15684 GLASS CONTAINING MARE BASALT CLASTS ST. 9A 1.40 g

INTRODUCTION: 15684 is a fragment of glass which contains small clasts, the most prominent of which is a shocked pyroxene-phyric mare basalt (Fig. 1). The shock has converted the plagioclase to maskelynite. The glass composition more closely resembles quartz-normative mare basalt than it does any regolith. Zap pits are present in varied amounts around the sample; one side appears to have none. 15684 was collected as part of the rake sample from Station 9A.

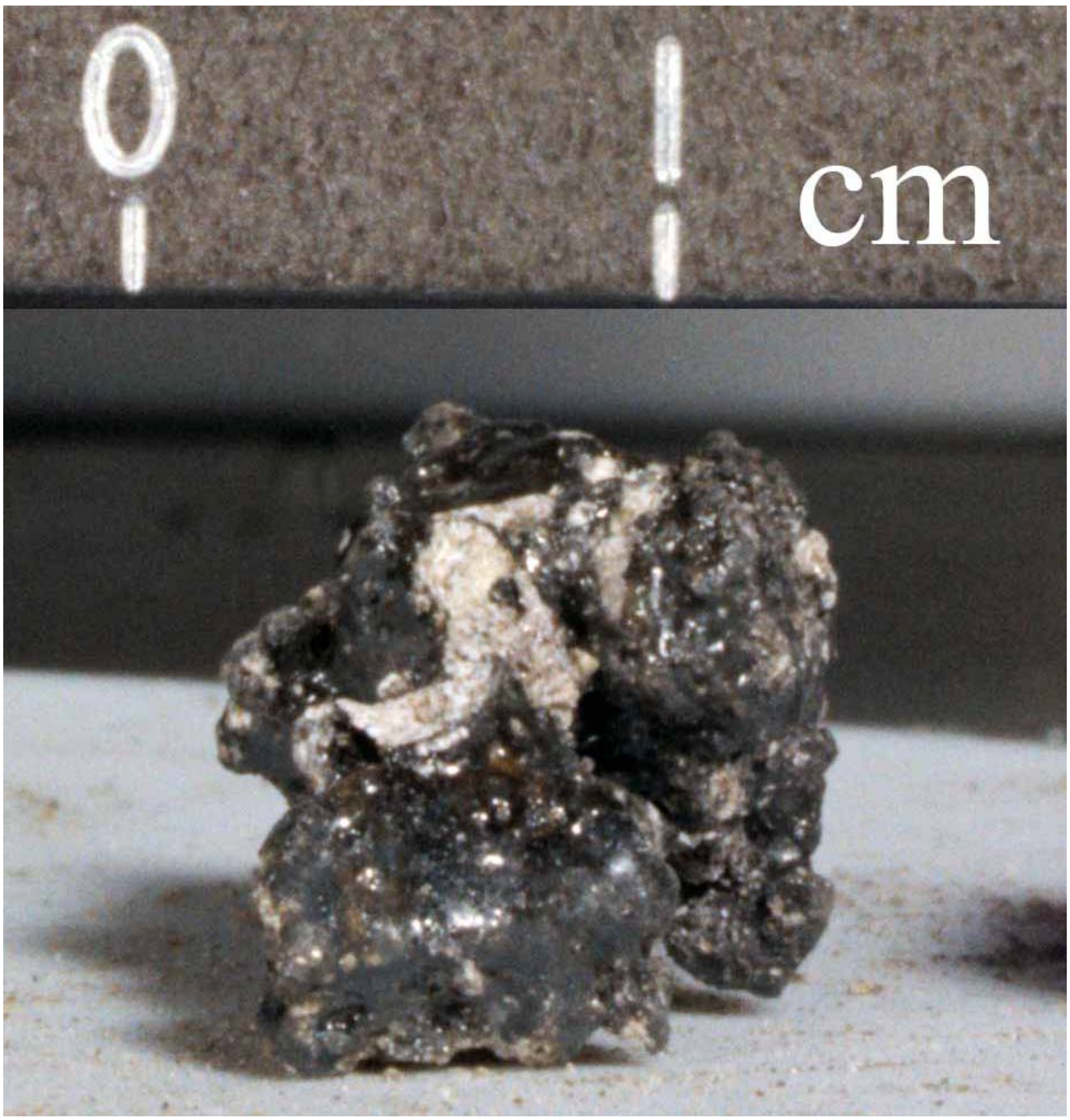

Figure 1. Pre-chip view of 15684 showing basalt clast. S-71-49840

PETROLOGY: Most of 15684 is a black glass apparently formed in a single event, but the thin sections are dominated by a pyroxenephyric basalt clast (Fig. 2). The glasses in the sample were described and analyzed by Schaal and Horz (1977). The glass coat is vesicular with flow structures, and covers nearly the entire basalt clast in thin section. It formed a thermal aureole in many grains that it coats, with edge melting visible in pyroxene grains. The glass is mainly yellow-green. There are colorless and reddish brown schlieren with flow bands consisting of aligned opaque phases. Other smaller glass fragments are present; analyses were tabulated by Schaal and Horz (1977) and shown in Figure 3. Most of the glass coat more closely resembles Apollo 15 mare basalt than Apollo 15 regolith, so appears to have formed directly from a basaltic substrate.

Fig. 2a

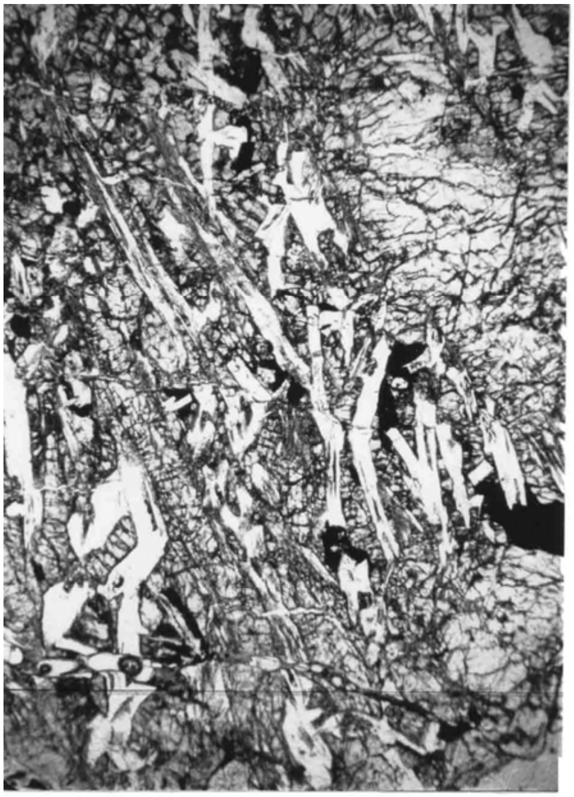

Fig.2b

Fig. 2c

Figure 2. Photomicrographs of 15684,3. Widths about 3 mm.
a) exterior glass (bottom) and basalt (top); transmitted light,
b) pyroxene-phyric basalt clast; transmitted light,
c) as b), crossed polarizers, showing that all plagioclase is at extinction (maskelynite).

The basalt was described with microprobe analyses by Dowty et al. (1973a, b, c; 1974), Nehru et al. (1973), and Schaal and Horz (1977) (Figs. 4, 5). According to Dowty et al. (1973a, b; 1974) it is pyroxene-phyric and so severely shocked that the plagioclase is mostly isotropic and melted locally. The groundmass consists of large subradiating pyroxene and plagioclase laths. Dowty et al. (1974) reported 36% phenocrysts; shock effects precluded useable x-ray patterns. Schaal and Horz (1977) reported a mode of 66% clinopyroxene (mainly pigeonite), 28% plagioclase (mainly maskelynite), about 8% ilmenite, and traces of kamacite and troilite. They listed microprobe analyses for augite, pigeonite, maskelynite, and ilmenite (see also Fig. 5). The moderate shock effects are pervasive and indicate peak pressures of less than 450 Kbar. Pyroxene grains are granulated and mosaic, and some contain closely spaced fractures and shock lamellae. Lofgren et al. (1975), in a comparison of the texture (as reported by Dowty et al., 1974) with those produced in dynamic crystallization experiments on an Apollo 15 quartz-normative mare basalt composition, inferred a cooling rate of less than 1°C/hr for the phenocrysts and 1-5°C/hr for the matrix of the basalt.

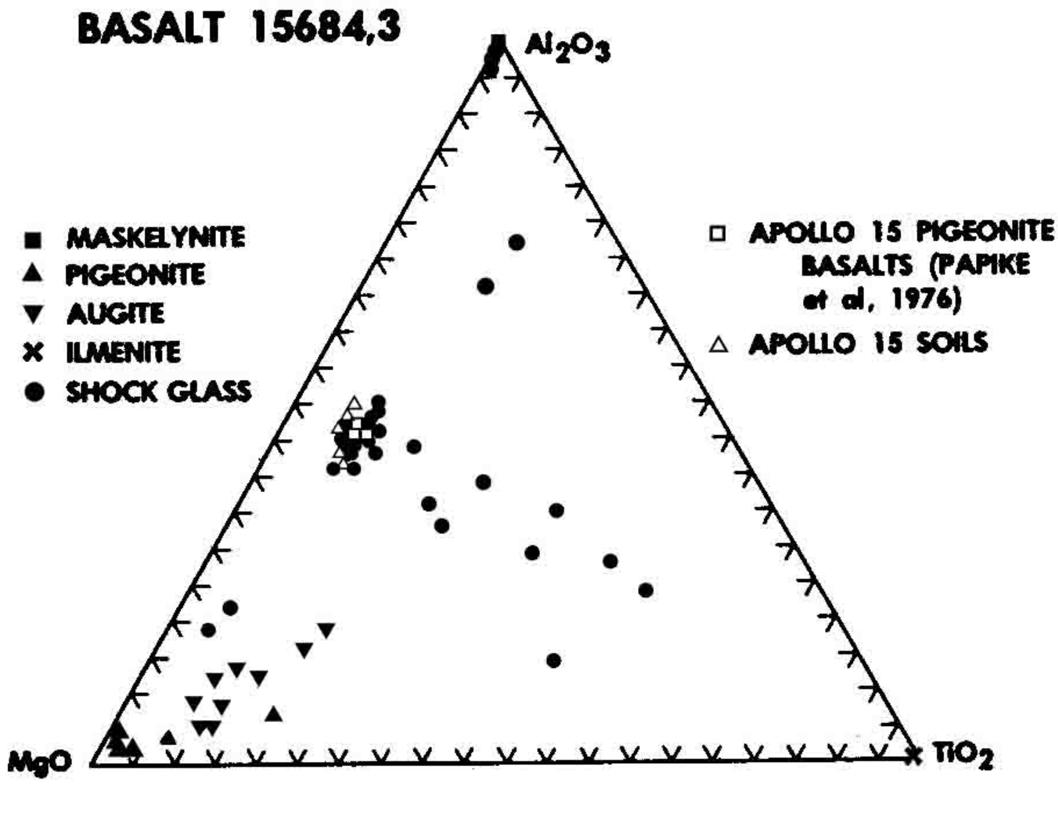

Figure 3. Compositions of glass in 15684
(Schaal and Horz, 1977).

CHEMISTRY: A defocussed beam microprobe analysis of the basalt (Table 1) is not particularly definitive even as to basalt type, and probably is subject to severe errors (note that it was normalized to 100%). The high SiO_2 and low TiO_2 are consistent with a quartz-normative mare basalt.

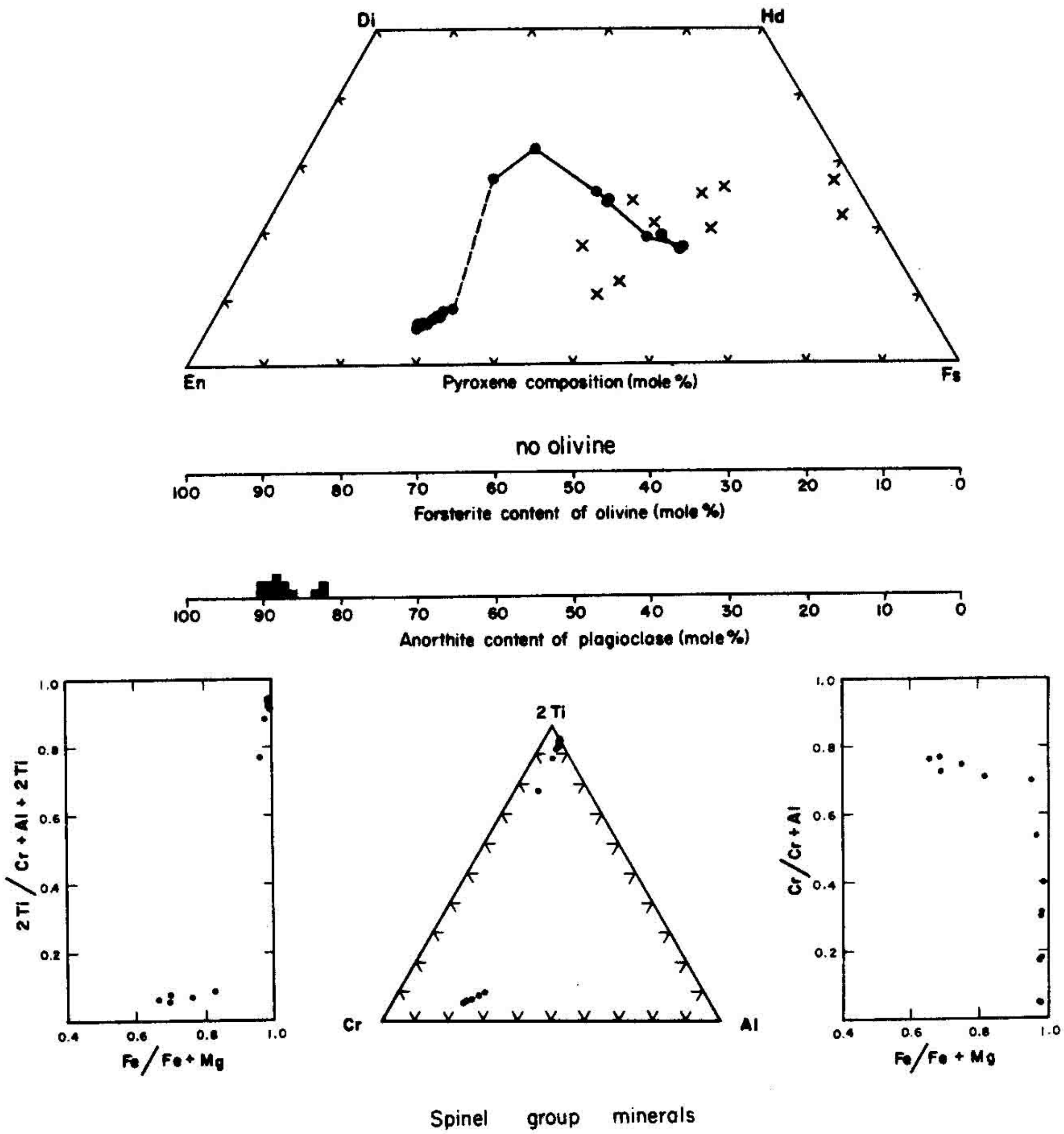

Figure 4. Compositions of minerals in 15684
pyroxene-phyric basalt clast (Dowty et al., 1973b).

PROCESSING AND SUBDIVISIONS: Chipping was made to include the larger basalt fragment visible in Figure 1, and produced chip ,1, which was used to make thin sections ,3 and ,4. In 1977, more chipping produced ,6 (chips), and ,7 (two small chips of exterior glass). ,7 was partly used to make thin section ,9. ,0 is now 0.63 g.

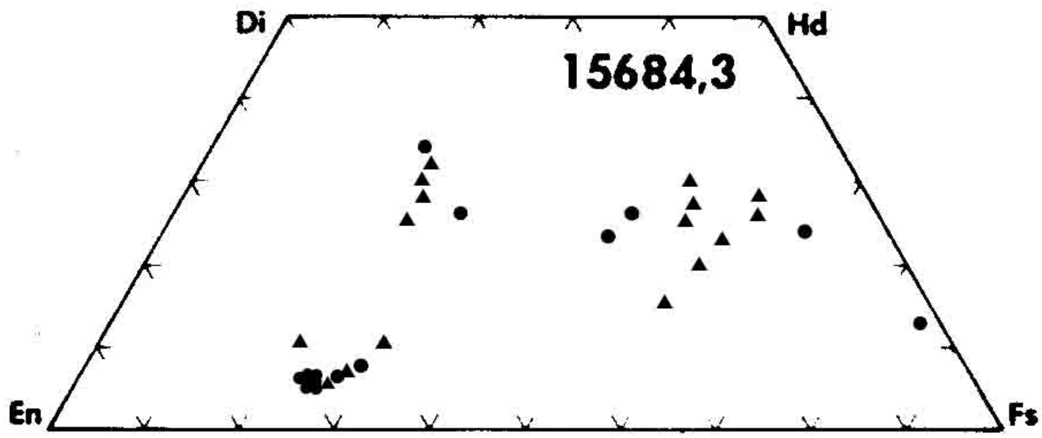

Figure 5. Compositions of pyroxenes in 15684 pyroxene-phyric basalt clast (Schaal and Horz, 1977).

TABLE 15684-1. Defocussed beam microprobe bulk analysis (Dowty et al., 1973a,b) (normalized to 100%)

Wt %	SiO2	47.6	
	TiO2	1.45	
	Al2O3	8.4	
	FeO	21.5	
	MgO	10.8	
	CaO	8.9	
	Na2O	0.33	
	K2O	0.05	
	P2O5	0.03	
ppm	Cr	3865	(a)
	Mn	2250	(b)

(a) reported as ~3630 in Dowty et al. (1973b)
(b) reported as ~2170 in Dowty et al. (1973b)