

**15245**  
Regolith Breccia  
115.5 grams

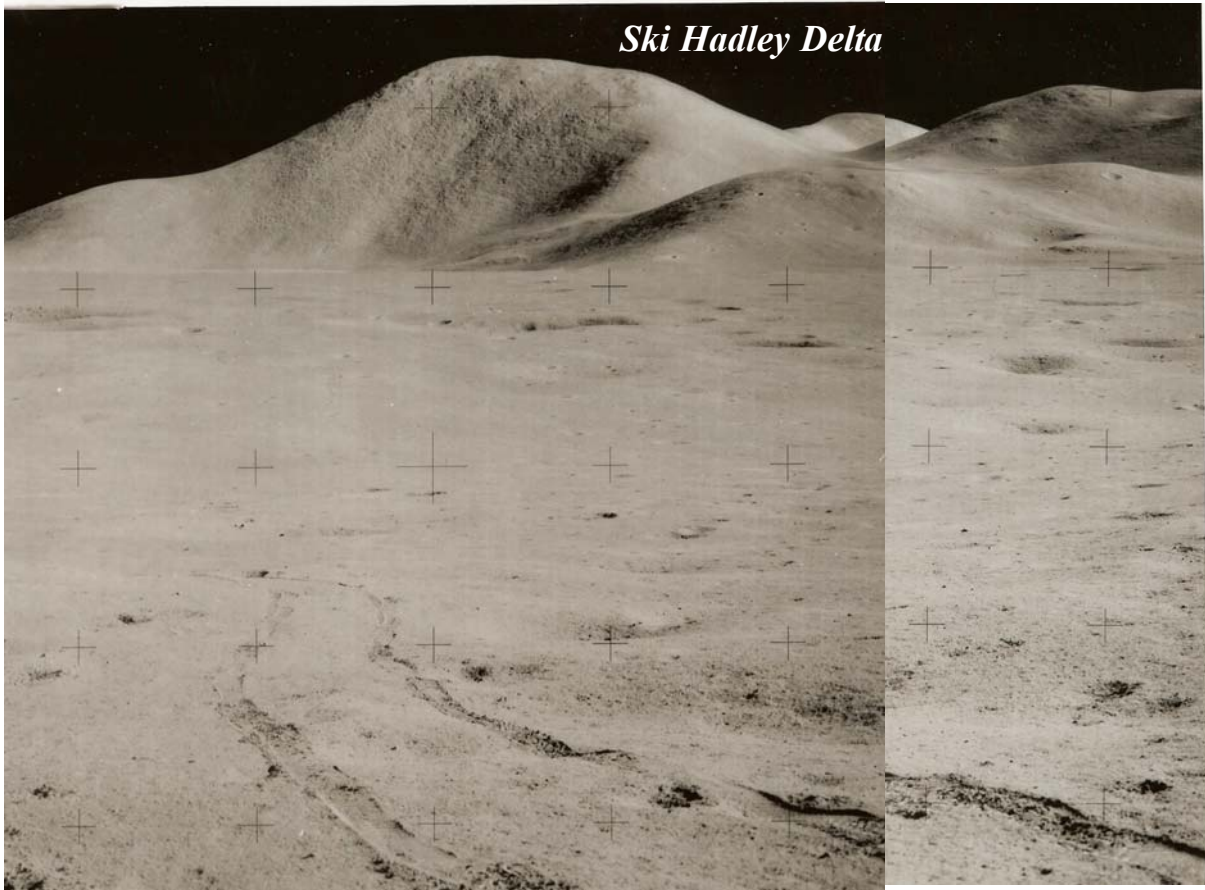


Figure 1: The first assect of the Apennine Front was an awesome event. The astronauts remarked that the scenery reminded them of Sun Valley, Idaho. This is what it looked like from station 6.

**Introduction**

15245 was collected from the glassy bottom of a small fresh crater (figure 3) – along with soil 15240. It was apparently picked up as a delicate glass-welded soil breccia (see transcript) which broke up into about 90 small fragments (figure 5), the largest of which was only 12 grams (figure 4).

The Apollo 11 astronauts were to first to remark on the abundance of shiny glass at the bottom of fresh craters, but this sample from Apollo 15 appears to be the best one collected and made available for study.

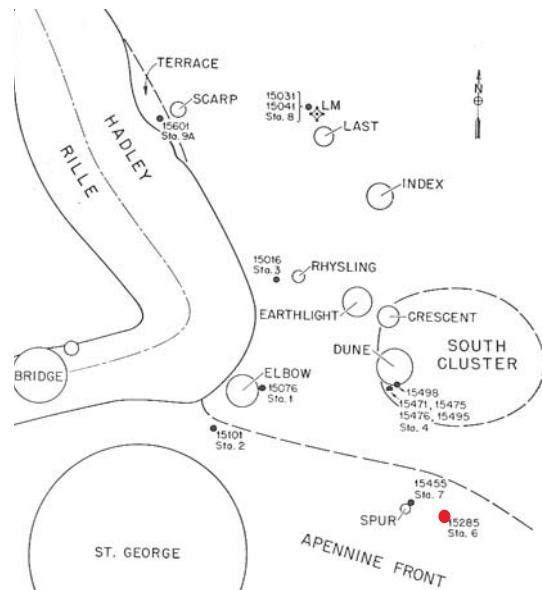


Figure 2: Location of 15245 on Apennine Front.

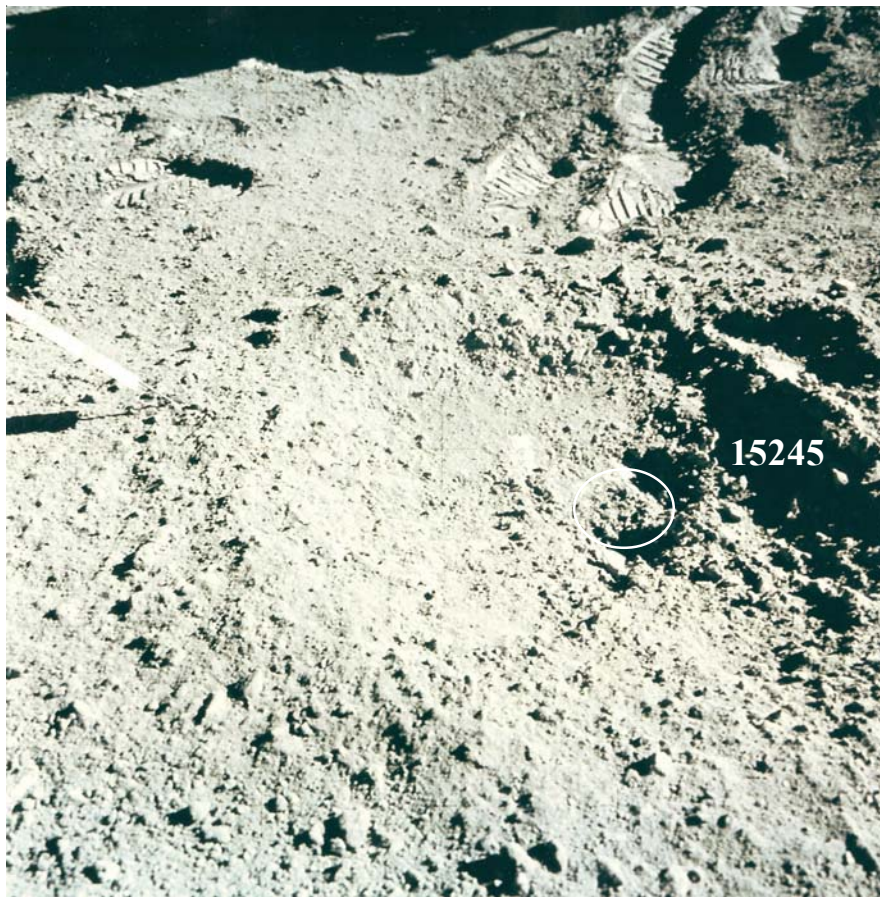


Figure 3: Small meter-sized crater where 15245 was collected. Leg of Gnomon is 50 cm. AS15-86-11614

Transcript

CDR There's one of those fresh little craters. Let's go sample that one.

LMP Got glass in the bottom.

CDR Okay. I'll get you a bag. And, it looks to me like the best thing to do – would be to – scoop the side – scoop the center where the glass is. Oh, what a beautiful sight. You know, we're a long way from the LM. At least we can see it.

LMP And we're going to sample the glass in the middle of it.

CDR Yes. Start with the middle, and we'll pick up the rim, too.

LMP It all felt kind of welded together.

CDR Hey, get me another load.

LMP I hope it stays together for us. Like fragments all glued together. What an intricate pattern.



Figure 4: Photo of 15245,37. About 2.5 cm across. S75-33757

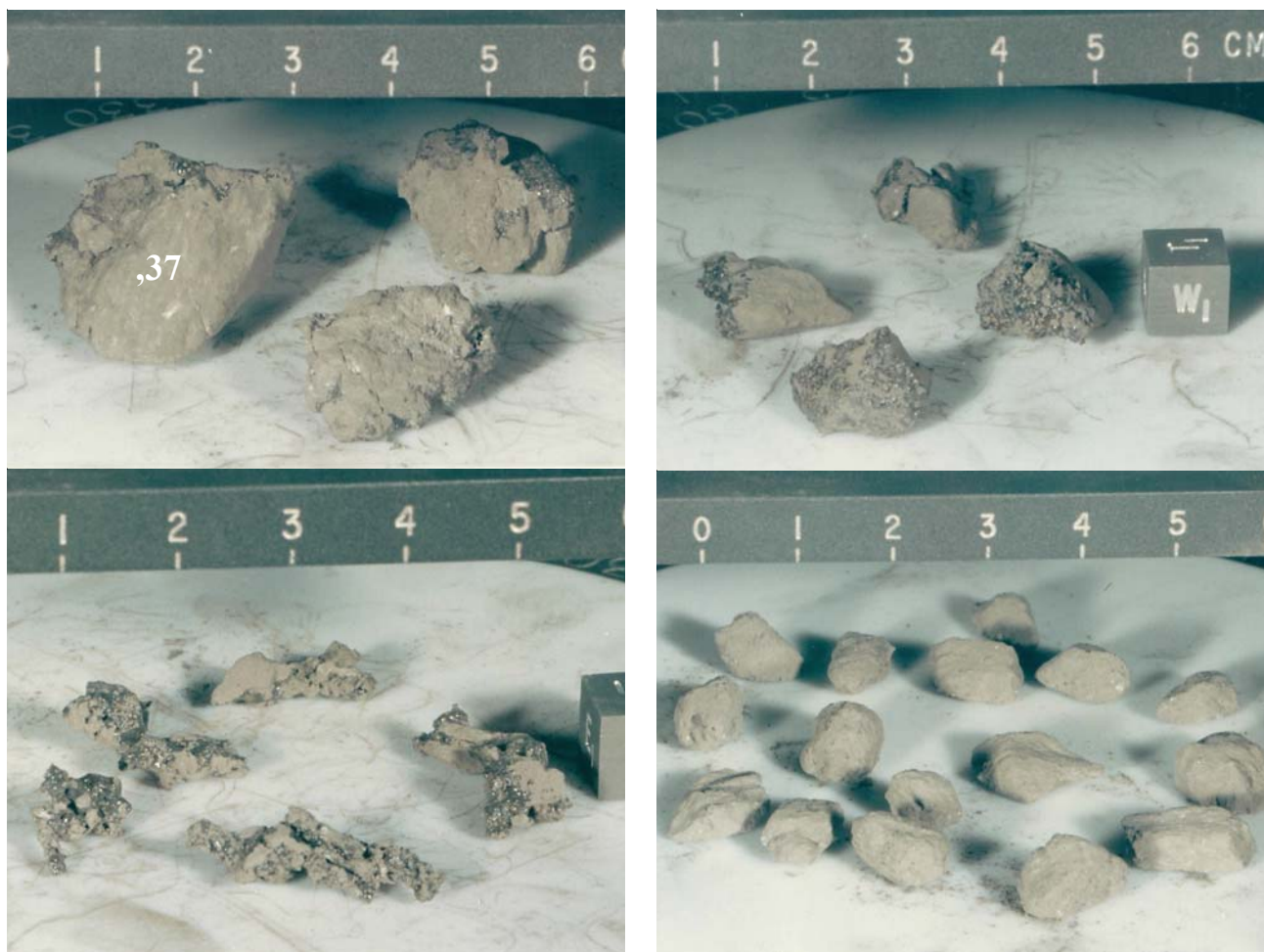


Figure 5: Photo of particles that make up 15245. Scale and cube are in cm. S71-47912, 47990, 47931, 47938

### **Petrography**

McKay et al. (1989) reported that the maturity index for 15245 was  $I_s/FeO = 41$ . They also reported a high percentage of agglutinates.

### **Chemistry**

Brunfelt et al. (1972), Wanke et al. (1976) and McKay et al. (1989) found that the bulk composition of 15245 was similar to that of the soil (figure 7). Moore et al. (1973) reported 132 ppm carbon (figure 8).

### **Other Studies**

Fabel et al. (1972) reported soft x-ray studies and gave an analysis that makes no sense at all.

Megrue (1973) determined He, Ne and Ar and their isotopic ratios to identify solar and cosmogenic components.

### **Processing**

There are only two thin sections of 15245.

### **Mineralogical Mode for 15245**

(McKay et al. 1989)

	20-500 micron	500-1000 micron
Mare Basalt	1.3 %	0 %
KREEP basalt	4	15.4
Plutonic	1	31
Breccias	6	23.1
Olivine	1	0
Pyroxene	14.7	0
Plagioclase	16.3	0
Opagues	0.7	0
Glass	13.7	15.4
Agglutinates	22	15.4

**Table 1. Chemical composition of 15245.**

reference weight	McKay89		Brunfelt72		Wanke 76	
SiO <sub>2</sub> %					48.4	(b)
TiO <sub>2</sub>	1.45		(a) 1.24			
Al <sub>2</sub> O <sub>3</sub>	16.3		(a) 15.78		17.4	(b)
FeO	11.8	11.9	(a) 12		12	(b)
MnO	0.16		(a) 0.22		0.16	(b)
MgO	10.6		(a) 10		10.8	(b)
CaO	10.2	11.4	(a) 9.8		10.8	(b)
Na <sub>2</sub> O	0.47	0.49	(a) 0.46		0.47	(b)
K <sub>2</sub> O					0.2	(b)
P <sub>2</sub> O <sub>5</sub>						
S %						
sum						
Sc ppm	22.8	22.6	(a) 21.9	(a) 23.5		(b)
V	73		(a) 76	(a) 84		(b)
Cr	2160	2180	(a) 3295	(a) 2210		(b)
Co	38.5	37.1	(a) 39	(a) 36		(b)
Ni	229	192	(a) 180	(a) 215		(b)
Cu						
Zn						
Ga						
Ge ppb						
As						
Se						
Rb			6.3	(a)		
Sr	145	130	(a) 115	(a) 160		(b)
Y						
Zr	350	410	(a)		368	(b)
Nb						
Mo						
Ru						
Rh						
Pd ppb						
Ag ppb						
Cd ppb						
In ppb						
Sn ppb						
Sb ppb						
Te ppb						
Cs ppm	0.29	0.29	(a) 0.49	(a) 0.28		(b)
Ba	257	277	(a) 210	(a) 290		(b)
La	25.7	27.5	(a) 25	(a) 26.3		(b)
Ce	68	73	(a)		71.2	(b)
Pr						
Nd	38	40	(a)		45.6	(b)
Sm	12	13.1	(a) 12.1	(a) 11.1		(b)
Eu	1.44	1.49	(a) 1.8	(a) 1.42		(b)
Gd						
Tb	2.36	2.58	(a) 2.7	(a) 2.57		(b)
Dy			10	(a) 15.5		(b)
Ho					3.7	(b)
Er						
Tm						
Yb	8.4	8.9	(a) 10.7	(a) 8.62		(b)
Lu	1.16	1.25	(a)	(a) 1.16		(b)
Hf	9.7	10.2	(a) 10.5	(a) 8.92		(b)
Ta	1.17	1.25	(a) 1.25	(a) 1.08		(b)
W ppb						
Re ppb						
Os ppb						
Ir ppb	8.7	6.7	(a)		8	(b)
Pt ppb						
Au ppb	3.1	2	(a)			
Th ppm	4.3	4.6	(a) 3.98	(a) 4.6		(b)
U ppm	1.13	1.1	(a) 1.02	(a)		

technique: (a) INAA, (b) various

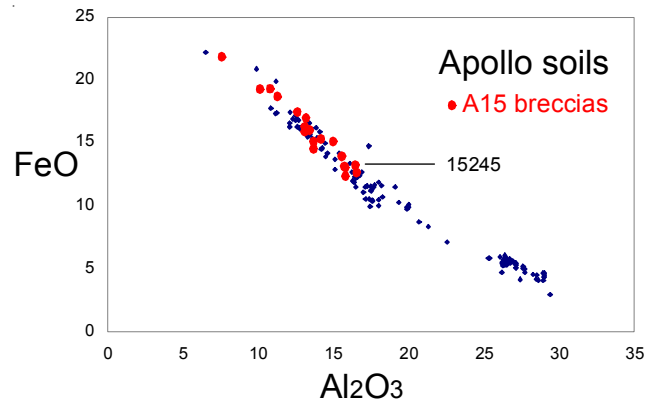


Figure 6: Composition of 15245 compared with that of Apollo soils and Apollo 15 breccias.

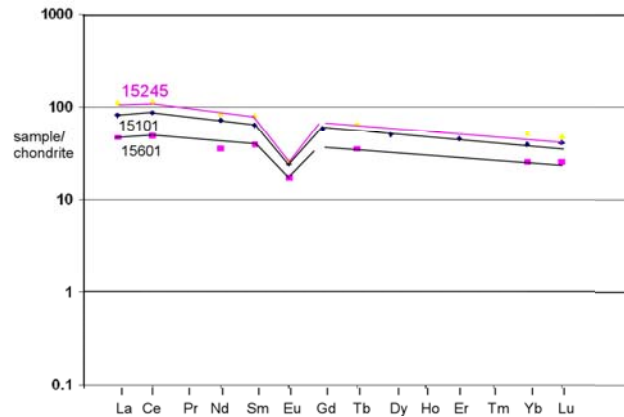


Figure 7: Normalized rare-earth-element diagram for 15245 compared with that of Apollo 15 soils.

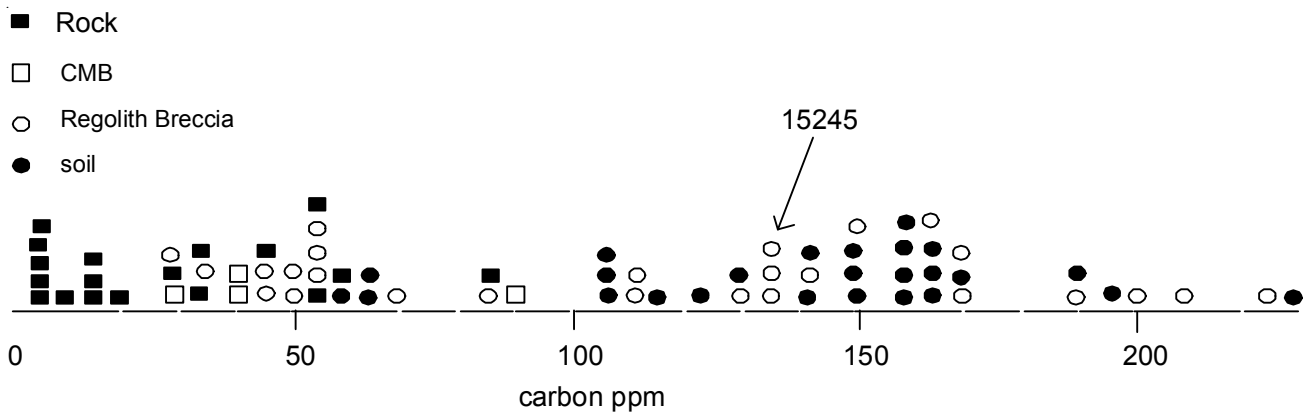
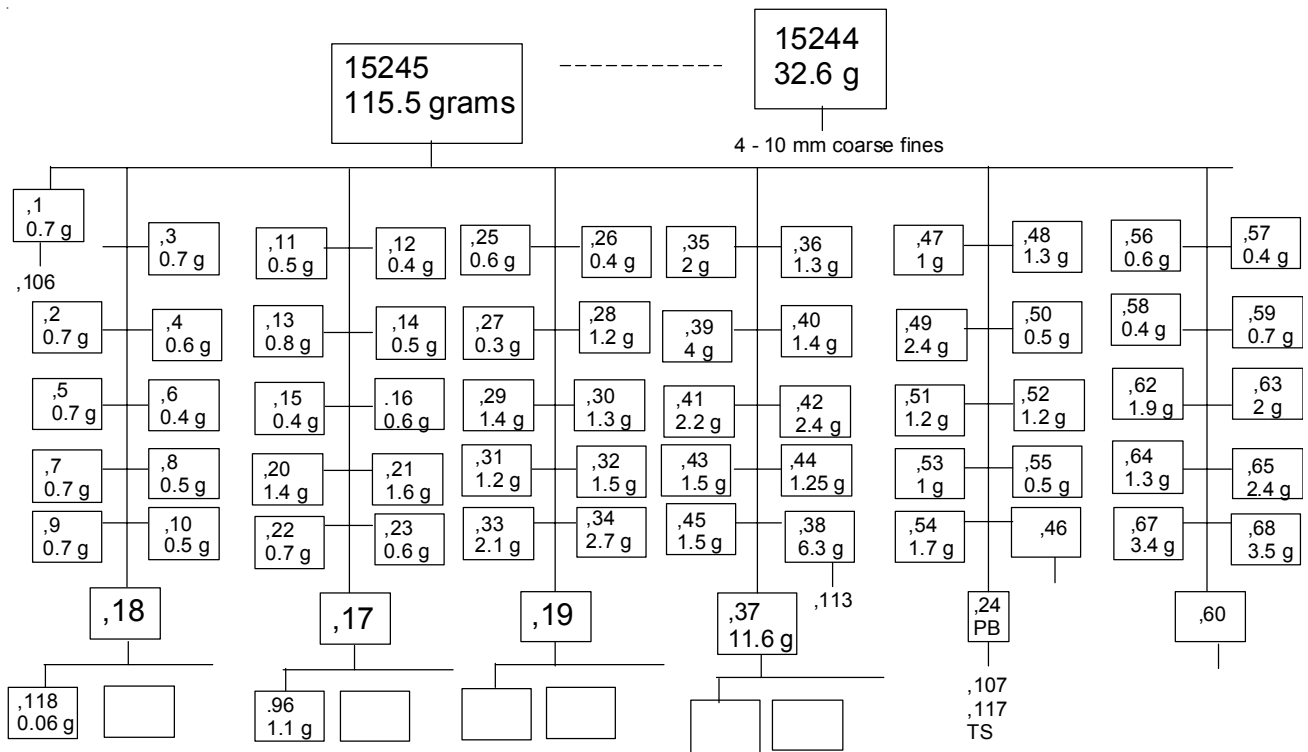


Figure 8: Carbon content of lunar soils, breccias and "rocks".

## References for 15245

- Brunfelt A.O., Heier K.S., Nilssen B., Steiennes E. and Sundvoll B. (1972) Elemental composition of Apollo 15 samples. In **The Apollo 15 Lunar Samples** (Chamberlain and Watkins, eds.), 195-197. Lunar Science Institute, Houston.
- Butler P. (1971) Lunar Sample Catalog, Apollo 15. Curators' Office, MSC 03209
- Fabel G.W., White W.B., White E.W. and Roy R. (1972) Structure of lunar glasses by Raman and soft x-ray spectroscopy. *Proc. 3<sup>rd</sup> Lunar Sci. Conf.* 939-951.
- LSPET (1972a) The Apollo 15 lunar samples: A preliminary description. *Science* **175**, 363-375.
- LSPET (1972b) Preliminary examination of lunar samples. Apollo 15 Preliminary Science Report. NASA SP-289, 6-1—6-28.
- McKay D.S., Morris R.V. and Wentworth S.J. (1984) Maturity of regolith breccias as revealed by ferromagnetic and petrographic indices (abs). *Lunar Planet. Sci.* **XV**, 530-531. Lunar Planetary Institute, Houston.
- McKay D.S., Bogard D.D., Morris R.V., Korotev R.L., Wentworth S.J. and Johnson P. (1989) Apollo 15 regolith breccias: Window to a KREEP regolith. *Proc. 19<sup>th</sup> Lunar Sci. Conf.* 19-41. Lunar Planetary Institute, Houston.
- Megrue G.H. (1973a) Spatial distributions of <sup>40</sup>Ar/<sup>39</sup>Ar ages in lunar breccia 14301. *J. Geophys. Res.* **78**, 3216-3221.
- Megrue G.H. (1973b) Distribution of gases within Apollo 15 samples: Implications for the incorporation of gases within solid bodies of the Solar System. *J. Geophys. Res.* **78**, 4875-4883.
- Moore C.B., Lewis C.F., and Gibson E.K. (1972) Carbon and nitrogen in Apollo 15 lunar samples. In *The Apollo 15 Lunar Samples* (Chamberlain J.W. and Watkins C., eds.), 316-318. The Lunar Science Institute, Houston.
- Moore C.B., Lewis C.F. and Gibson E.K. (1973) Total carbon contents of Apollo 15 and 16 lunar samples. *Proc. 4<sup>th</sup> Lunar Sci. Conf.* 1613-1923.
- Nagle J.S. (1982a) Evidence of subcrater lithification and hot ejecta deposition in lunar polymict regolith breccias and achondrites (abs). *Lunar Planet. Sci.* **XIII**, 568-569. Lunar Planetary Institute, Houston.
- Nagle J.S. (1982b) Subcrater lithification of polymict regolith breccias. *Proc. 13<sup>th</sup> Lunar Planet. Sci. Conf. in J. Geophys. Res.* **87**, A131-A146.
- Ryder G. (1985) Catalog of Apollo 15 Rocks (three volumes). Curatorial Branch Pub. # 72, JSC#20787
- Ryder G. and Sherman S.B. (1989) The Apollo 15 Coarse Fines. Curators Office #81, JSC#24035
- 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.
- Wänke H., Palme H., Kruse H., Baddenhausen H., Cendales M., Dreibus G., Hofmeister H., Jagoutz E., Palme C., Spettel B. and Thacker R. (1976) Chemistry of lunar highland rocks: a refined evaluation of the composition of the primary matter. *Proc. 7<sup>th</sup> Lunar Sci. Conf.* 3479-3499.