15009

Single Drive Tube

Station 6

Figure 1: Photo of drive tube 15009 driven in all the way. AS15-86-11565.

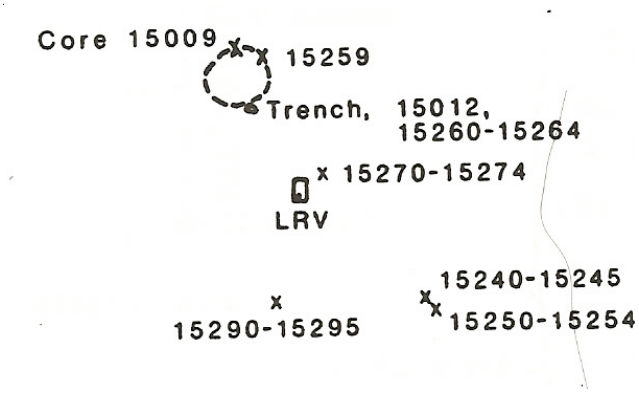


Figure 2: Location of soil samples, trench and drive tube at station 6, Apollo 15.

Introduction

Lunar core 15009 (622 grams, 30 cm) was collected from the soft rim of a small crater at station 6, on the Apennine Front (figures 1 and 2). A trench was dug in the other side of the crater (see 15261 and 15012). Surface soils 15241, 15251, 15271 and 15291 were also collected from this site.

Schwarz (1985) described the dissection of this core in Lunar Newsletter #51. The material in the core is submature and uniform throughout (figure 3).

Petrography

Basu et al. (1991) determined the modal mineralogy of 6 layers of the core and gave an average. They found an abundance of glass particles. The agglutinate content is 22 – 40 % with an average of 31%. The green glass content is high (2 – 6 %) consistent with other soils from this location. One thing that is different is that this core contains about 5 % ropy, clast-bearing glass, not seen in adjacent soil sampl3es.

Basu et al. also determined the composition of numerous individual mineral grains. Particularly noteworthy is that the pyroxenes in the core are generally like those in KREEP basalt (figure). Lithic fragments of KREEP basalt number about 3.5 %. Mare basalt about 9 %.

Transcript 15009

LMP Let's try it right there.

CDR Yes, boy, the soil is more granular here, too. Quite a difference from one side of the rim to the other.

LMP Okay, Joe. And you're suggesting using an upper here?

CC That's affirmative, Jim, an upper.

CDR Okay. I don't think you'll need your hammer, but I've got it anyway.

LMP Yes, and I'll get up on the uphill side here. Okay; it's in position.

*CDR Okay: I got the picture, 07"s the number, Joe. Easy. Neat *** hey all the way in very easily with a push, Joe. Yes, it'll be soft, bring it out – be gentle. Don't auger it. You got it?*

LMP Yes.

CDR Yes. Watch out. Watch out. Jim, watch out. You're over by the bench now; don't go any farther backward.

LMP Oh, I thought you meant I was about to lose the core.

CDR Just don't step backward any further. Wait, let me get the picture. Good core, Joe.

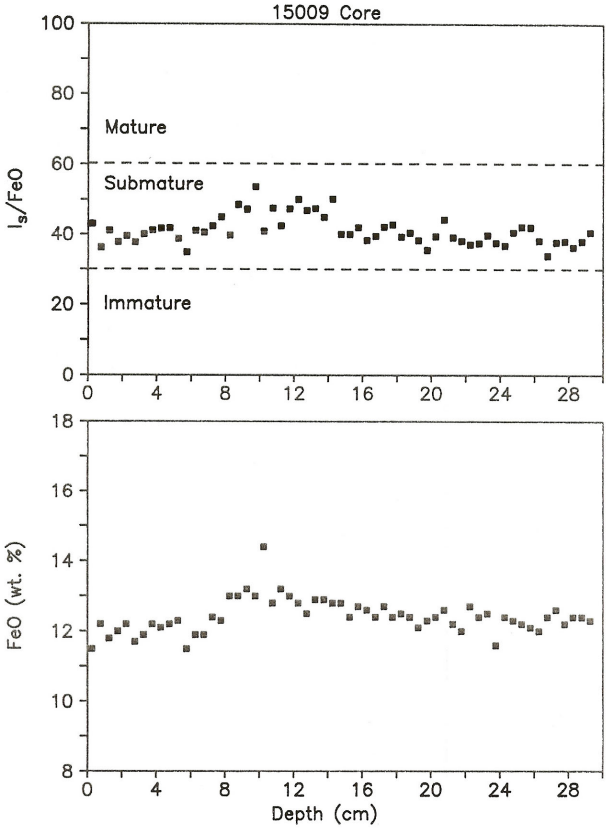


Figure 3: Maturity index and FeO content for 15009 (Morris, newsletter 51).

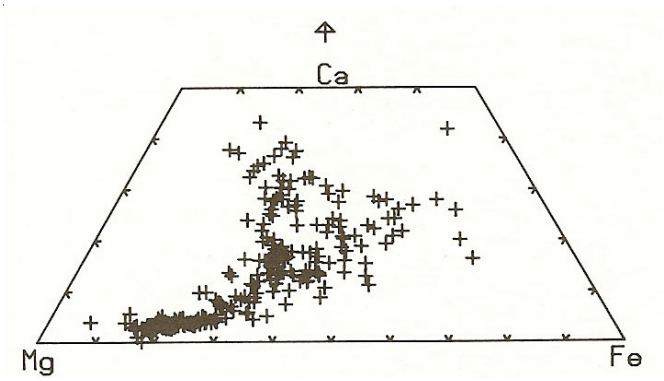


Figure 4: Pyroxene composition for 15009 (Basu et al. 1991).

Chemistry

The iron content along core 15009 is relatively constant at ~ 12 % FeO (figure 3), and that's all we know (from Newsletter 51).

Processing

Core 15009 was returned in SCB 5 which was placed in ALSRC#2. However, ALSRC#2 failed to seal and was not under vacuum.

The dissection and sample description is recorded in Lunar Newsletter #51 (Schwarz 1985). Some of the drawings are reproduced here as figures 5 – 7.

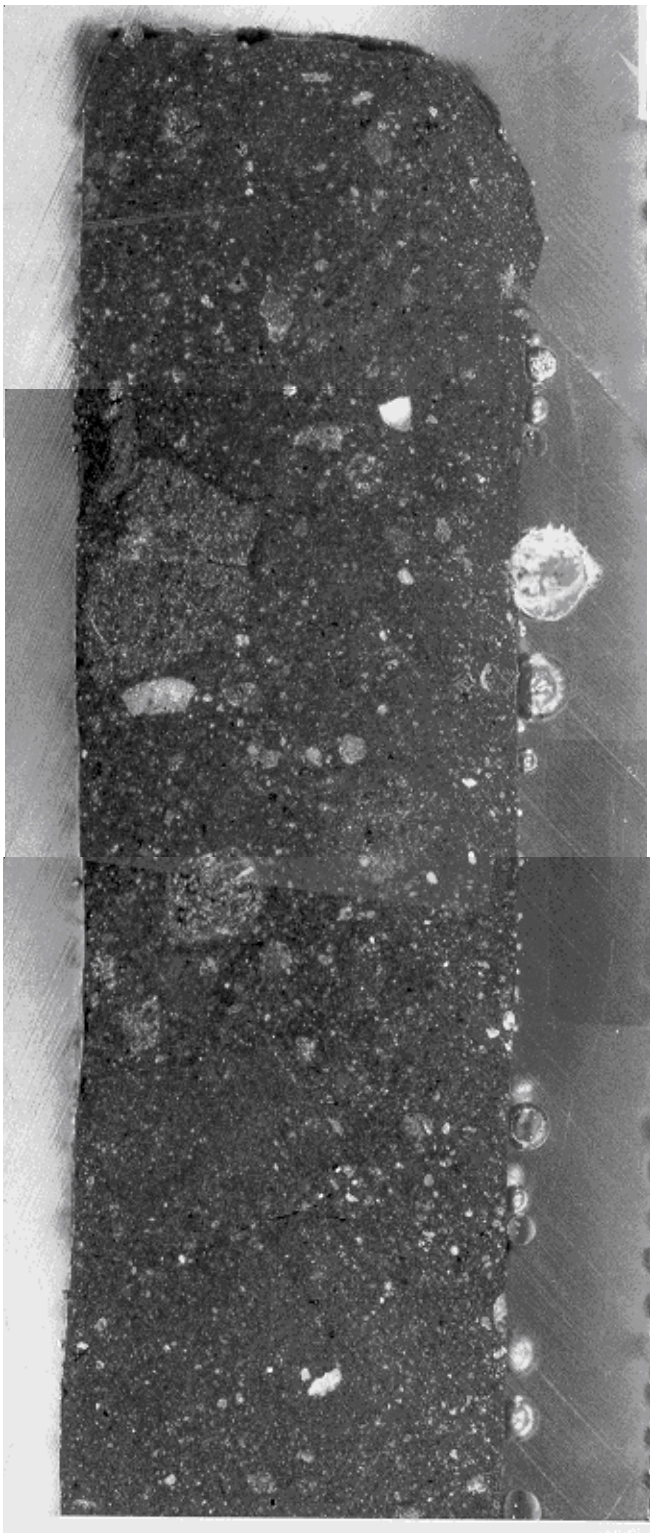
There are three sets of thin sections for the whole core, but they appear to not have been studied.

Modal content of core 15009.
From Basu et al. 1991

	2 cm	9 cm	13 cm	16 cm	21 cm	29 cm	ave
Agglutinates	35.9 %	40.2	29	32.9	24.8	22.5	30.9
Mare Basalt	5.3	8.9	9.1	9.5	8.9	11.7	8.9
KREEP Basalt	3.4	3.4	4.8	3.6	3.4	2.7	3.5
Breccia	17.8	14.4	19.9	15.4	18.1	15.9	16.9
Anorthosite	0.3	0.3	0.3	0.3	0.6	0.9	0.5
Gabbroic	0	0	0	0.3	0	0	0
Plagioclase	8.4	4.9	4.5	8.9	12.3	7.2	7.7
Pyroxene	8.8	12	12.5	11.9	11	12.9	11.5
Olivine	0.3	0.9	0.3	0.3	0.9	0.3	0.5
Ilmenite	0	0.3	0	0	0.3	0.6	0.2
Green glass	2.2	3.7	5.1	3.3	4.3	6.3	4.1
Yellow glass	1.3	1.2	1.7	0.9	2.1	1.2	1.4
Colorless glass	1.6	2.1	2.6	1.8	2.8	2.7	2.3
Ropy glass	6.9	4	5.4	4.5	4.9	6.3	5.3

15009,6000
epoxy
encapsulated
core

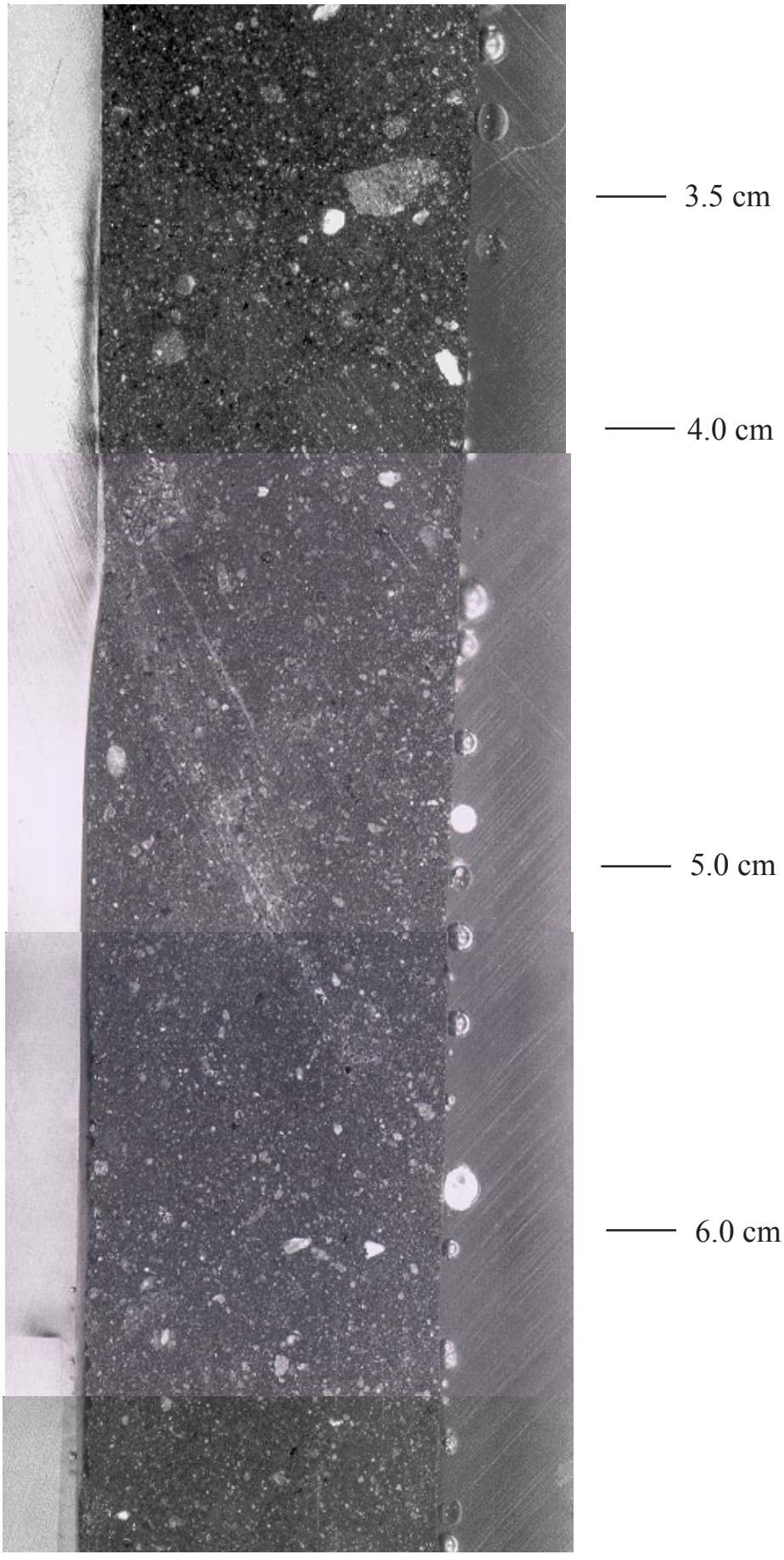
top

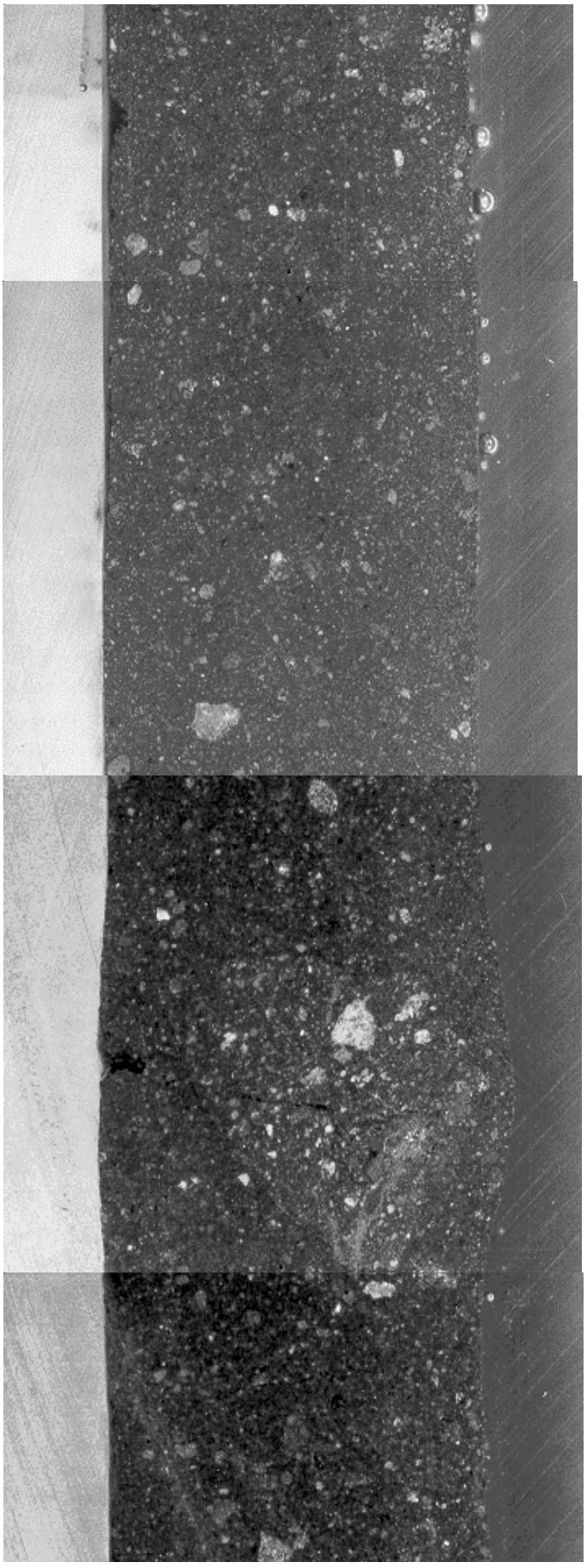


0.0 cm

1.5 cm

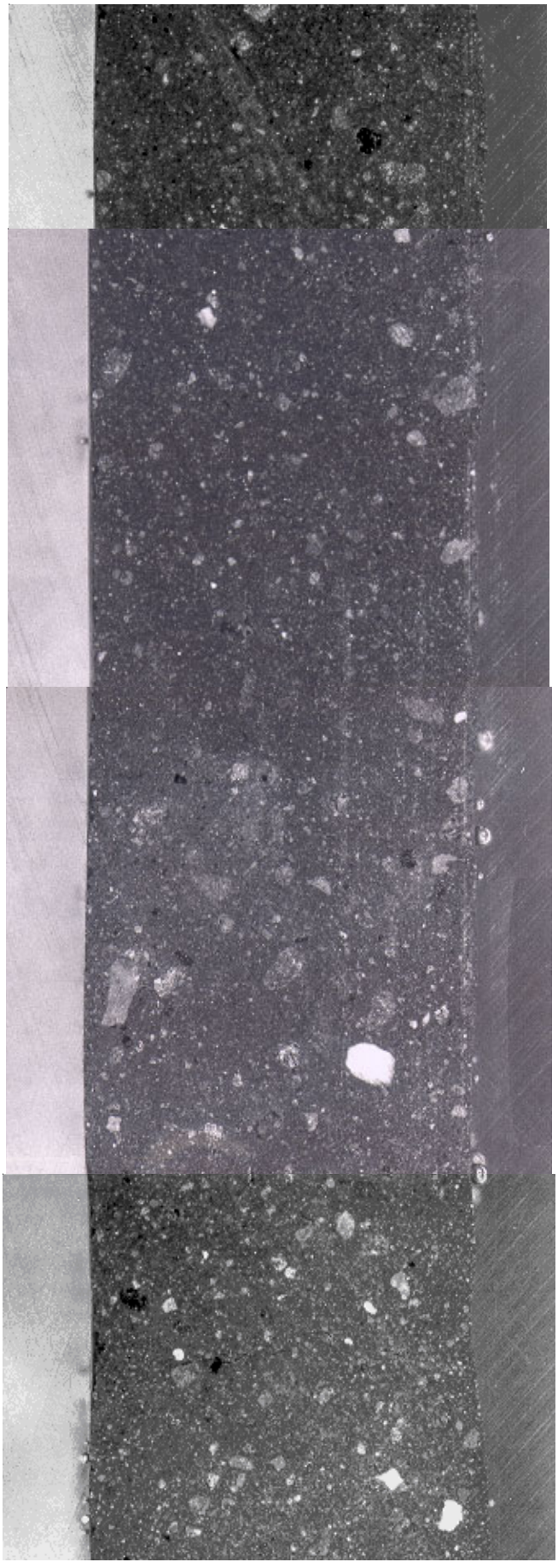
3.0 cm


3.5 cm
4.0 cm
5.0 cm
6.0 cm



9.0 cm

9.5 cm

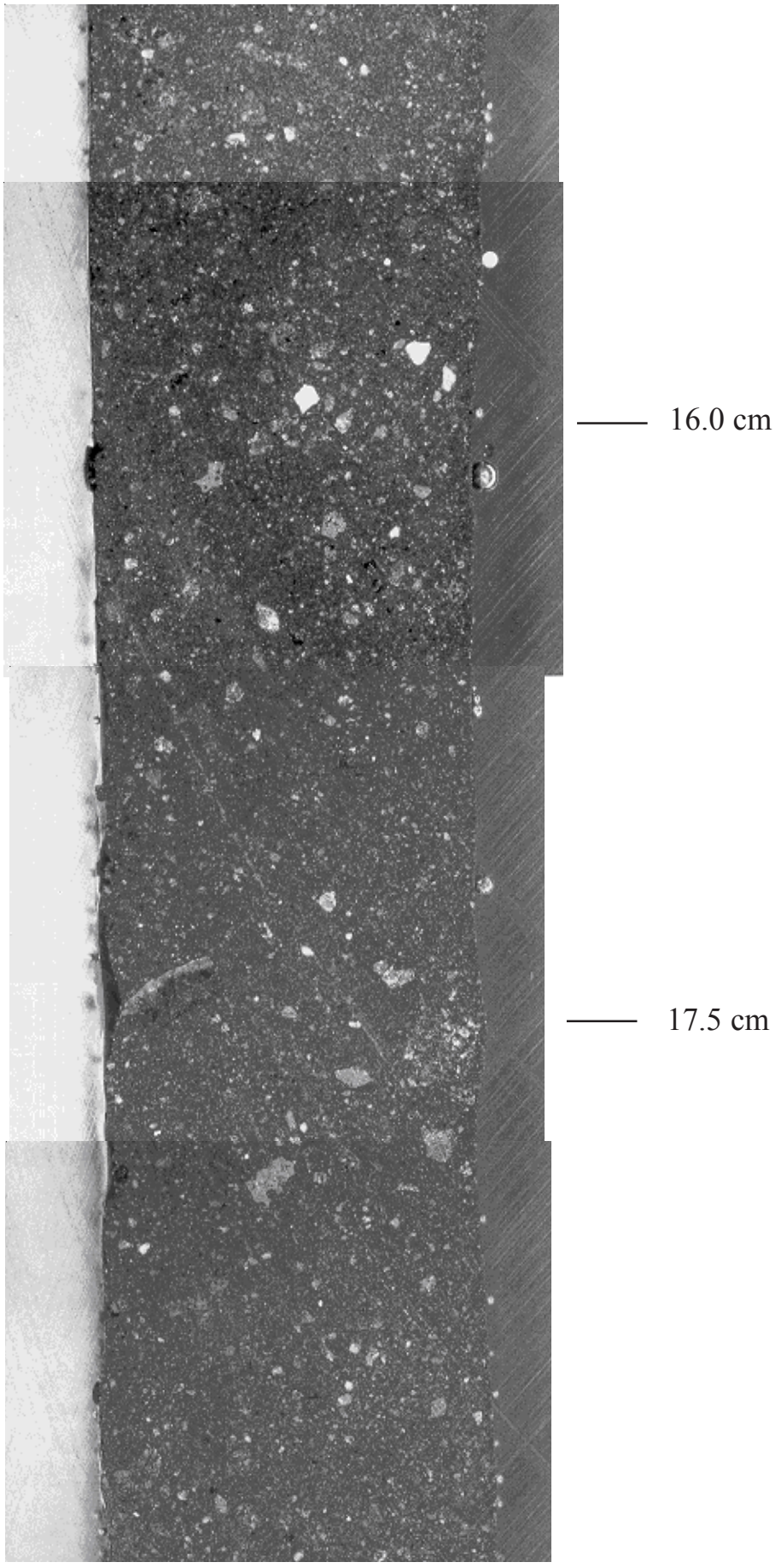


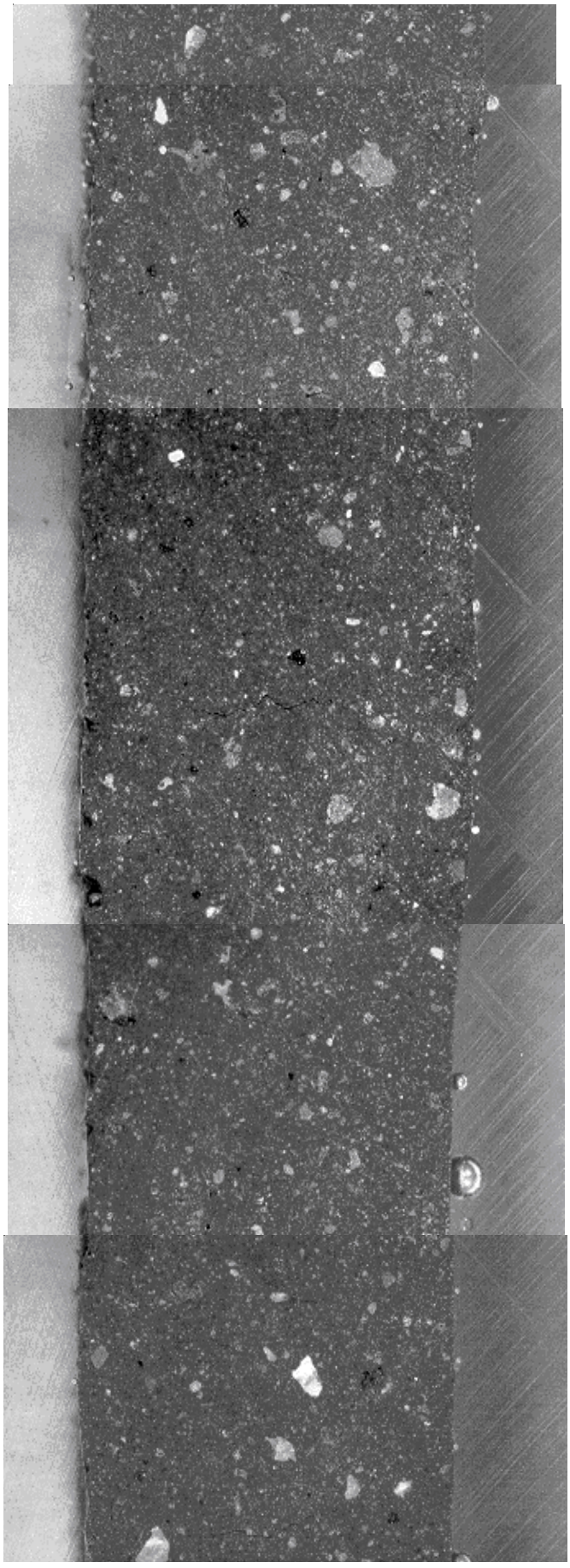
11.5 cm

12.5 cm

13.5 cm

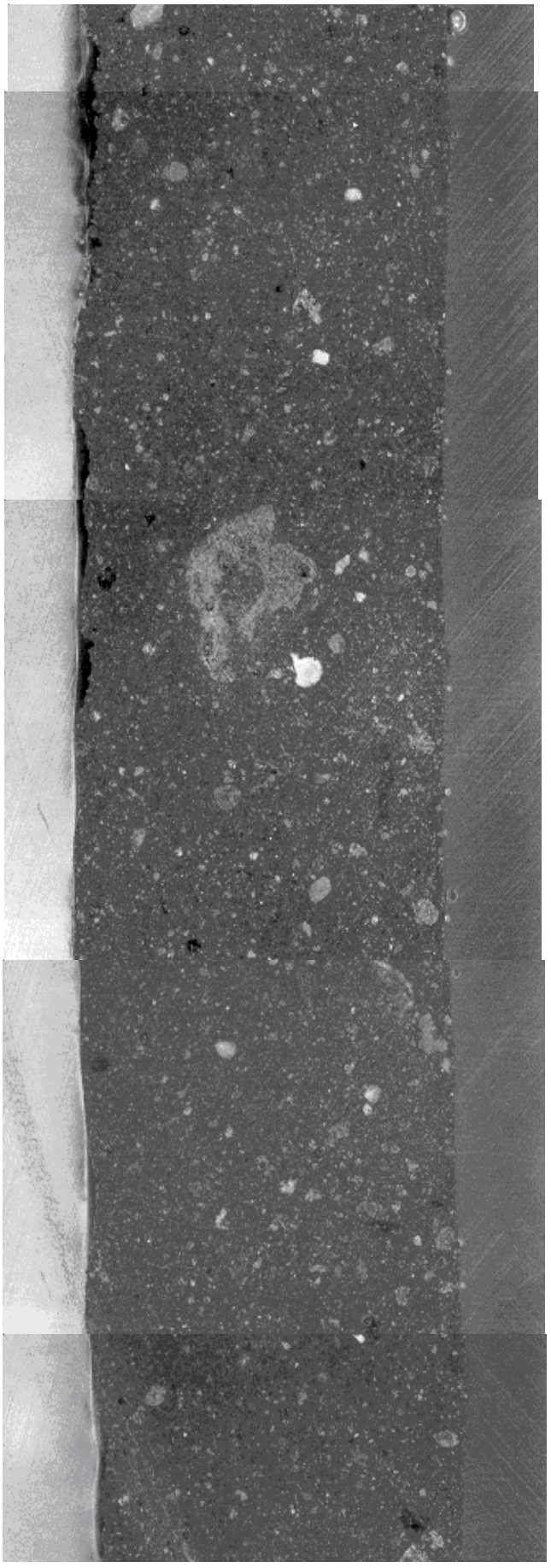
14.5 cm

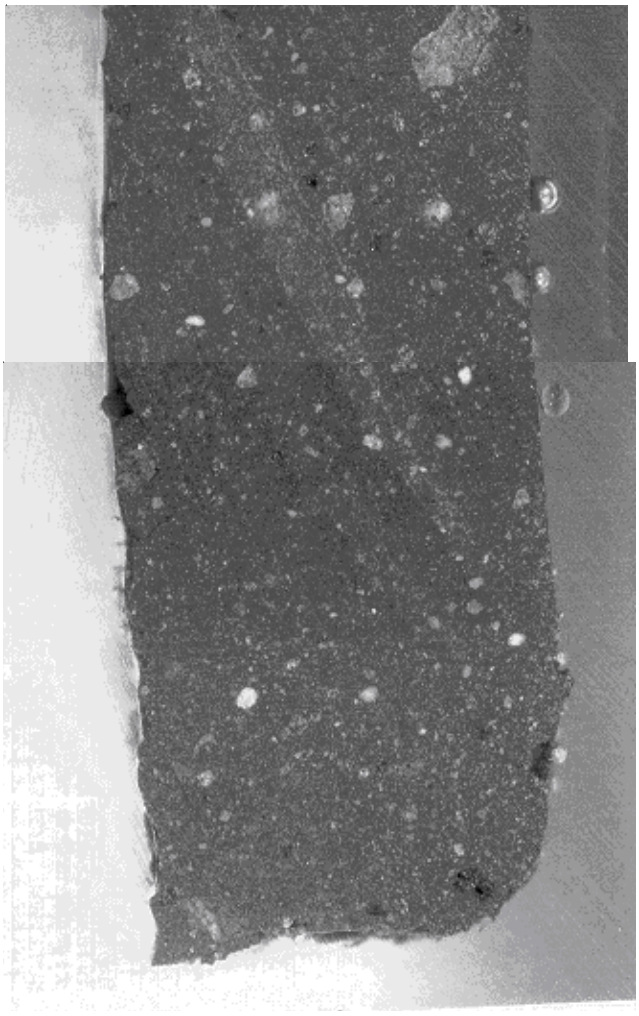

16.0 cm
17.5 cm

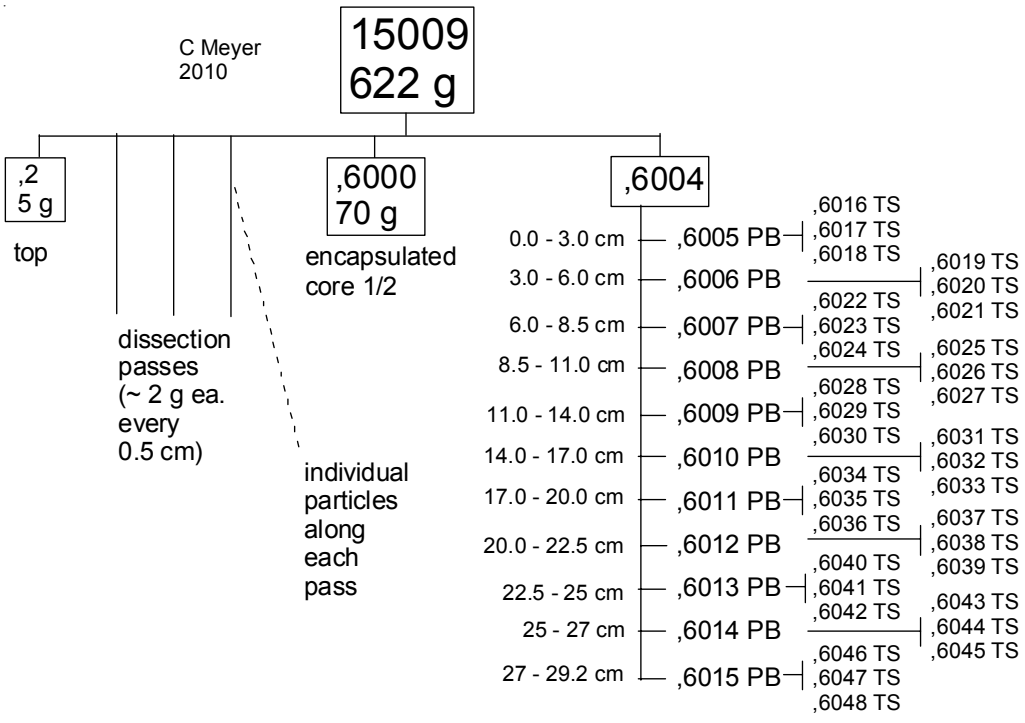


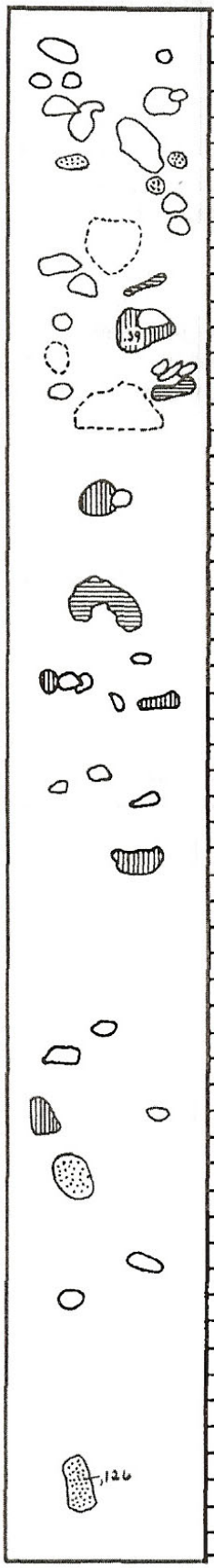
21.0 cm

22.5 cm


24.0 cm
25.0 cm


27.0 cm
28.0 cm
28.9 cm
bottom


C Meyer
2010
15009
622 g
,2
5 g
top
dissection
passes
(~ 2 g ea.
every
0.5 cm)
,6000
70 g
encapsulated
core 1/2
individual
particles
along
each
pass
,6004
0.0 - 3.0 cm
,6005 PB
,6016 TS
,6017 TS
,6018 TS
3.0 - 6.0 cm
,6006 PB
,6019 TS
,6020 TS
,6021 TS
,6022 TS
6.0 - 8.5 cm
,6007 PB
,6023 TS
8.5 - 11.0 cm
,6008 PB
,6024 TS
,6025 TS
,6026 TS
,6027 TS
,6028 TS
11.0 - 14.0 cm
,6009 PB
,6029 TS
14.0 - 17.0 cm
,6010 PB
,6030 TS
,6031 TS
,6032 TS
,6033 TS
,6034 TS
17.0 - 20.0 cm
,6011 PB
,6035 TS
20.0 - 22.5 cm
,6012 PB
,6036 TS
,6037 TS
,6038 TS
,6039 TS
,6040 TS
22.5 - 25 cm
,6013 PB
,6041 TS
25 - 27 cm
,6014 PB
,6042 TS
,6043 TS
,6044 TS
,6045 TS
,6046 TS
27 - 29.2 cm
,6015 PB
,6047 TS
,6048 TS



Depth (cm)	<1 mm Fraction Sample No.	<1 mm Fraction Sample Wt.	>1 mm Fraction Sample No.	>1 mm Fraction Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	11	.339	12	.035			
1.0	13	.480	14	.246			
1.5	15	.745	16	.120			
2.0	17	.687	18	.559			
2.5	19	.683	20	.703			
3.0	21	.837	22	.204			
3.5	23	1.073	24	.153			
4.0	25	.835	26	.159			
4.5	27	.669	28	.142			
5.0	29	1.015	30	.177			
5.5	31	1.033	32	.249			
6.0	33	1.162	34	.254	39	0.34	Breccia?
6.5	35	.841	36	.099			
7.0	37	1.088	38	.225			
7.5	40	1.123	41	.235			
8.0	42	.427	43	.082			
8.5	44	1.444	45	.103			
9.0	46	1.330	47	.055			
9.5	48	1.326	49	.580			
10.0	50	1.748	51	.044			
10.5	52	1.555	53	.018			
11.0	54	1.335	55	.034			
11.5	56	1.693	57	.407			
12.0	58	1.760	59	.081			
12.5	60	1.661	61	.149			
13.0	62	1.610	63	.531			
13.5	64	1.826	65	.149			
14.0	66	1.487	67	.108			
14.5	68	1.618	69	.120			
15.0	70	1.710	71	.128			
15.5	72	1.720	73	.133			
16.0	74	1.970	75	.056			
16.5	76	1.873	77	.269			
17.0	78	2.009	79	.168			
17.5	80	2.018	81	.067			
18.0	82	1.836	83	.095			
18.5	84	2.072	85	.060			
19.0	86	1.620	87	.050			
19.5	88	1.849	89	.155			
20.0	90	2.137	91	.185			
20.5	92	1.942	93	.053			
21.0	94	2.028	95	.045			
21.5	96	2.028	97	.296			
22.0	98	1.983	99	.073			
22.5	100	1.505	101	.137			
23.0	102	2.162	103	.326			
23.5	104	1.730	105	.079			
24.0	106	2.017	107	.106			
24.5	108	2.011	109	.175			
25.0	110	1.905	111	.187			
25.5	112	2.166	113	.135			
26.0	114	1.669	115	.174			
26.5	116	2.184	117	.126			
27.0	118	1.823	119	.158			
27.5	120	1.816	121	.245			
28.0	122	1.653	123	.108	126	0.383	Soil clod
28.5	124	1.832	125	.087			
29.0	127	1.649	128	.160			
29.3	129	1.447	130	.163			

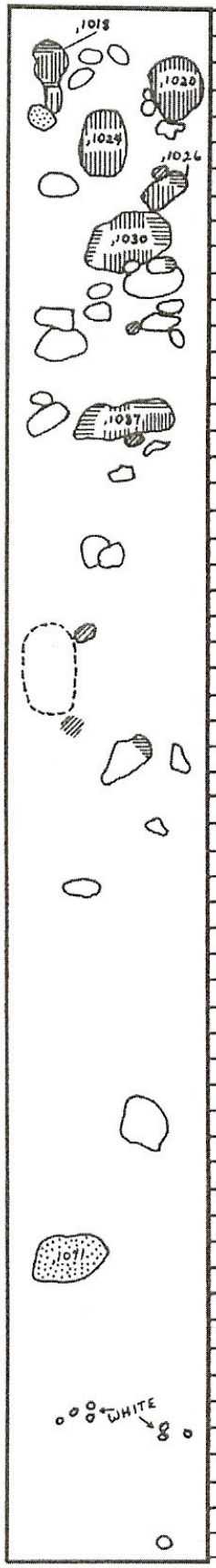
Breccia

Glass

Soil Clods

White

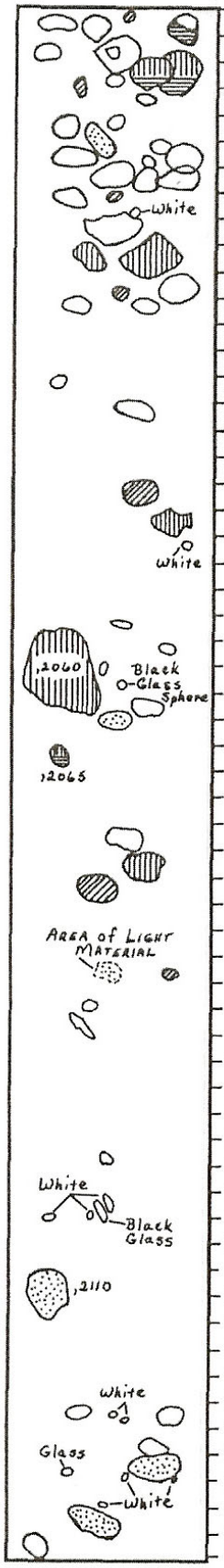
Figure 5: 15009, first dissection showing location of particles (Schwarz).



Depth (cm)	Unsieved Sample No.	Unsieved Sample Wt.	>1 mm Fraction Sample No.	>1 mm Fraction Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	1015	2.150					
1.0	1016	1.813					
1.5	1017	1.942			1018	0.559	S. Bx w/glass
2.0	1019	2.120			1020	0.525	S. Bx
2.5	1022	1.834					
3.0	1023	2.345			1024	0.540	S. Bx
3.5	1025	2.698			1026	0.380	S. Bx w/glass
4.0	1027	2.405					
4.5	1028	2.526			1030	1.581	S. Bx w/glass
5.0	1029	2.201					
5.5	1031	2.808					
6.0	1032	2.997					
6.5	1033	2.834					
7.0	1034	2.703					
7.5	1035	2.537					
8.0	1036	2.043			1037	2.836	S. Bx w/glass
8.5	1039	2.753					
9.0	1040	2.713					
9.5	1041	2.762					
10.0	1042	2.192					
10.5	1043	2.602					
11.0	1044	2.846					
11.5	1045	3.177					
12.0	1046	2.865					
12.5	1047	2.398					
13.0	1048	2.427					
13.5	1049	2.489					
14.0	1050	2.714					
14.5	1051	2.501					
15.0	1052	2.595					
15.5	1053	2.563					
16.0	1054	2.885					
16.5	1055	2.475					
17.0	1056	3.019					
17.5	1057	3.023					
18.0	1058	2.307					
18.5	1059	3.499					
19.0	1060	2.571					
19.5	1061	2.613					
20.0	1062	2.930					
20.5	1063	2.989					
21.0	1064	2.455					
21.5	1065	2.817					
22.0	1066	3.053					
22.5	1067	3.254					
23.0	1068	2.665					
23.5	1069	3.190					
24.0	1070	2.485			1071	0.479	Soil Clod
24.5	1072	3.001					
25.0	1073	2.883					
25.5	1074	3.026					
26.0	1075	3.149					
26.5	1076	3.189					
27.0	1077	3.118					
27.5	1078	3.284					
28.0	1079	3.101					
28.5	1080	2.776					
29.0	1081	2.510					
29.3	1082	2.442					

Breccia
Glass
Soil Clods
White

Figure :6 15009, second dissection showing location of particles (Schwarz).



Depth (cm)	<1 mm Fraction Sample No.	<1 mm Fraction Sample Wt.	>1 mm Fraction Sample No.	>1 mm Fraction Sample Wt.	Special Samples No.	Special Samples Wt.	Special Samples Type
0.5	2006	2.272	2007	0.698			
1.0	2008	2.293	2009	1.044			
1.5	2010	2.147	2011	0.760			
2.0	2012	1.591	2013	0.341			
2.5	2014	2.150	2015	0.707			
3.0	2016	1.985	2017	0.393			
3.5	2018	2.244	2019	0.676			
4.0	2020	2.455	2021	0.368			
4.5	2022	2.091	2023	0.284			
5.0	2024	2.245	2025	0.612			
5.5	2026	1.986	2027	0.275			
6.0	2028	2.623	2029	0.257			
6.5	2030	2.067	2031	0.132			
7.0	2032	2.626	2033	0.091			
7.5	2034	2.660	2035	0.079			
8.0	2036	2.053	2037	0.129			
8.5	2038	2.538	2039	0.051			
9.0	2040	2.926	2041	0.093			
9.5	2042	3.134	2043	0.195			
10.0	2044	2.873	2045	0.118			
10.5	2046	2.815	2047	0.075			
11.0	2048	2.375	2049	0.058			
11.5	2050	2.946	2051	0.075			
12.0	2052	2.901	2053	0.156			
12.5	2054	1.864	2055	0.066	2060	2.605	S. Breccia
13.0	2056	2.442	2057	0.099			
13.5	2058	2.739	2059	0.309			
14.0	2061	2.737	2062	0.228			
14.5	2063	2.269	2064	0.120	2065	0.537	Bx w/Glass
15.0	2066	3.157	2067	0.092			
15.5	2068	2.358	2069	0.112			
16.0	2070	3.104	2071	0.408			
16.5	2072	2.828	2073	0.161			
17.0	2074	3.178	2075	0.179			
17.5	2076	2.458	2077	0.051			
18.0	2078	2.678	2079	0.157			
18.5	2080	2.868	2081	0.049			
19.0	2082	2.987	2083	0.052			
19.5	2084	2.996	2085	0.094			
20.0	2086	3.146	2087	0.137			
20.5	2088	2.822	2089	0.038			
21.0	2090	3.055	2091	0.154			
21.5	2092	2.812	2093	0.072			
22.0	2094	2.787	2095	0.198			
22.5	2096	2.634	2097	0.268			
23.0	2098	2.870	2099	0.145			
23.5	2100	2.914	2101	0.183			
24.0	2102	2.609	2103	0.167			
24.5	2104	2.726	2105	0.216			
25.0	2106	2.096	2107	0.287	2110	1.238	S. Clod
25.5	2108	2.725	2109	0.137			
26.0	2111	3.204	2112	0.235			
26.5	2113	2.526	2114	0.359			
27.0	2115	2.996	2116	0.354			
27.5	2117	3.273	2118	0.422			
28.0	2119	3.143	2120	0.400			
28.5	2121	2.687	2122	0.237			
29.0	2123	2.509	2124	0.607			
29.3	2125	2.112	2126	0.145			

Breccia
Glass
Soil Clods
White

Figure 7: 15009, third dissection showing location of particles (Schwarz).

References for 15009.

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LSPET (1972a) The Apollo 15 lunar samples: A preliminary description. *Science* **175**, 363-375.

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Schwarz C. (1985) Dissection of 15009. Lunar News 51.

Swann G.A., Hait M.H., Schaber G.C., Freeman V.L., Ulrich G.E., Wolfe E.W., Reed V.S. and Sutton R.L. (1971b) Preliminary description of Apollo 15 sample environments. U.S.G.S. Interagency report: 36. pp219 with maps

Swann G.A., Bailey N.G., Batson R.M., Freeman V.L., Hait M.H., Head J.W., Holt H.E., Howard K.A., Irwin J.B., Larson K.B., Muehlberger W.R., Reed V.S., Rennilson J.J., Schaber G.G., Scott D.R., Silver L.T., Sutton R.L., Ulrich G.E., Wilshire H.G. and Wolfe E.W. (1972) 5. Preliminary Geologic Investigation of the Apollo 15 landing site. In Apollo 15 Preliminary Science Rpt. NASA SP-289. pages 5-1-112.