

INTRODUCTION: 67115 is a friable, light gray matrix breccia partially coated by dark glass (Fig. 1). Macroscopically the rock has a shattered appearance, being cut by many penetrating fractures and veined by dark glass.

This sample was collected within the southeast rim of North Ray Crater; lunar orientation is unknown. Many zap pits are present on the S surface of the rock, with few to none on other surfaces.

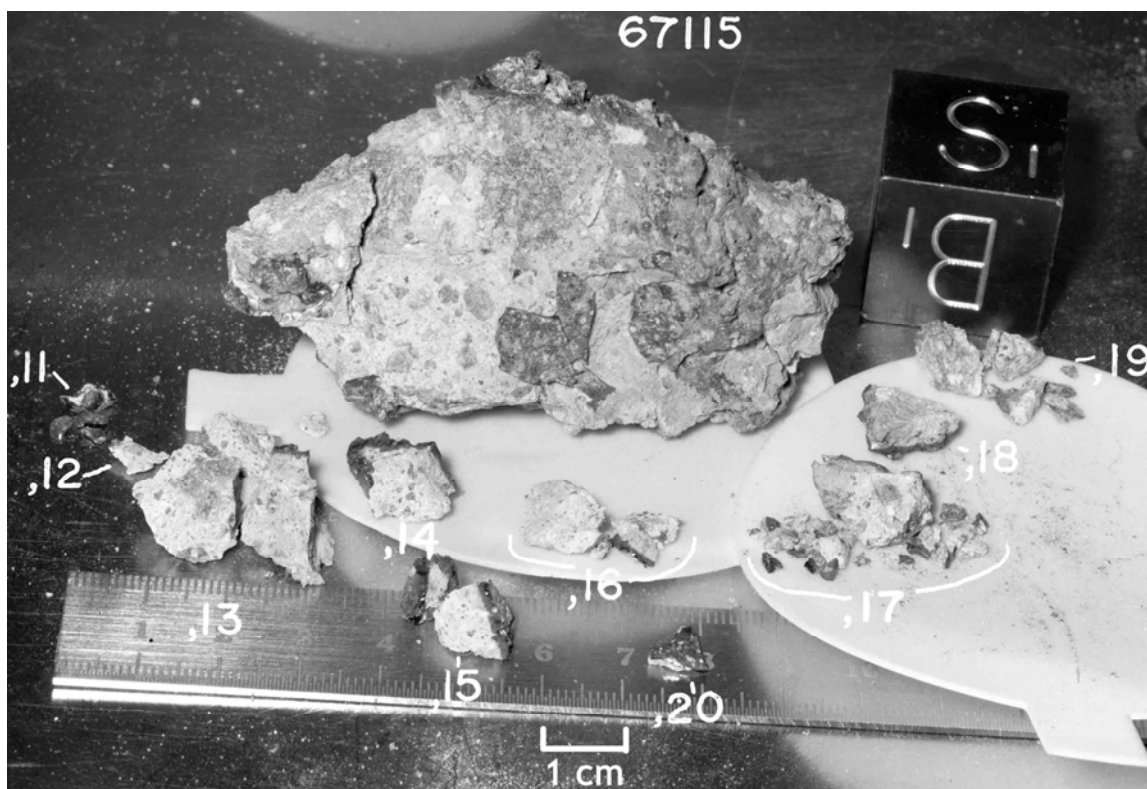


FIGURE 1. S-72-53517.

PETROLOGY: A restricted population of clast types characterizes this fragmental matrix breccia (Fig. 2). Mineral fragments of plagioclase are by far the most abundant constituent. Granoblastic anorthosites with variable percentages of mafic minerals, and clast-rich, dark melt matrix breccias are virtually the only lithic types in the rock (Fig. 2), though both are present in abundance. Fragments of olivine, pyroxene, spinel, metal and schreibersite are minor components.

Incipient recrystallization appears to have affected the finest portion of the matrix. Abundant tiny, rounded grains of olivine (?) fill interstices and occasionally rim larger, more angular grains (Fig. 2).

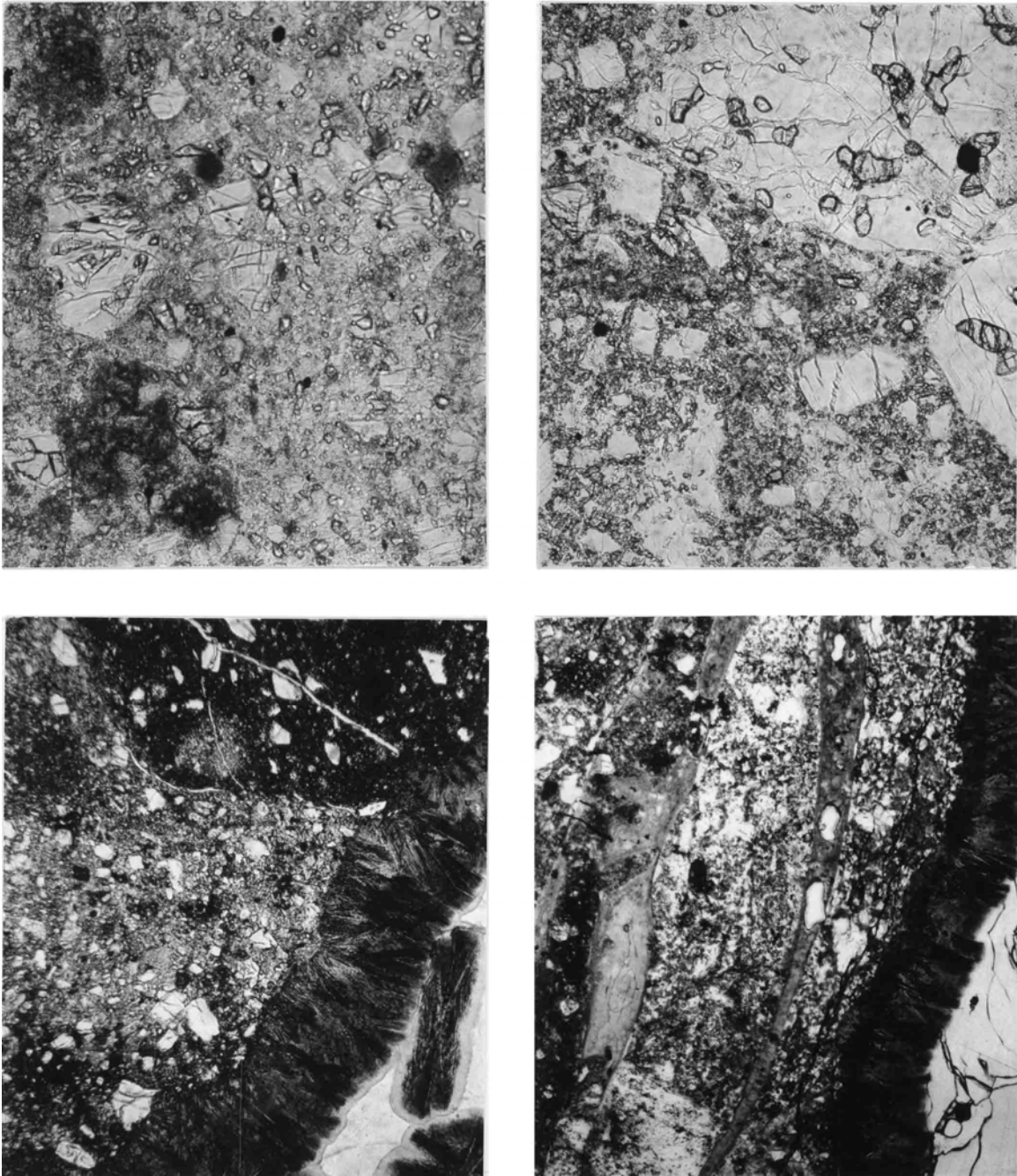


FIGURE 2.

- a) 67115,31. Matrix, ppl. Width 0.5 mm.
- b) 67115,30. Matrix and granoblastic clast, ppl. Width 1 mm.
- c) 67115,30. Matrix, dark clast, and glass coat, ppl. Width 2 mm.
- d) 67115,49. Glass veins near contact of breccia and glass coat, ppl. Width 2 mm.

The glass coat is irregularly distributed over the surface of the rock. Schaal et al. (1979) tabulate various physical parameters of the glass coat, such as vesicularity. A zone of fine-grained quench crystals occurs at the breccia/ glass contact (Fig. 2).

CHEMISTRY: Major and trace element abundances for the bulk rock are given by Rose et al. (1973). Major and trace element analyses of “black” and “white” portions of the rock reported by S.R. Taylor et al. (1973) bracket the bulk analysis of Rose et al. (1973). (The rock is erroneously referred to as 61175 in the text of S.R. Taylor et al. (1973), but is correctly labeled in all tables). Clark and Keith (1973) and Eldridge et al. (1975) provide natural and cosmogenic radionuclide data and Jovanovic and Reed (1976a,b) report halogens and other trace element data for the bulk rock. Major and trace element analyses of the glass coat and a plagioclase separate are given by S.R. Taylor et al. (1973). Meteoritic siderophile and volatile abundances for two “gray” clasts, a glass vein and the bulk matrix are given by Hertogen et al. (1977). Schaal (unpublished) determined major elements in the glass coat by electron microprobe.

67115 is compositionally similar to several other Apollo 16, Station 11 and 13 light matrix breccias in being very aluminous (~30% Al_2O_3) and low in lithophile and siderophile elements (Table 1, Fig. 3). All of the samples analyzed by Hertogen et al. (1977) are contaminated with meteoritic siderophiles but the low levels of these elements renders assignments to specific meteoritic groups somewhat tenuous. The “light gray clast” is nearly pristine (Table 1). Photographs of this split show a single, nearly white clast but no thin sections or other chemical data are available.

The glass samples are poorer in Al_2O_3 and richer in lithophiles and siderophiles than the bulk rock, and are close to the composition of North Ray soils.

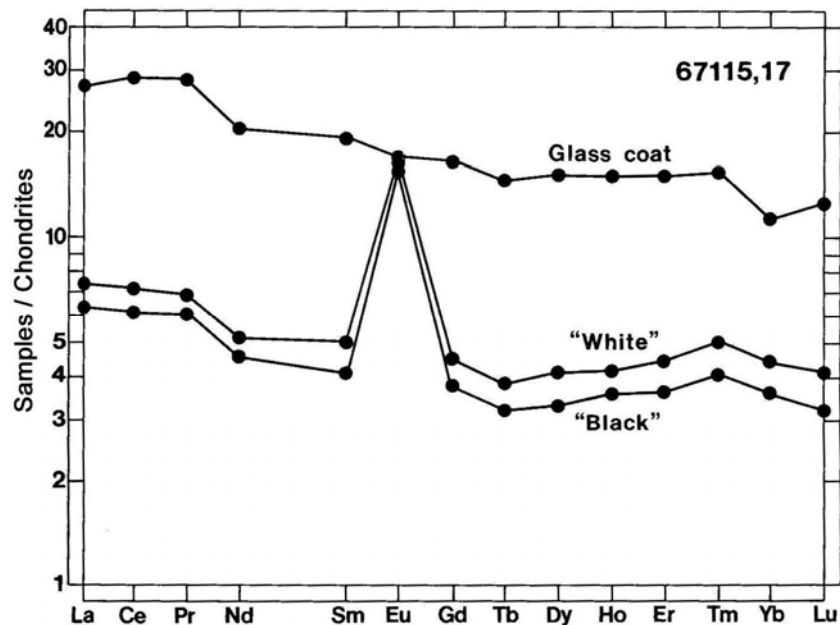


FIGURE 3. Rare earths, from S.R. Taylor et al. (1973).

TABLE 1. Summary chemistry of 67115 lithologies.

	<u>Bulk rock</u>	<u>Glass coat and vein</u>	<u>Light gray clast</u>	<u>Medium gray clast</u>
SiO ₂	44.6	44.5		
TiO ₂	0.2	0.65		
Al ₂ O ₃	31.0	27.9		
Cr ₂ O ₃	0.06	0.10		
FeO	2.5	4.8		
MnO	0.04			
MgO	3.1	4.9		
CaO	17.7	15.8		
Na ₂ O	0.5	0.45		
K ₂ O	0.08	0.12		
P ₂ O ₅	0.02	0.06		
Sr	180			
La	2.2	9.0		
Lu	0.12	0.43		
Rb	~1	1.5	0.36	0.45
Sc	2			
Ni	50	164	28	45
Co	5			
Ir ppb	1.59	7.17	0.44	2.69
Au ppb	0.16	3.27	0.39	0.5
C				
N				
S				
Zn	~4	2.54	4.85	4.13
Cu	2			

Oxides in wt%; others in ppm except as noted.

EXPOSURE AGES: Clark and Keith (1973) and Eldridge et al. (1975) provide cosmogenic radionuclide data as determined by gamma-ray spectroscopy. 67115 is apparently unsaturated in ²⁶Al activity.

MICROCRATERS: Morphological parameters of microcraters in the 0.2-100 μm diameter range are reported by Brownlee et al. (1973), from scanning electron microscopy (SEM) studies (Fig. 4).

PROCESSING AND SUBDIVISIONS: 67115 has never been sawn but was extensively subdivided by chipping in 1972. Allocations have been made from all areas of the rock. ,16 and ,17 (Fig. 1) were allocated for chemistry to Rose and S.R. Taylor, respectively. ,25 - ,28 (Fig. 5) were analyzed by Hertogen et al. (1977). The largest single piece remaining is ,9 (161.6g).

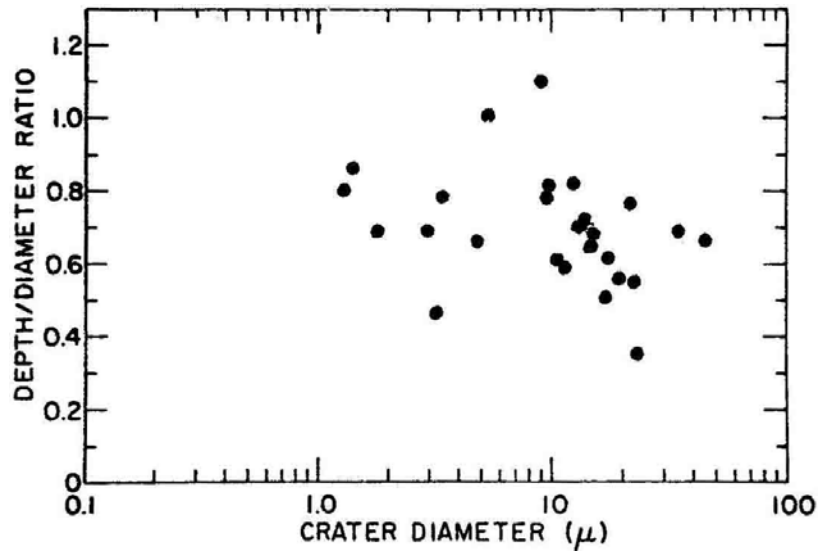


FIGURE 4. Microcraters, from Brownlee et al. (1973).

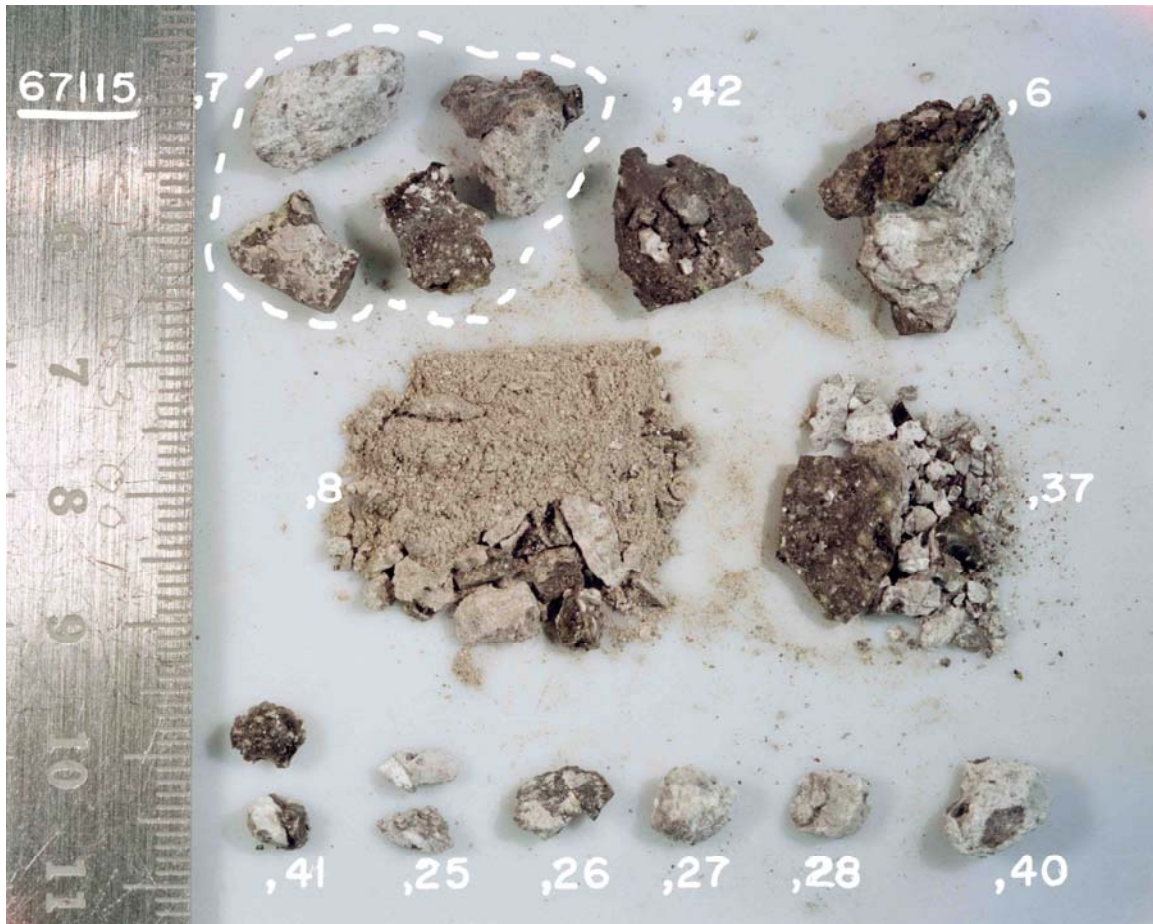


FIGURE 5. Smallest scale division in mm. S-74-33199.