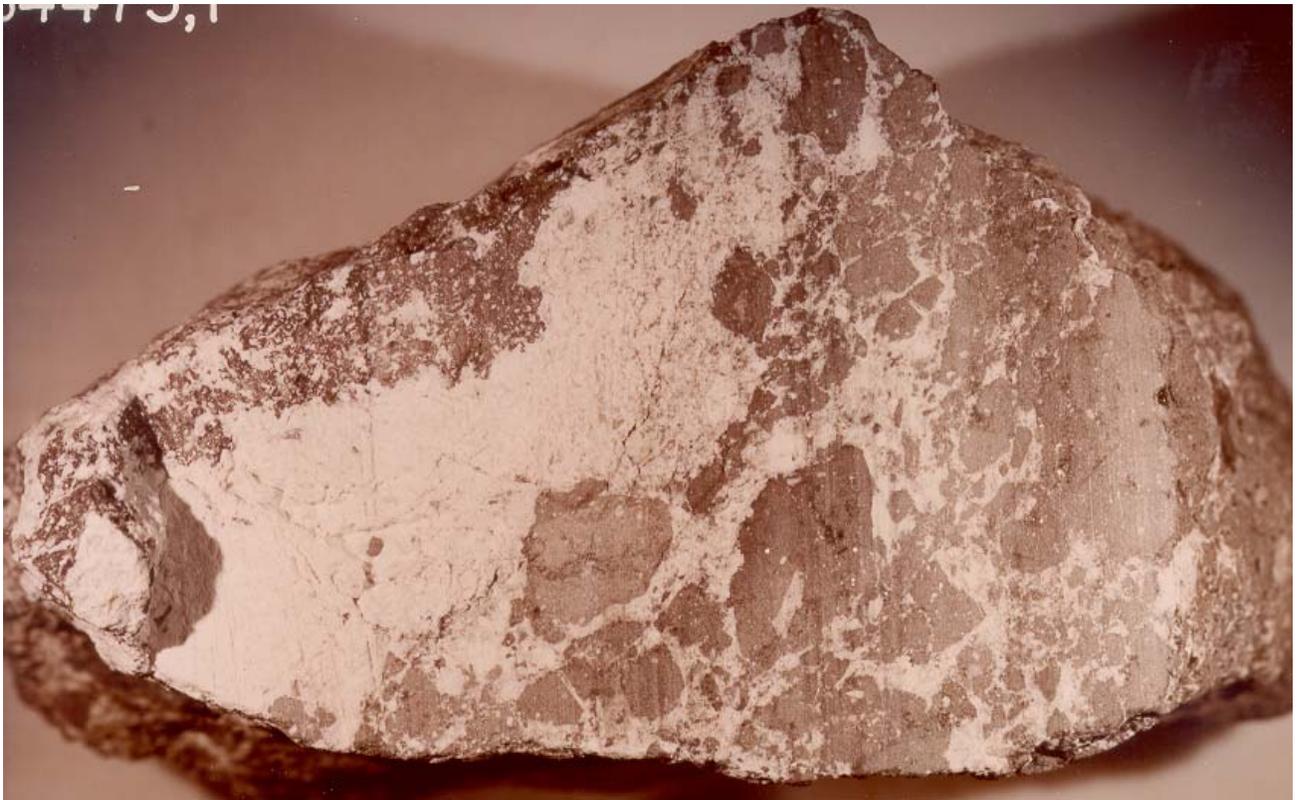
Bogard and Gibson (1975) reported the rare gas composition, noting that 64475 was loaded with solar wind gases.

### **Processing**

64475 thru 64478 were returned in the same bag, which included 27 grams of residue. A slab was cut from 64475 (figures 9 and 10) and a column was cut from the slab (figure 12). There are 13 thin sections of 64475 and 4 for 64476.



*Figure 8: Photo of 64475 (S1). NASA S72-43086. Note numerous micrometeorite pits this surface, including large one. Cube is 1 cm.*



*Figure 9: Photo of sawn surface of 64475,1. Sample is 10 cm. NASA S80-30589.*

**Table 1. Chemical composition of 64475.**

reference weight	64476			
	McKinley 84		Scoon 74	Clark73 125 g
SiO <sub>2</sub> %	47.1	(b)	44.81	(c)
TiO <sub>2</sub>	0.8 (a) 0.84	(b)	0.54	(c)
Al <sub>2</sub> O <sub>3</sub>	21.2 (a) 22.9	(b)	28.32	(c)
FeO	8 (a) 5.7	(b)	4.64	(c)
MnO	0.082 (a) 0.08	(b)	0.06	(c)
MgO	11.1 (a) 9.4	(b)	5.61	(c)
CaO	13.3 (a) 13	(b)	15.88	(c)
Na <sub>2</sub> O	0.515 (a) 0.6	(b)	0.49	(c)
K <sub>2</sub> O	0.16 (a) 0.2	(b)	0.12	(c) 0.08 (c)
P <sub>2</sub> O <sub>5</sub>		(b)	0.15	(c)
S %				
sum				
Sc ppm	10.6 (a)			
V	33 (a)			
Cr	1115 (a)			
Co	65 (a)			
Ni	1080 (a)			
Cu				
Zn				
Ga				
Ge ppb				
As				
Se				
Rb				
Sr				
Y				
Zr				
Nb				
Mo				
Ru				
Rh				
Pd ppb				
Ag ppb				
Cd ppb				
In ppb				
Sn ppb				
Sb ppb				
Te ppb				
Cs ppm				
Ba	290 (a)			
La	27.8 (a)			
Ce	69 (a)			
Pr				
Nd	40 (a)			
Sm	13.2 (a)			
Eu	1.58 (a)			
Gd				
Tb	2.43 (a)			
Dy	14.7 (a)			
Ho				
Er				
Tm				
Yb	8.37 (a)			
Lu	1.21 (a)			
Hf	8.6 (a)			
Ta	1.2 (a)			
W ppb				
Re ppb				
Os ppb				
Ir ppb	30 (a)			
Pt ppb				
Au ppb	30 (a)			
Th ppm	4.1 (a)		1.19	(c)
U ppm	1.2 (a)		0.31	(c)

technique: (a) INNA, (b) strange and uncertain, (c) wet chem., (d) radiation counting

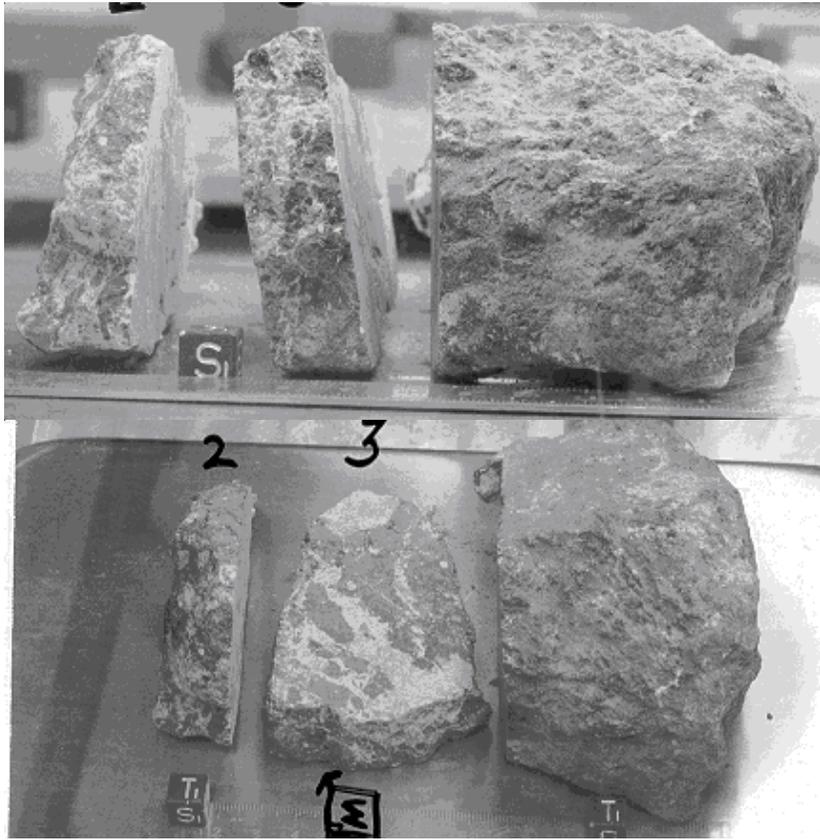


Figure 10: Photos from 'data pack' showing processing of 64475.

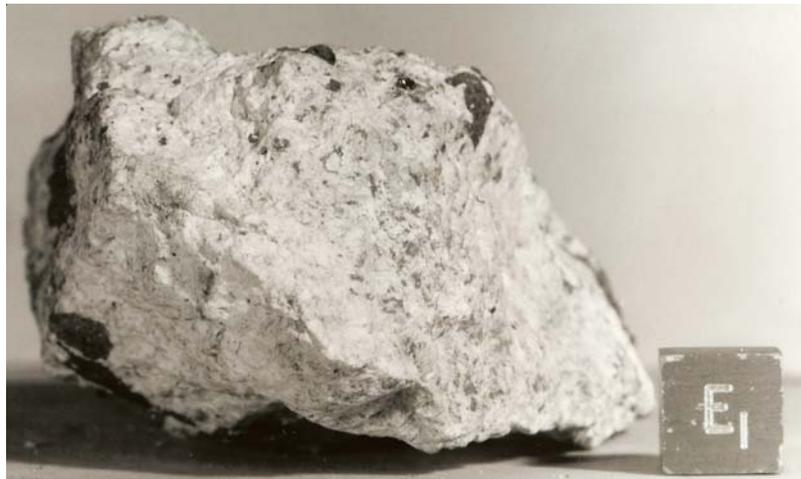


Figure 11: Photo of 64476. Cube is 1 cm. S72-43101

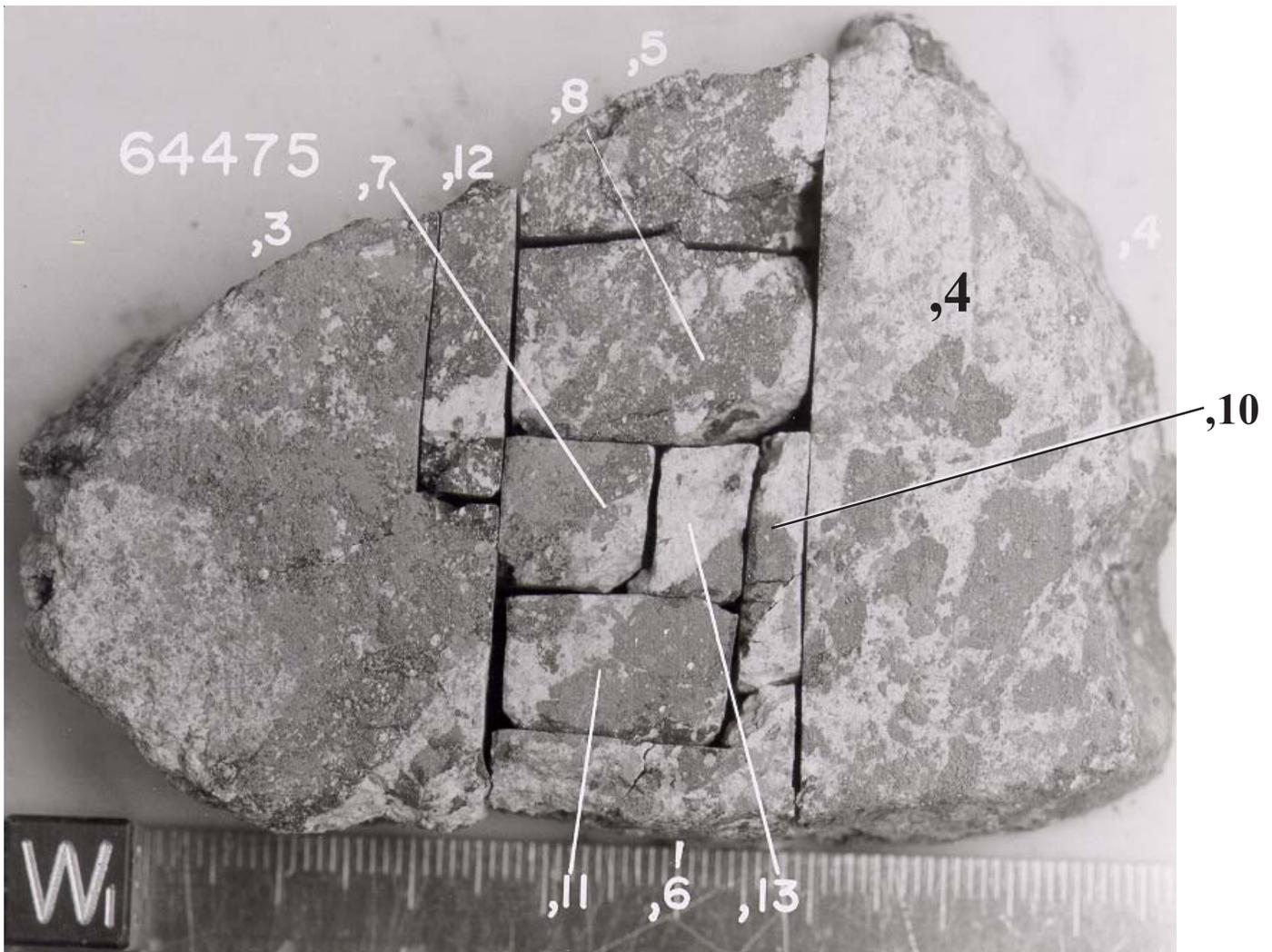
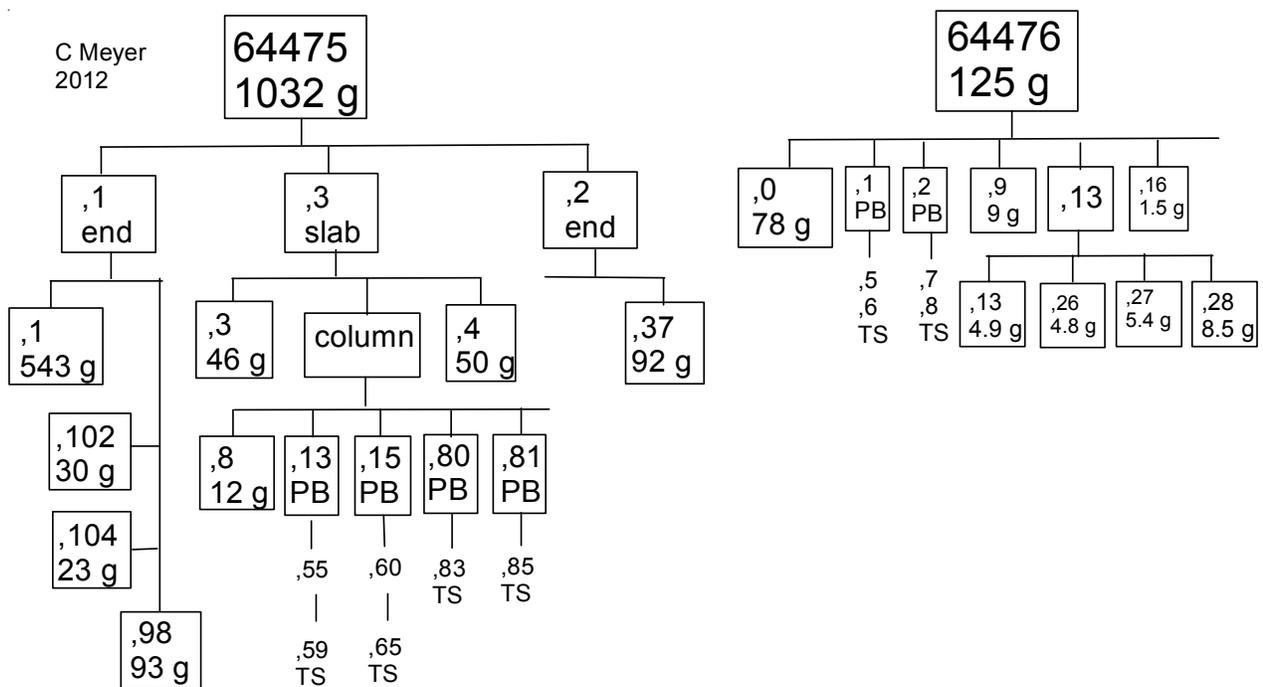


Figure 12: Photo of slab and column cut from 64475. NASA S73-28695. Cube is 1 cm.



## References 64475 and 64476

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