15260

Trench Soil

610.5 grams

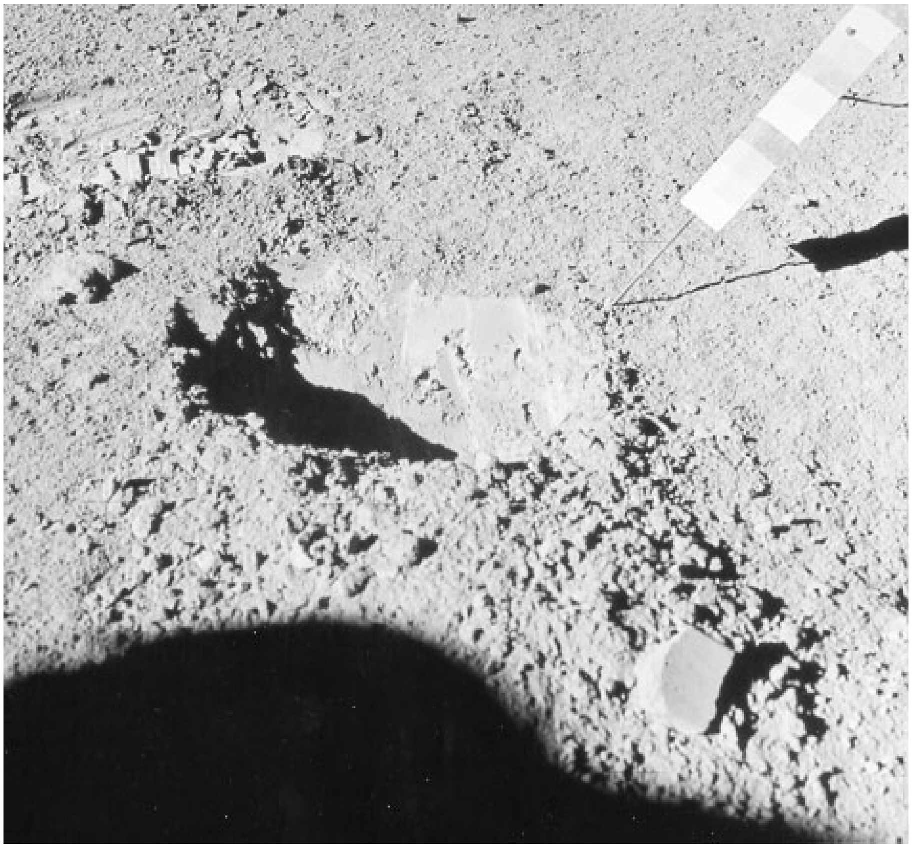

Figure 1: Apollo 15 trench, station 6. AS15-86-11643. Sample 15260 was collected from bottom of this trench (~25 cm). The legs on the Gnomen are 50 cm. apart.

Introduction

Soil samples 15260 and 15012 were collected from the bottom of a small trench at station 6, Apollo 15 (Swann et al. 1972). 15012 was placed in a special environmental sample container (SESC) and was sealed. Morris et al. (1983) state that this trench was only 10 cm deep, but the picture looks more like 20-25 cm deep (figure 1). The trench was dug on the rim of a crater about 12 meters across. Core sample 15009 was from the other side of the 12 m crater. Soils samples 15240, 15250, 15270 and 15290 were collected nearby. Station 6 was located about 350 meters to the east of Spur Crater on the Apennine Front, well above the mare surface.

Modal content of soils 15260.
From Morris et al. 1983.

	15260
Agglutinates	50.5
Basalt	4
Breccia	8.5
Anorthosite	0.5
Norite	
Gabbro	
Plagioclase	0.5
Pyroxene	14
Olivine	2.5
Ilmenite	-
Glass other	19

Petrography

15260 is a mature soil with Is/FeO = 77 (Morris 1978) with agglutinate content ~ 50% (McKay et al. unpublished). Walker and Papike (1981) calculate that this soil is made up of 28 % mare basalt, 18 % LKFM, ~14 % anorthosite, ~25 % KREEP and ~17 % mafic green glass. Soil breccias 15265 and 15266 were returned in a separate bag.

Best and Minkin (1972) and Warner et al. (1972) studied the composition of glass beads in 15261. Goldstein and Axon (1972) and Axon and Goldstein (1972) analyzed metallic iron grains in this sample (figure 2). Simon et al. (1987) described a sample of KREEP basalt (15263,42) found as a "coarse-fine" particle in this trench.

Chemistry

Taylor et al. (1973), Korotev (1987), Duncan et al. (1975) and others have analyzed 15260 (table 1, figures 3 and 4). Kaplan et al. (1976) determined the C, N and S content (156 ppm, 106 ppm and 700 ppm respectively). Moore et al. (1973) reported 115 ppm C. This soil has a carbon content consistent with its maturity (figure 5).

Simon et al. (1987) reported the composition of a particle of KREEP basalt in coarse-fines from this soil (figure 4).

Cosmogenic isotopes and exposure ages

Rancitelli et al. (1972) determined the cosmic ray induced activity of ^{22}Na = 37 dpm/kg. and ^{26}Al = 50 dpm/kg. Fireman et al. (1972) reported on ^{37}Ar, ^{39}Ar and ^{3}H (tritium) found in 15261 stating that *"the solar-flare intensity averaged over 30 yr obtained from the tritium depth dependence was approximately the same as the flare intensity averaged over 1000 yr obtained from ^{39}Ar measurements."*

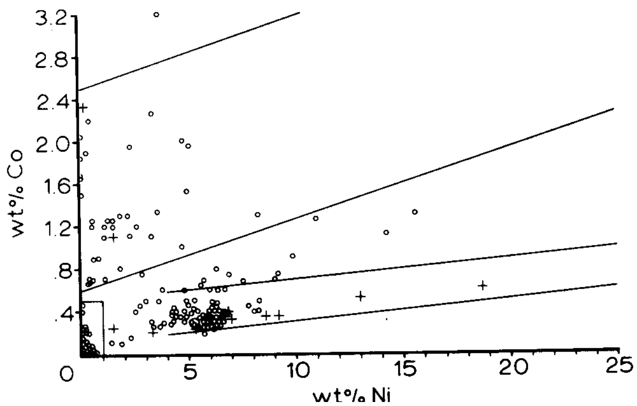

Figure 2: Ni and Co content of iron grain from 15261 (from Goldstein and Axon 1972).

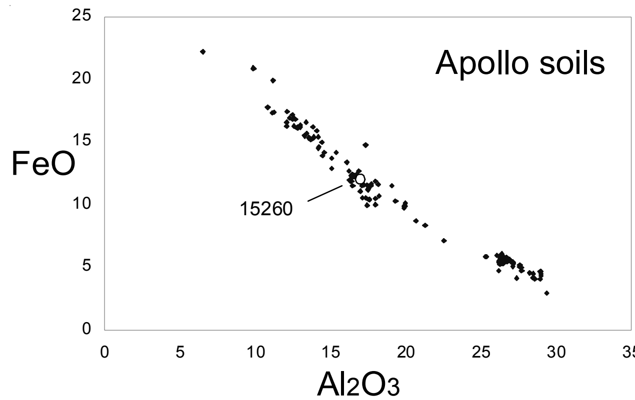

Figure 3: Chemical composition of lunar soils.

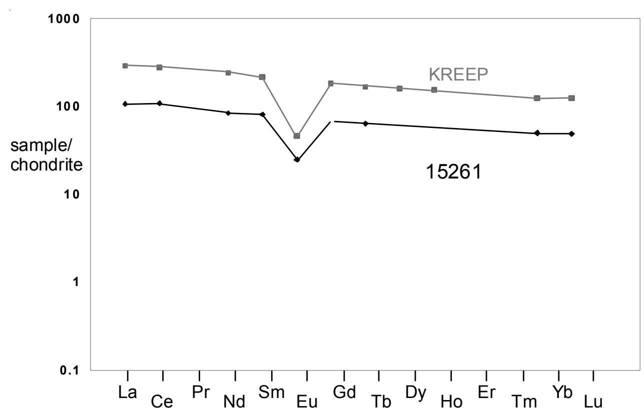

Figure 4: Normalized rare-earth-element diagram for trench soil 15261 and one of the coarse-fine particles found in it (KREEP).

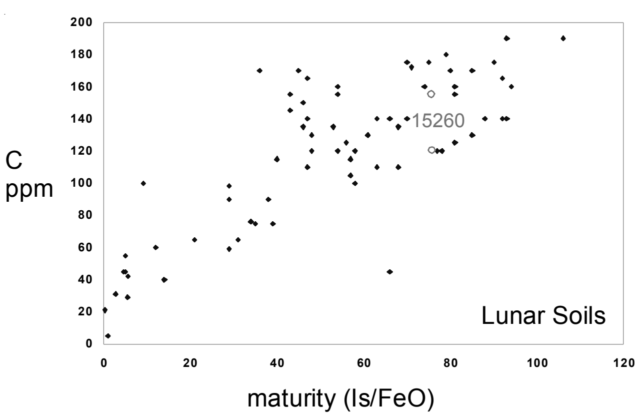

Figure 5: Carbon content and matruity for lunar soils. Data from Kaplan et al. (1976), Moore (1974) and Morris (1977).

Other Studies
Holland et al. (1972) studied the temperature release (pyrolysis) of soil 15261 for various molecular species (figure 6).

Processing
Sample 15260 was returned in a sample collection bag (#3) and would have seen the air in the LM, CSM and Pacific. This is a relatively large soil sample for Apollo 15, especially when you consider the added amount from the trench in the SESC container (see 15012).

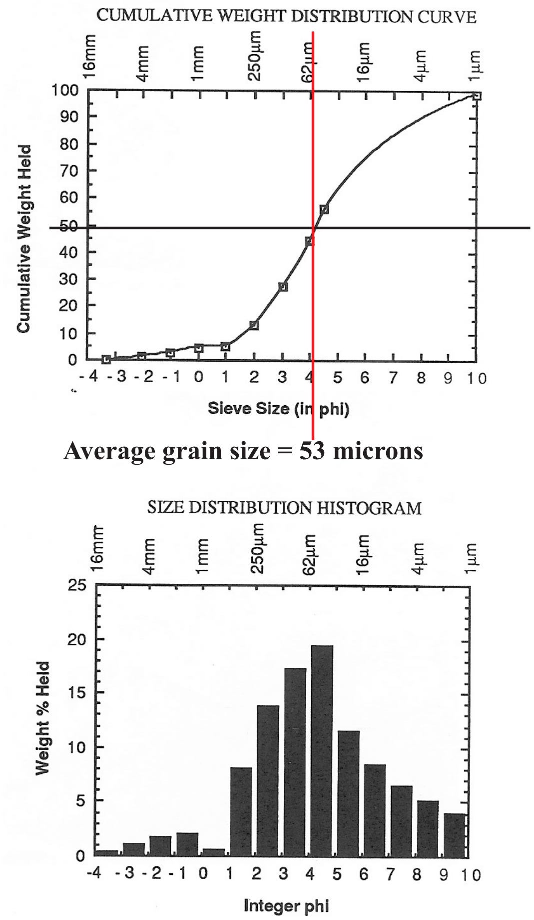

Figure 7: Grain size distribution of 15260 (Graf 1993).

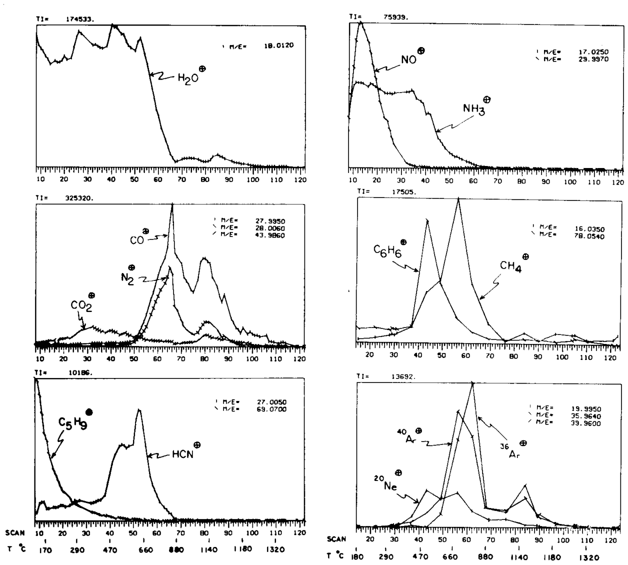

Figure 6: Volatile release curves for 15261 (from Holland et al. 1972).

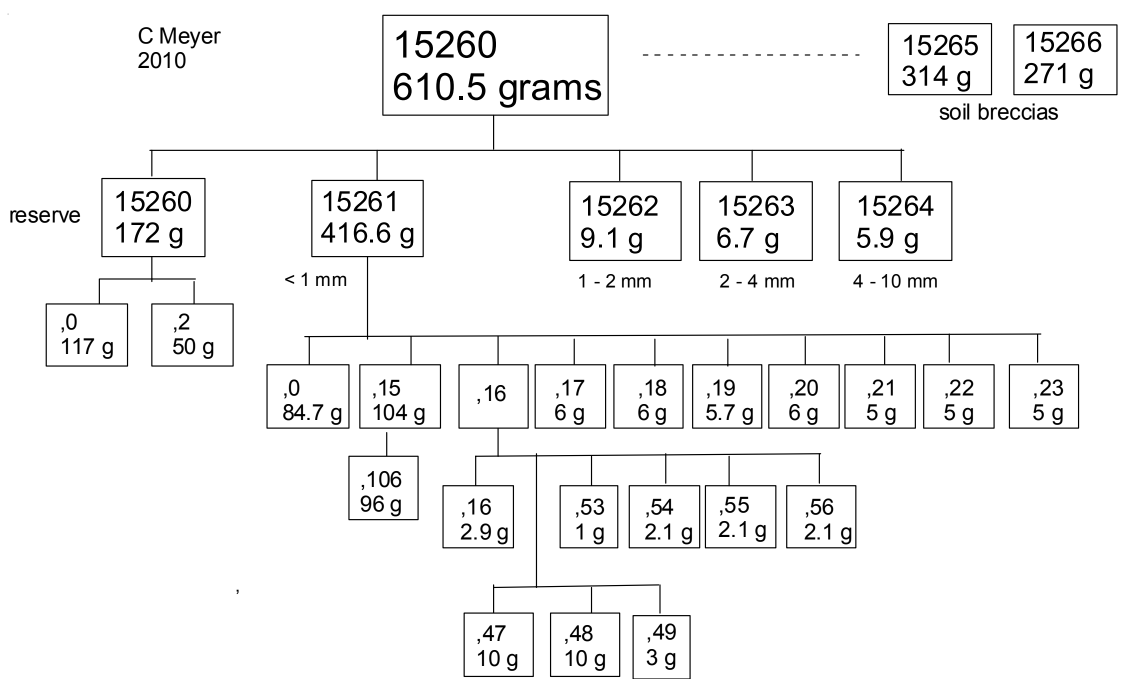

Table 1. Chemical composition of 15260.

													KREEP basalt	
reference	Korotev87		Taylor 73		Duncan75		Brunfelt72		Hughes72		Rancitelli72		Simon 87	
weight													15263,42	
SiO2 %					46.35	(b)								
TiO2	1.5	(a)			1.5	(b)	1.4	(a)					1.7	(a)
Al2O3	16.4	(a)			16.4	(b)	16.1	(a)					15.3	(a)
FeO	12.3	(a)			12.28	(b)	12.1	(a)					9.9	(a)
MnO	0.16	(a)			0.159	(b)	0.16	(a)					0.14	(a)
MgO	10.7	(a)			10.71	(b)							9.6	(a)
CaO	11	(a)			11.15	(b)	11.89	(a)					9.4	(a)
Na2O	0.44	(a)			0.39	(b)	0.44	(a)					0.74	(a)
K2O					0.19	(b)					0.2	(d)	0.54	(a)
P2O5					0.219	(b)								
S %					0.084	(b)			0.089	(c)				
sum														
Sc ppm	23.8	(a)					23.3	(a)					20.2	(a)
V					81	(b)	131	(a)					65	(a)
Cr	2260	(a)			2347	(b)	2450	(a)					2429	(a)
Co	40.9	(a)			42	(b)	44.6	(a)					20.4	(a)
Ni	247	(a)			250	(b)	300	(a)						
Cu					11	(b)	7	(a)						
Zn					26	(b)	19	(a)						
Ga							4.5	(a)						
Ge ppb														
As							0.16	(a)						
Se							0.37	(a)	0.38	(c)				
Rb			3.5	(e)	6	(b)	6.9	(a)						
Sr	150	(a)			136	(b)	131	(a)					230	(a)
Y			67	(e)	80.7	(b)								
Zr	330	(a)	356	(e)	382	(b)							880	(a)
Nb			19.8	(e)	24.8	(b)								
Mo														
Ru														
Rh														
Pd ppb														
Ag ppb							45	(a)	16	(c)				
Cd ppb														
In ppb							39	(a)						
Sn ppb			0.6	(e)										
Sb ppb														
Te ppb														
Cs ppm	0.29	(a)					0.27	(a)						
Ba	251	(a)	307	(e)	260	(b)	231	(a)					750	(a)
La	25.4	(a)	22	(e)			22	(a)					68	(a)
Ce	66	(a)	61	(e)			92	(a)					170	(a)
Pr			7.73	(e)										
Nd	38	(a)	32.2	(e)									110	(a)
Sm	11.9	(a)	11.3	(e)			12.8	(a)					31.6	(a)
Eu	1.39	(a)	1.5	(e)			1.6	(a)					2.6	(a)
Gd			11.5	(e)									36	(a)
Tb	2.33	(a)	1.99	(e)			2.3	(a)					6.1	(a)
Dy			14.2	(e)			12.7	(a)					39	(a)
Ho			3.27	(e)			2	(a)					8.6	(a)
Er			9.3	(e)			7	(a)						
Tm			1.4	(e)									3.1	(a)
Yb	8.1	(a)	8.75	(e)			2.5	(a)					20.4	(a)
Lu	1.2	(a)	1.4	(e)			0.76	(a)					3.05	(a)
Hf	9.2	(a)	7.1	(e)			12.2	(a)					22.7	(a)
Ta	1.13	(a)					1.02	(a)					2.8	(a)
W ppb			5200	(e)			1300	(a)						
Re ppb									0.8	(c)				
Os ppb									7.5	(c)				
Ir ppb	7.5	(a)					7.4	(a)	7	(c)				
Pt ppb														
Au ppb	*107*	(a)					5.5	(a)	4.1	(c)				
Th ppm	4.2	(a)	4.12	(e)			3.6	(a)			4.64	(d)	12	(a)
U ppm	1.13	(a)	1.08	(e)			1.14	(a)			1.18	(d)	3.3	(a)

technique: (a) INAA, (b) XRF, (c) RNAA, (d) radiation counting, (e) Spark source mass spec.

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