

67728 – 9.3 grams  
 67946 – 3.2 grams  
 Glass Objects

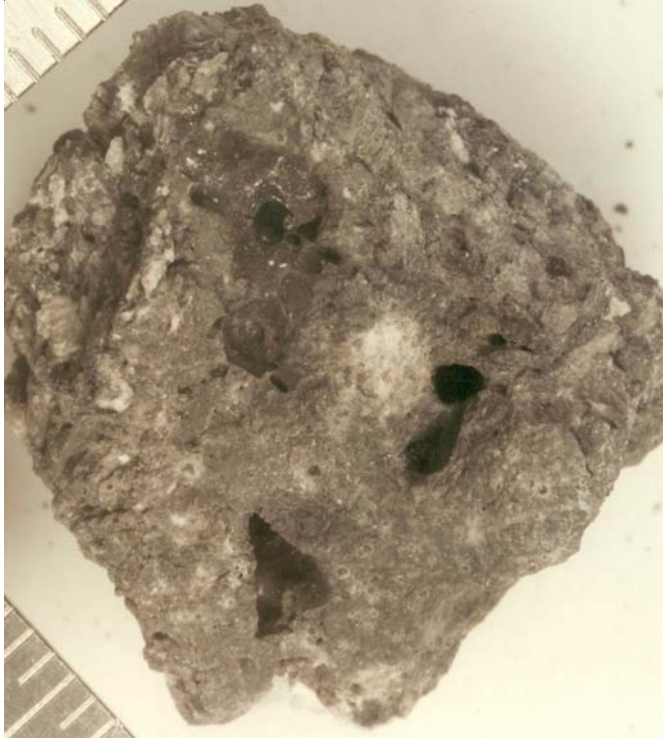


Figure 1: Photo of 67728. S72-49545 with zaps and mm scale.

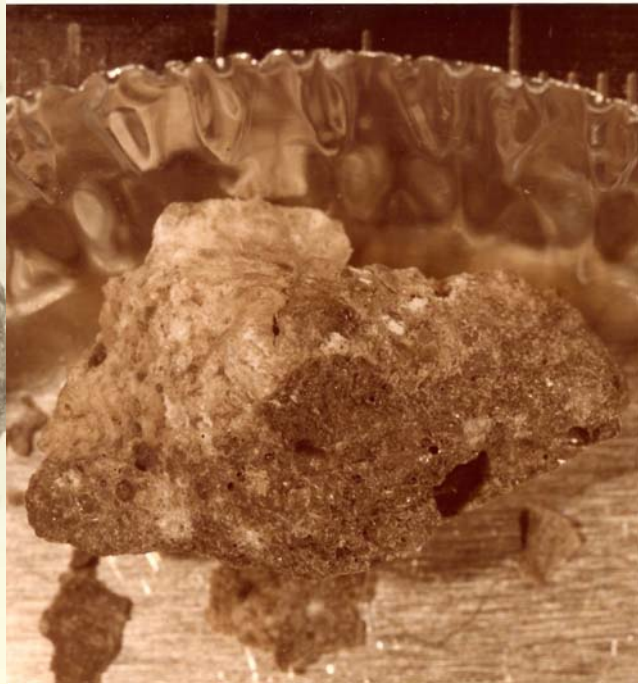


Figure 2: Photo of 67946 showing two distinct lithologies. Sample is 2 cm across. S80-40842.

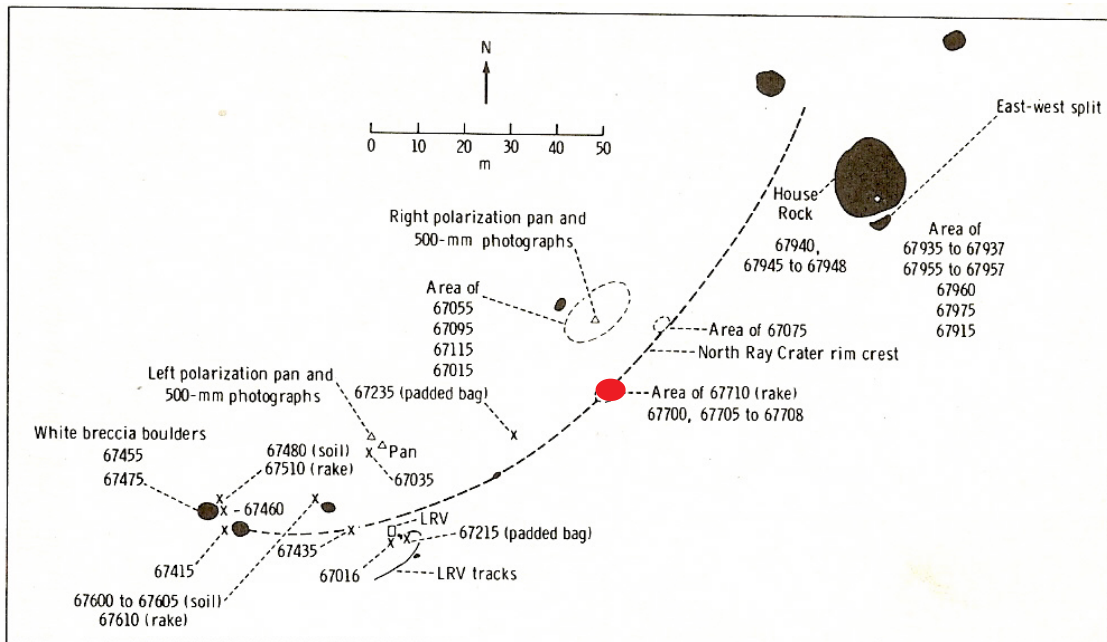


Figure 3: Map of North Ray Crater showing location of rake sample.



Figure 4: Well, it was a glass! This image is 2 mm across.

**Introduction**

67728 and 67946 are glass (?) particles that were collected as rake samples from the rim of North Ray Crater – see section on 67701. They have the approximate exposure age of North Ray Crater, but also have also have much older formation ages.

**Petrography**

Where are the glass objects associated with the North Ray Crater event? What would they look like (figure 4)? Vesicular – yes, devitrified – yes, full of lithic

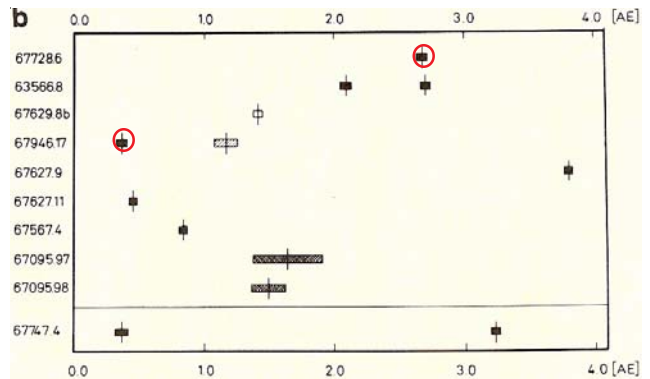


Figure 5: Ar ages of glass particles from Stoffler et al. 1985.

inclusions – yes, excess Ar – yes. See also sections on 67729 and glass objects from station 13.

**Chemistry**

Borchardt et al. (1986) and Stoffler et al. (1985) reported analyses of 67728 and 67946 (table).

**Radiogenic age dating**

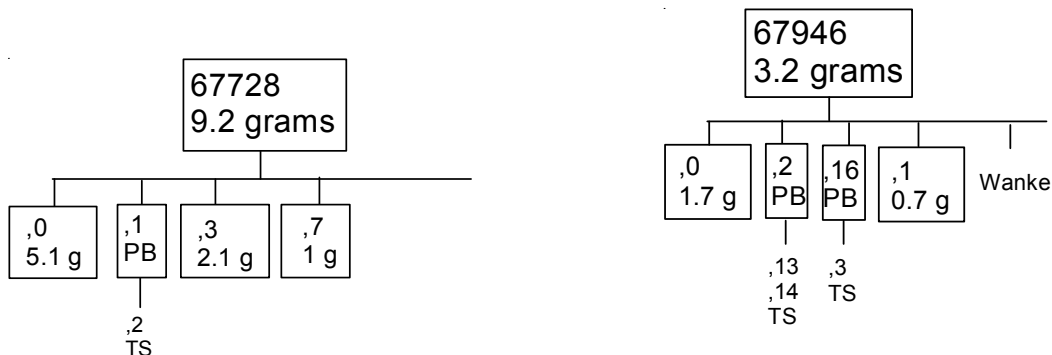
Borchardt et al. (1986) reported Ar/Ar plateau ages of  $2.68 \pm 0.04$  b.y. for 67728 and  $\sim 0.4$  b.y. for 67946 (figure 5).

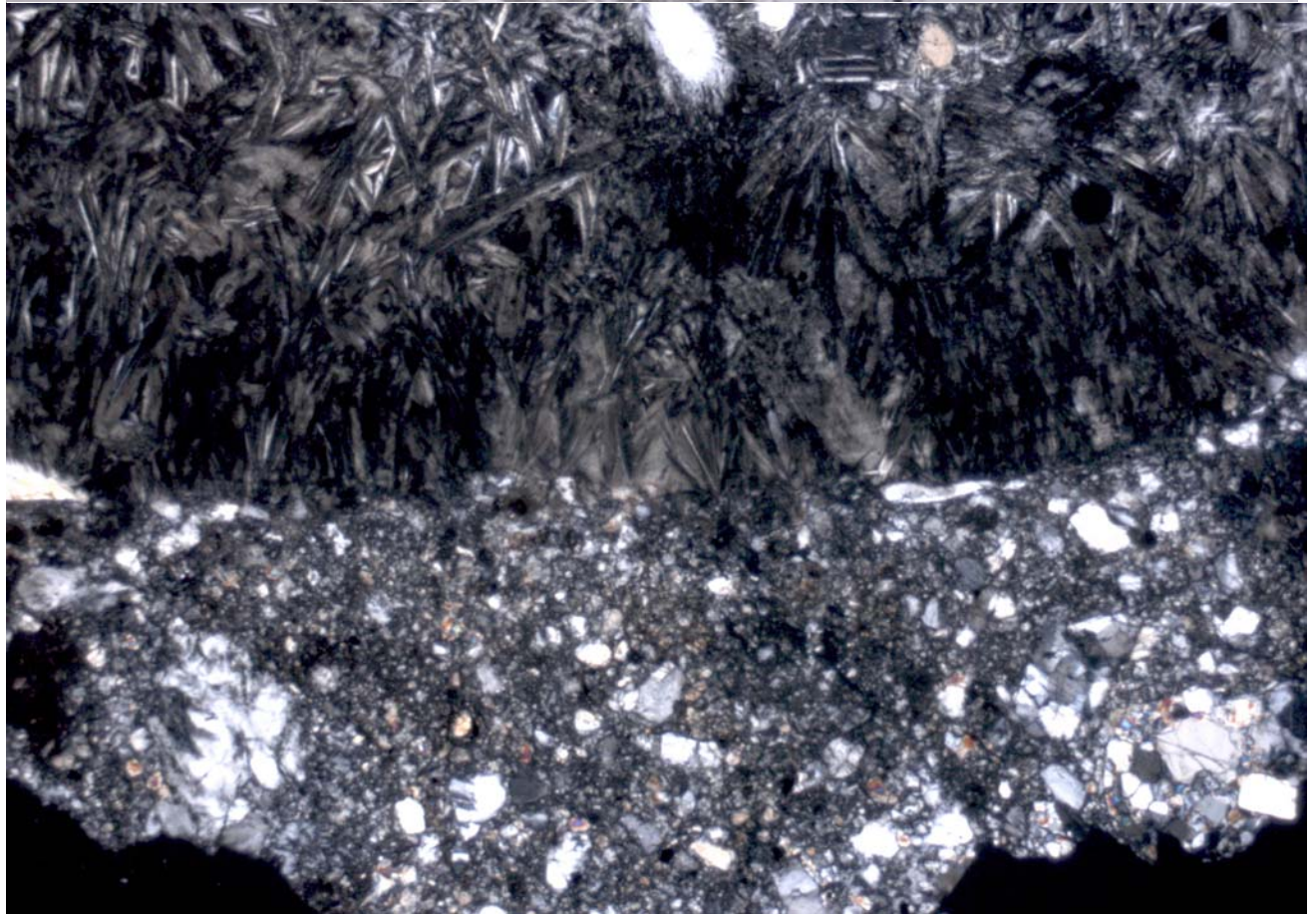
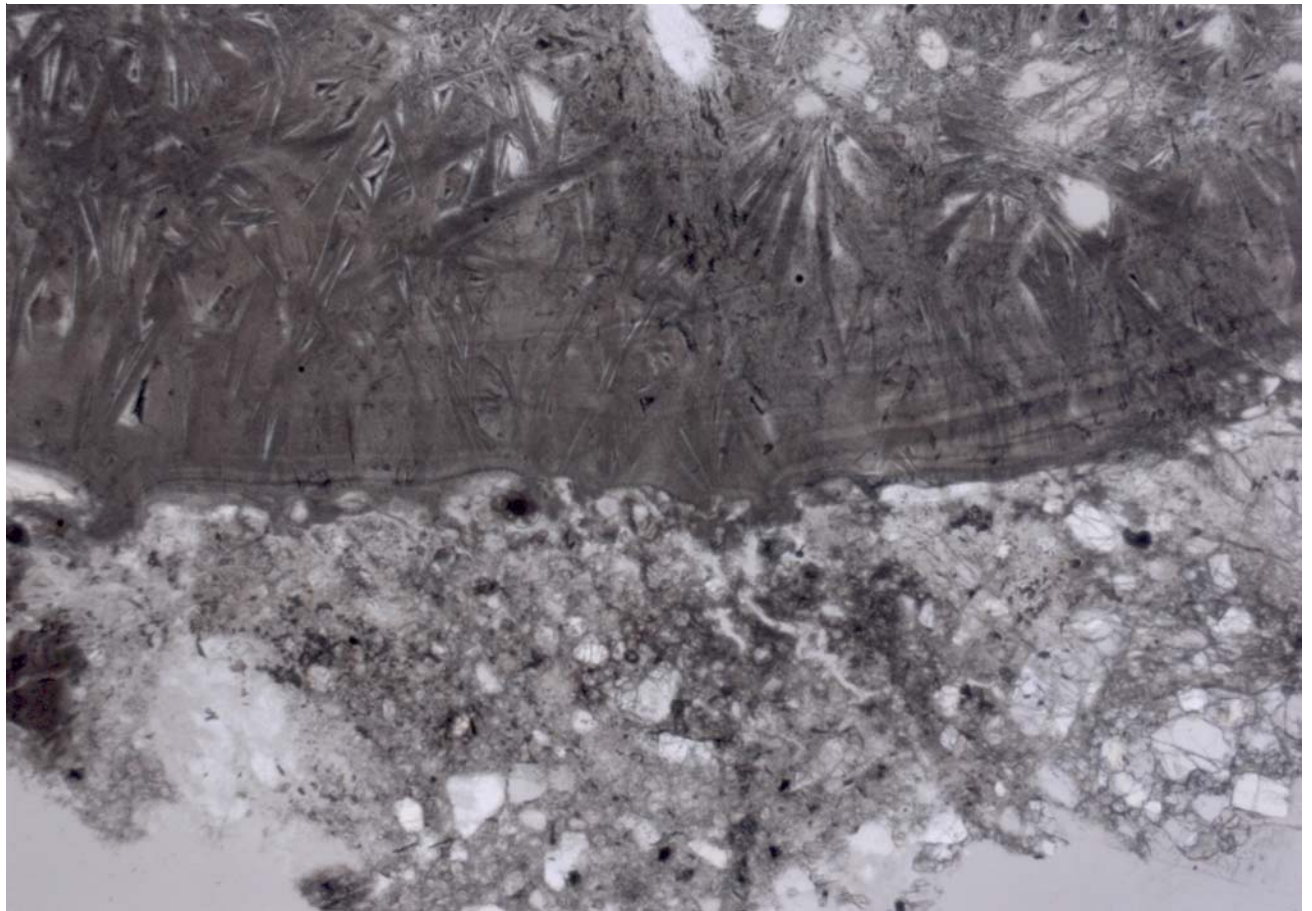
**Cosmogenic isotopes and exposure ages**

Borchardt et al. (1986) determined  $^{38}\text{Ar}$  exposure ages of 49 m.y. for 67728 and 40 m.y. for 67946.

**Processing**

There are thin sections of each.





**Table 1. Chemical composition of 67728.**

reference weight	Stoffler85		duplicate		
	Borchardt86				
SiO2 %	44	(a)	43.6	(a)	
TiO2	0.42	(a)	0.46	(a)	0.83 (b)
Al2O3	29.3	(a)	28.5	(a)	
FeO	3.8	(a)	3.82 (b)	4.2 (a)	3.7 (b)
MnO	0.03	(a)	0.01	(a)	
MgO	4.4	(a)	4.8	(a)	
CaO	17	(a)	17.1 (b)	16.7 (a)	16.4 (b)
Na2O	0.51	(a)	0.54 (b)	0.49 (a)	0.54 (b)
K2O	0.07	(a)	0.058 (b)	0.1 (a)	0.059 (b)
P2O5	0.1	(a)	0.17	(a)	
S %					
sum					
Sc ppm		6.66 (b)		6.47 (b)	
V					
Cr		426 (b)		410 (b)	
Co		14.8 (b)		13.7 (b)	
Ni		176 (b)			
Cu					
Zn		15 (b)			
Ga		4.2 (b)		4.2 (b)	
Ge ppb					
As					
Se					
Rb					
Sr		211 (b)		206 (b)	
Y					
Zr		60 (b)			
Nb					
Mo					
Ru					
Rh					
Pd ppb					
Ag ppb					
Cd ppb					
In ppb					
Sn ppb					
Sb ppb					
Te ppb					
Cs ppm					
Ba		70 (b)		68 (b)	
La		5.02 (b)		5 (b)	
Ce		13.6 (b)		9 (b)	
Pr					
Nd		8.31 (b)			
Sm		2.21 (b)		2.21 (b)	
Eu		1.21 (b)		1.2 (b)	
Gd		2.9 (b)			
Tb		0.5 (b)		0.46 (b)	
Dy		3.2 (b)		2.98 (b)	
Ho		0.64 (b)		0.65 (b)	
Er					
Tm		0.32 (b)			
Yb		1.76 (b)		1.8 (b)	
Lu		0.25 (b)		0.25 (b)	
Hf		1.8 (b)			
Ta		0.27 (b)			
W ppb					
Re ppb					
Os ppb					
Ir ppb		5.7 (b)			
Pt ppb					
Au ppb		3.6 (b)		4.6 (b)	
Th ppm		0.7 (b)			
U ppm		0.2 (b)			

technique: (a) broad beam e probe, (b) INAA

**Table 2. Chemical composition of 67946.**

reference weight	Borchardt86	Stoffler85	
SiO2 %		44	(b)
TiO2		0.39	(b)
Al2O3		30.1	(b)
FeO	3.3	(a)	3.4 (b)
MnO			
MgO		3.7	(b)
CaO	16.4	(a)	16.1 (b)
Na2O	0.55	(a)	0.59 (b)
K2O	0.06	(a)	0.06 (b)
P2O5		0.05	(b)
S %			
sum			
Sc ppm	5.8	(a)	
V			
Cr	404	(a)	
Co	9.1	(a)	
Ni	170	(a)	
Cu			
Zn	20	(a)	
Ga	4	(a)	
Ge ppb			
As			
Se			
Rb			
Sr	203	(a)	
Y			
Zr			
Nb			
Mo			
Ru			
Rh			
Pd ppb			
Ag ppb			
Cd ppb			
In ppb			
Sn ppb			
Sb ppb			
Te ppb			
Cs ppm			
Ba	71	(a)	
La	3.75	(a)	
Ce	10.5	(a)	
Pr			
Nd	6.4	(a)	
Sm	1.72	(a)	
Eu	1.2	(a)	
Gd			
Tb	0.43	(a)	
Dy	2.35	(a)	
Ho	0.51	(a)	
Er	1.45	(a)	
Tm			
Yb	1.4	(a)	
Lu	0.2	(a)	
Hf	1.39	(a)	
Ta	0.22	(a)	
W ppb			
Re ppb			
Os ppb			
Ir ppb			
Pt ppb			
Au ppb	4	(a)	
Th ppm	0.7	(a)	
U ppm	0.22	(a)	

technique: (a) INAA, (b) broad beam e probe

## References for 67728 and 67946

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