71065 - 28.8 grams
71066 – 20 grams
71069 – 4.06 grams
Fine-grained Ilmenite Basalt

Figure 1: Photo of 71065. Cube is 1 cm. S73-16932.

Figure 2: Photo of 71066. Scale in mm. S73-17066.

Introduction

The basalt fragments found in soil sample 71060 were fine grained and high-Ti (figures 1 – 3). They have microporphritic texture with eroded olivine phenocrysts and abundant sawtooth ilmenite (figures 6 and 7). Early formed armalcolite is rimed by ilmenite (Neal and Taylor 1993).

Chemistry

The composition of 71065, 66 and 69 was determined by Ma et al. (1979) and reported by Warner et al. (1979).

Figure 3: Photo of 71069 with mm scale. S73-17080

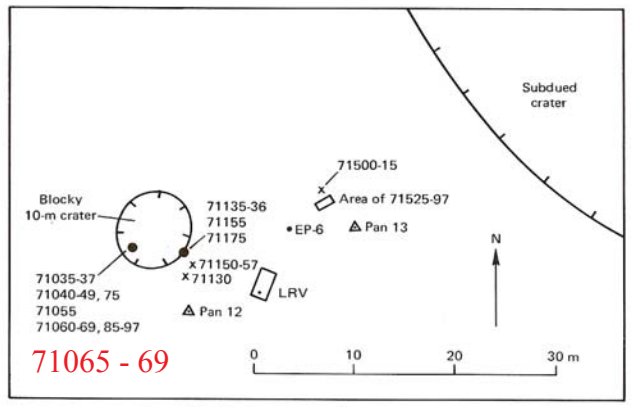


Figure 4: Map of station 1, Apollo 17 near Steno Crater.

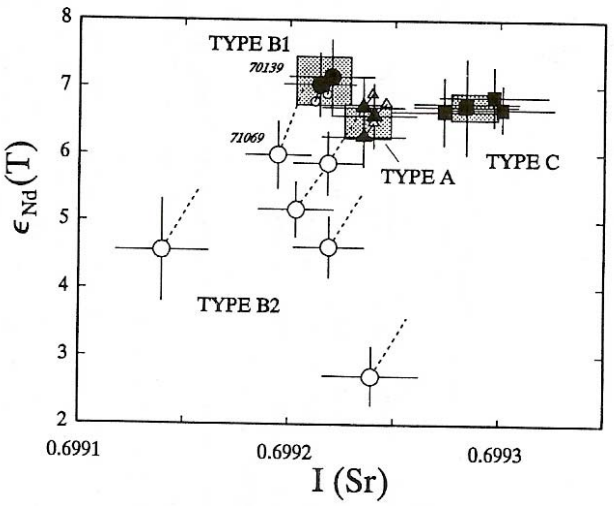


Figure 5: Isotopic diagram for Apollo 17 basalts assuming age of 3.72 b.y. (Paces et al. 1991).

Radiogenic age dating

Paces et al. (1991) determined the isotopic ratio of Sr and Nd which yield the initial isotopic composition of the magma (figure 5) if one assumes the age (3.72 b.y.).

Processing

71060 was collected as a soil sample. It included numerous fragments of fine grained basalt 71065 – 69, 71085 – 89 and 71095 – 97. It was returned in bag 456 in ALSRC 1.

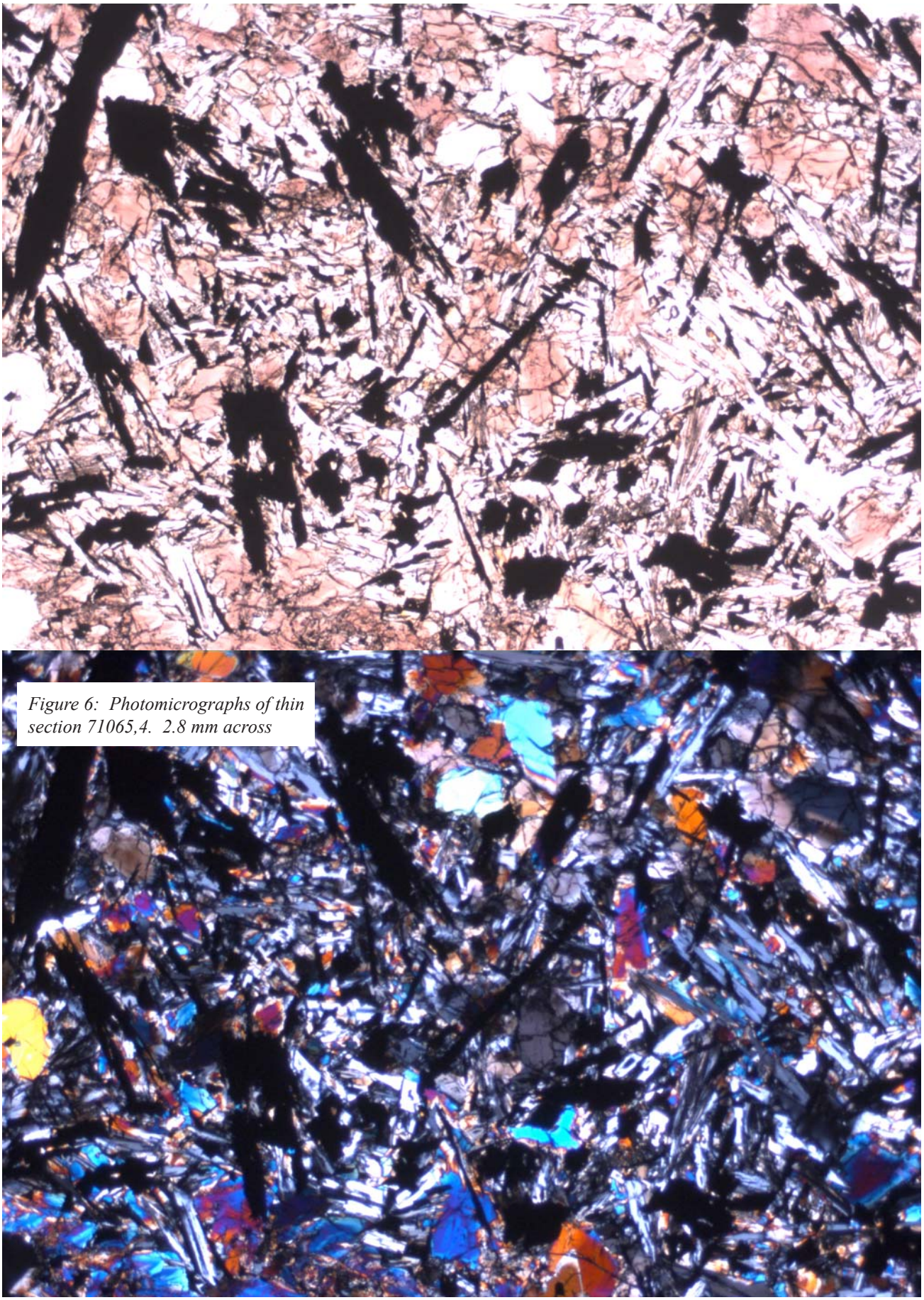


Figure 6: Photomicrographs of thin section 71065,4. 2.8 mm across

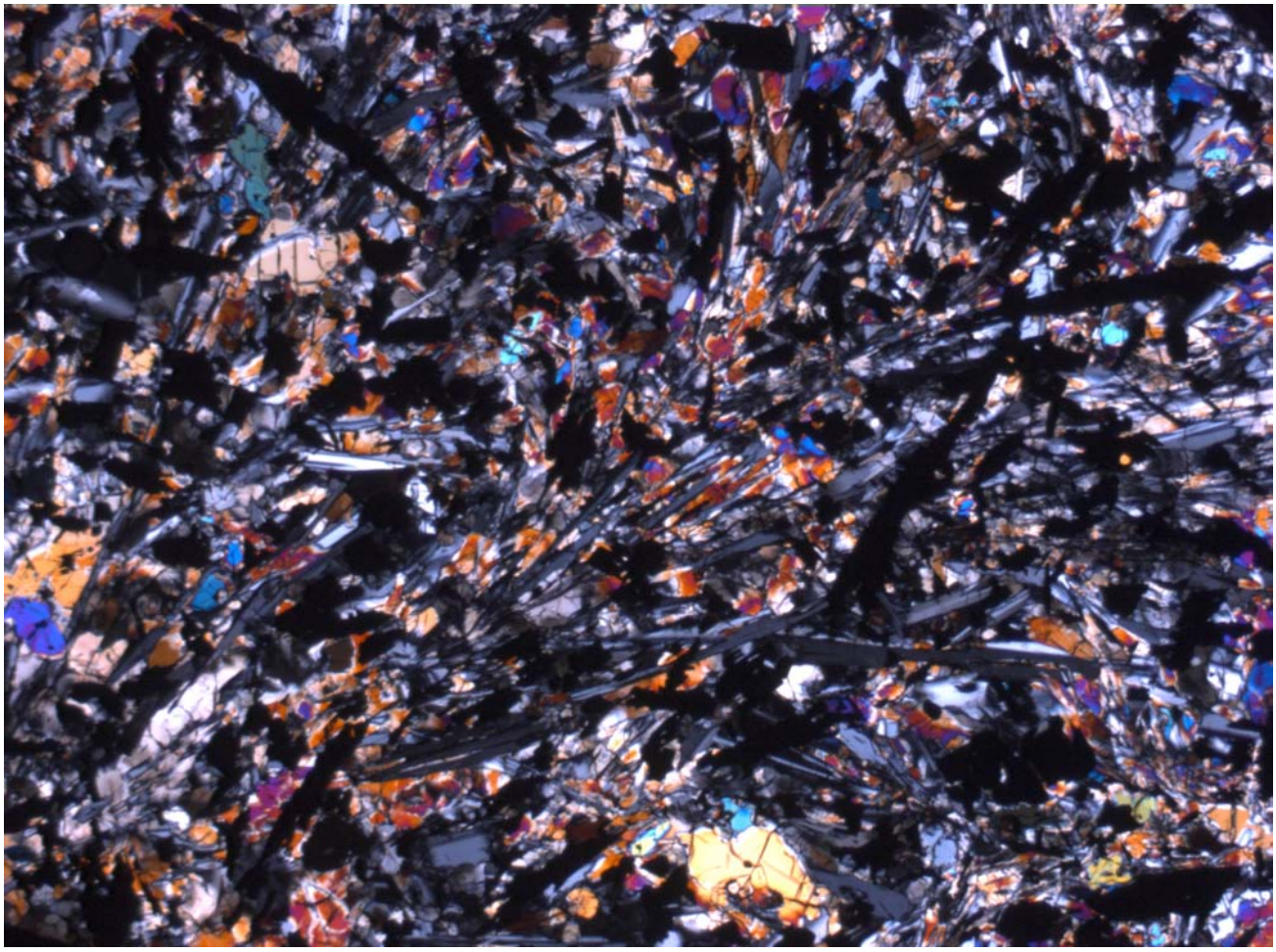
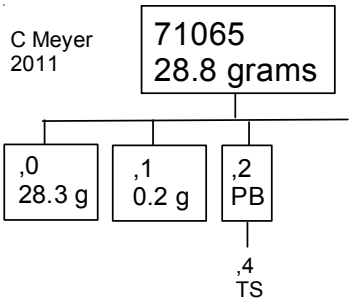
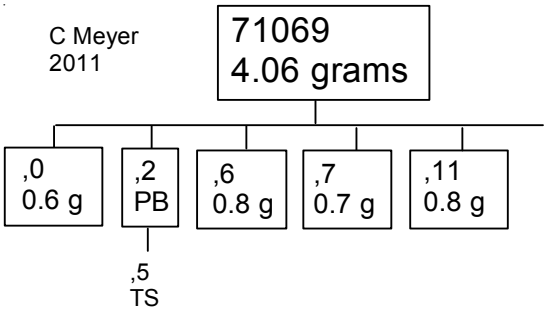
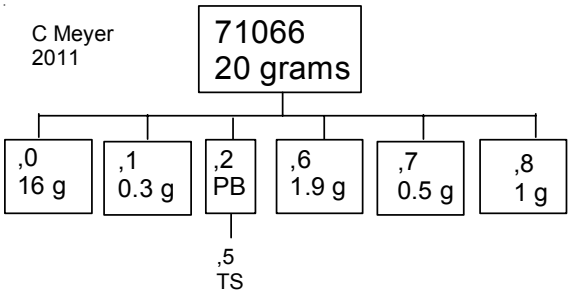


Figure 7: Photomicrograph of thin section of 71069. Crossed nicols and 2.8 mm across







References for 71065 and 71069

Butler P. (1973) **Lunar Sample Information Catalog Apollo 17.** Lunar Receiving Laboratory. MSC 03211 Curator's Catalog. pp. 447.

LSPET (1973) Apollo 17 lunar samples: Chemical and petrographic description. *Science* **182**, 659-672.

LSPET (1973) Preliminary Examination of lunar samples. Apollo 17 Preliminary Science Rpt. NASA SP-330. 7-1 – 7-46.

Table 1. Composition of 71065, 71066 and 71069.

	71065	71066	71069		71069	
reference	Warner79		Warner79		Paces91	
weight	Ma79					
SiO2 %						
TiO2	12.5	14.2	12.2	(a)		
Al2O3	8.9	8.9	8.6	(a)		
FeO	19.8	20.5	19.1	(a)		
MnO	0.26	0.26	0.246	(a)		
MgO	8	9	10	(a)		
CaO	10	9.4	9.8	(a)		
Na2O	0.39	0.406	0.312	(a)		
K2O	0.041	0.041	0.032	(a)		
P2O5						
S %						
sum						
Sc ppm	89	89	85	(a)		
V	102	133	140	(a)		
Cr	2579	3325	3243	(a)		
Co	22	27	21	(a)		
Ni						
Cu						
Zn						
Ga						
Ge ppb						
As						
Se						
Rb					0.315	(b)
Sr					146	(b)
Y						
Zr						
Nb						
Mo						
Ru						
Rh						
Pd ppb						
Ag ppb						
Cd ppb						
In ppb						
Sn ppb						
Sb ppb						
Te ppb						
Cs ppm						
Ba						
La	5.1	5.1	4.3	(a)		
Ce	18	18	17	(a)		
Pr						
Nd	19	18	20	(a)	17.3	(b)
Sm	6.9	6.5	7.4	(a)	7.35	(b)
Eu	1.34	1.33	1.55	(a)		
Gd						
Tb	1.7	1.6	1.9	(a)		
Dy	11	11	12	(a)		
Ho						
Er						
Tm						
Yb	6.9	6.7	7.4	(a)		
Lu	1.01	1.02	1.07	(a)		
Hf	6.8	6.4	6.6	(a)		
Ta	1.7	1.8	1.5	(a)		
W ppb						
Re ppb						
Os ppb						
Ir ppb						
Pt ppb						
Au ppb						
Th ppm						
U ppm						

technique: (a) INAA, (b) IDMS

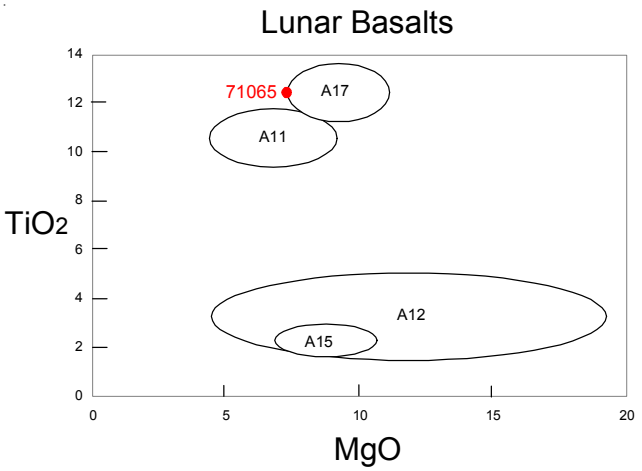


Figure 8a: Composition of 71069 compared with that of Apollo basalts.

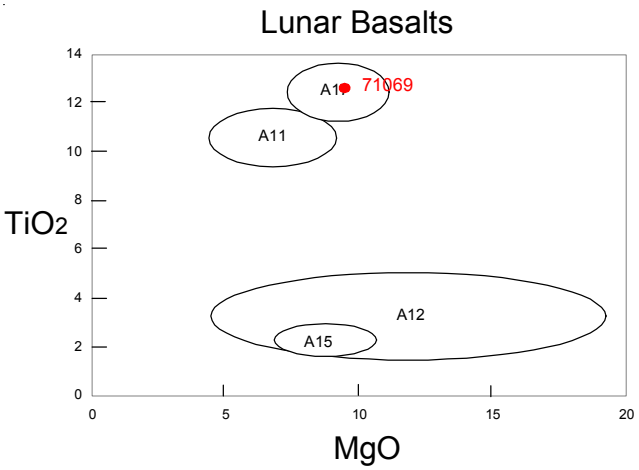


Figure 8b: Composition of 71069 compared with that of Apollo basalts.

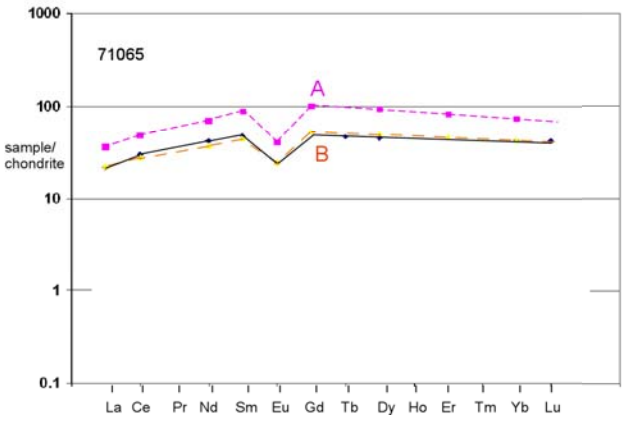


Figure 9a: Normalized rare-earth-element diagram for 70165 and type A and B basalts.

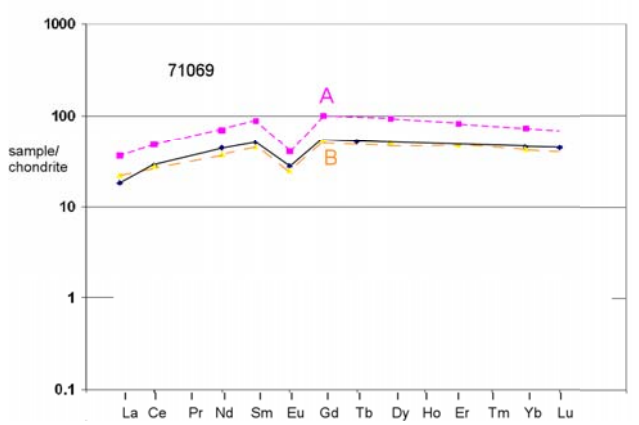


Figure 9b: Normalized rare-earth-element diagram for 71069 and type A and B basalts.

Ma M-S., Schmitt R.A., Warner R.D., Taylor G.J. and Keil K. (1979b) Composition, petrography, and genesis of Apollo 17 high-Ti mare basalts (abs). *Lunar Planet. Sci.* **X**, 765-767. Lunar Planetary Institute, Houston.

Muehlberger et al. (1973) Documentation and environment of the Apollo 17 samples: A preliminary report. Astrogeology 71 322 pp superceeded by Astrogeolgy 73 (1975) and by Wolfe et al. (1981)

Muehlberger W.R. and many others (1973) Preliminary Geological Investigation of the Apollo 17 Landing Site. *In* **Apollo 17 Preliminary Science Report.** NASA SP-330.

Neal C.R. and Taylor L.A. (1993) Catalog of Apollo 17 rocks. Vol. 2 Basalts

Neal C.R., Taylor L.A., Patchen A.D., Hughes S.S. and Schmitt R.A. (1990a) The significance of fractional crystallization in the petrogenesis of Apollo 17 Type A and B high-Ti basalts. *Geochim. Cosmochim. Acta* **54**, 1817-1833.

Papike J.J., Hodges F.N., Bence A.E., Cameron M. and Rhodes J.M. (1976) Mare basalts: Crystal chemistry, mineralogy and petrology. *Rev. Geophys. Space Phys.* **14**, 475-540.

Paces J.B., Nakai S., Neal C.R., Taylor L.A., Halliday A.N. and Lee D.-C. (1991) A strontium and neodymium isotopic study of Apollo 17 high-Ti mare basalts: Resolution of ages, evolution of magmas, and origin of source heterogeneities. *Geochim. Cosmochim. Acta* **55**, 2025-2043.

Warner R.D., Taylor G.J., Conrad G.H., Northrop H.R., Barker S., Keil K., Ma M.-S. and Schmitt R. (1979a) Apollo 17 high-Ti mare basalts: New bulk compositional data, magma types, and petrogenesis. *Proc. 10th Lunar Planet. Sci. Conf.* 225-247.

Wolfe E.W., Bailey N.G., Lucchitta B.K., Muehlberger W.R., Scott D.H., Sutton R.L and Wilshire H.G. (1981) The geologic investigation of the Taurus-Littrow Valley: Apollo 17 Landing Site. US Geol. Survey Prof. Paper, 1080, pp. 280.