14305/14302

Two football-sized rocks (FSR) were collected about 80 meters NNW of the LM during the first EVA. Both were broken apart during transit to the LRL. The pieces were numbered 14305/14302, and 14303/14304. Sample 14305/302 was returned in weigh bag 1027 along with 14303/304 and fragments 14165-14189. All of these samples have similar lithologies, numerous fractures, and freshly broken surfaces, so the fragments 14165-14189 could be from either of the two. It is believed that these football-size rocks may have been transferred into weigh bag 1027 inside the LM, but this transfer was not documented. They were taken out of 1027 in the CRA before entering NNPL for examination.

Sample 14302 was later renumbered 14305,18.

PHYSICAL CHARACTERISTICS

	Mass	Dimensions
14305	2117 g	14 x 15 x 10 cm
14302 (14305,18)	380 g	14 x 3.5 x 6 cm
Combined	2497 g	14 x 20 x 10 cm

The sample is a medium *g*ray, holocrystalline, clast rich breccia which has been well-sintered together.

SURFACE FEATURES

The N_1 face is subrounded and heavily zap-pitted. It contains one large glass-lined pit 8 mm in diameter. This is the surface facing up in lunar photographs. The T_1, W_1, B_1, and part of S_1 (facing E) is made up of a flat planar fracture, surface containing no zap pits. The combined rock was found on the regolith surface about two-thirds exposed. The orientation is well-documented by photography, however, the distribution of zap pits on the buried surface indicates a different orientation at an earlier time. The planar fracture and zap-pit distribution indicate that 14305/302 was exposed as part of yet another rock and was subsequently broken off and projected to its documented orientation [more detailed discussion can be found in Swarm et al. (1971) and Horz et al. (1972)].

Except for three fractures parallel to the S_1 planar surface on the S_1-B_1 edge, the rock is relatively tough. It is easy to shape with a saw, and the clasts are well sealed in matrix.

The turbid and shattered feldspars are the only shock features visible on the surface.

PETROGRAPHIC DESCRIPTION

14305 is a clast-rich, holocrystalline breccia that has been well-sintered together. It is composed of a light gray fragmental matrix (~ 70%) with an average grain size less than 0.1 mm (Simonds et al., 1977). The mineralogy of the matrix is indeterminate in binocular observation, but appears to be plagioclase rich. Only a few percent of mafic silicates are recognizable. The rock has a seriate texture with clasts ranging in size from 10 cm down to the crystallites comprising the matrix. Approximately 30% of the rock is composed of clasts larger than 1 mm. Most of these clasts (80%) are themselves microbreccias of an older generation. A dominant clast lithology is a dark gray aphanitic microbreccia. Only a small percentage of the clasts are of a non-fragmental nature. These include white plagioclase-rich clasts (15%) and brown mare basalt

clasts (5%). All of the clasts are well-cemented to the matrix and cannot be broken free. One dark clast has a black glassy matrix containing 15% phenocrysts and microphenocrysts of subhedral white feldspar and pale green olivine. These phenocrysts are approximately 0.2 mm long set in the crypto-crystalline matrix. Maps of 14305,27; 14305,30; and 14305,18 (Twedell et al., 1978) show the three major clast types (plagioclase, dark gray microbreccia, and mare basalt) as well as several other clasts that are interesting.

In an attempt to characterize the nature of the sample, a reconstruction of slab 14305,46 was undertaken. 14305,46 was subdivided into five portions and each of these were made into probe mounts (14305,104-14305,108). Micro-photography at approximately 3.75x was undertaken and a photo mosaic reconstruction of the slab was made. A detailed mapping of those clasts 1 mm was made and the phases characterized (see figure 4).

As can be seen, the major clasts present include a variety of crystalline breccias and/or cumulates and scattered basaltic fragments. Most of the single mineral clasts lie below the size limitation set and only occasional small clasts of pyroxene and plagioclase are present. A few clasts of anorthositic breccia are also present. Only part of the clasts (as designated) show extensive shock effects. A total of six other sections with various parents were examined to give a more complete characterization of the rock.

The samples examined with the proper parent designated were:

Sample	Parent	Dominant Clasts ≥ 1 mm
14305,4	- ,1	Subdiabasic basalt, anorthositic breccia and fine-grained breccia.
14305,17	- ,11	Large, shocked single crystal pyroxenes, coarse-grained anorthositic breccia and fine-grained breccia.
14305,87	- ,44	Pyroxene/plagioclase cumulates, olivine bearing basalt, fine-grained breccia and single crystal shocked pyroxene.
14305,89	- ,55	Medium-grained breccia and a fine-grained breccia.
14305,95	- ,46	Single crystal pyroxene, subophitic basalt, fine-grained basalt, anorthositic breccia and pyroxene-plagioclase cumulates
14305,99	- ,37	Myrmekitic-like pyroxene crystal, ophitic basalt, fine-grained, glass-rich breccia with plagioclase spherulites, and fine grained anorthositic breccia.

In summing the results of this survey, the predominant type of clasts in these examples is a coarse-grained basalt to pyroxene-plagioclase cumulate. The next most abundant type is the fine-grained breccia. Wilshire and Jackson (1972) list the order of abundance of clasts larger than 1 mm in 14305:

1. Dark metaclastic, most abundant.
2. Intersertal to variolitic basalt.
3. Opaque minerals.
4. Intergranular basalt/plagioclase-pyroxene cumulate-recrystallized pyroxenes.

5. Orthopyroxene/aphanitic basalt/graphic quartz-alkali feldspar/re-crystallized plagioclase, least abundant.

DISCUSSION

Sample 14305 is listed as an F_4 by Wilshire and Jackson (1972), and as a shocked, strongly annealed, Fra Mauro breccia by Chao et al. (1972). It is listed as a grade 6 (high-grade metamorphic) by Warner (1972) and as a crystalline matrix breccia of the Fra Mauro type by Simonds et al. In their studies of the mineral and chemical variations in these samples, Brown et al. (1972) found fragments and lenses of rhyolite, which they believed to have been derived from melting of crystalline granophyre fragments. Several granophyre fragments were observed. K-feldspar in one granophyre (14305,111) contains 4.1% BaO. Dence and Plant (1972) note that in section 14305,5 annealed glass, predominantly of Fra Mauro basalt composition, encloses small amounts of potassic granite. In their discussion of the effects of micro cratering on the lunar surface, Gault et al. (1972) pointed out the deep fracture cutting across the spalled region surrounding a large glass-lined pit. This impact apparently almost ruptured the rock, and is a good example of the violent and catastrophic disruption that is caused by particles which are capable of forming a crater with a diameter that is a significant fraction of the rock's dimensions discussed in the study by Gault et al. (1972). Sample 14305 is described by Morrison et al. (1972) as being heavily cratered on all major surfaces indicating a complex exposure history. A discussion of the surface orientation is presented in an article by Hörz et al. (1972).

14305,0 and ,18 (originally 14302), cube is 1 inch, S-71-31391

14305,18 was originally numbered 302,S-77-21474

14305,29 S-75-33045

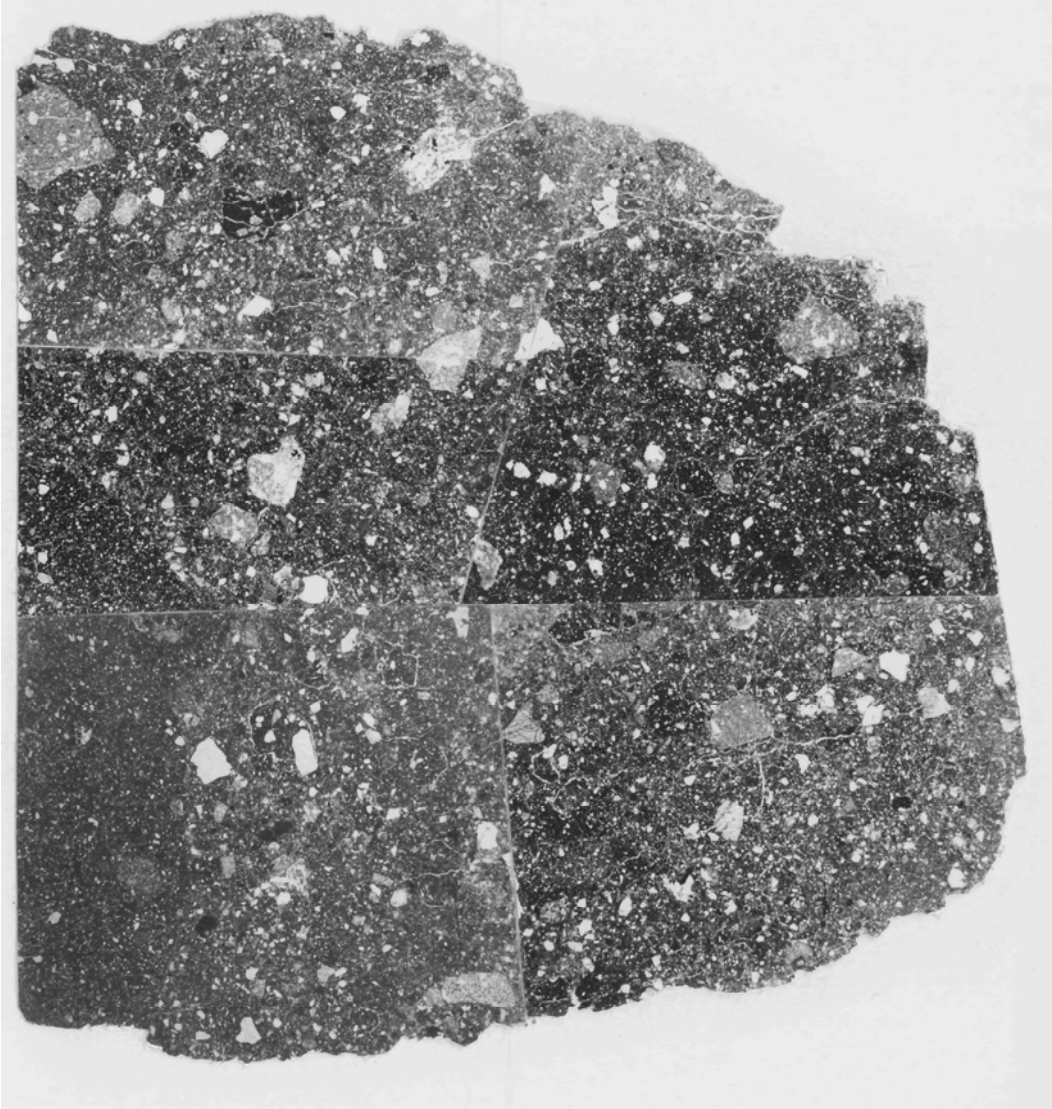


Figure 4a. Reconstructed slab from sample 14305.

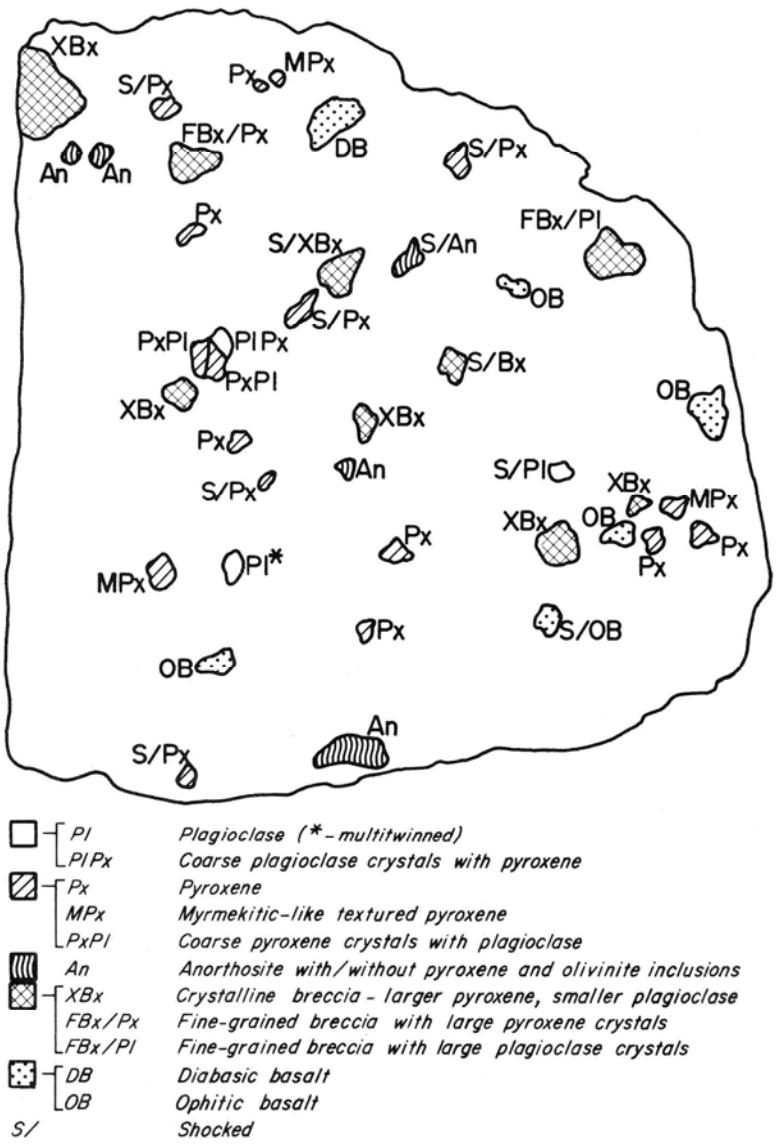
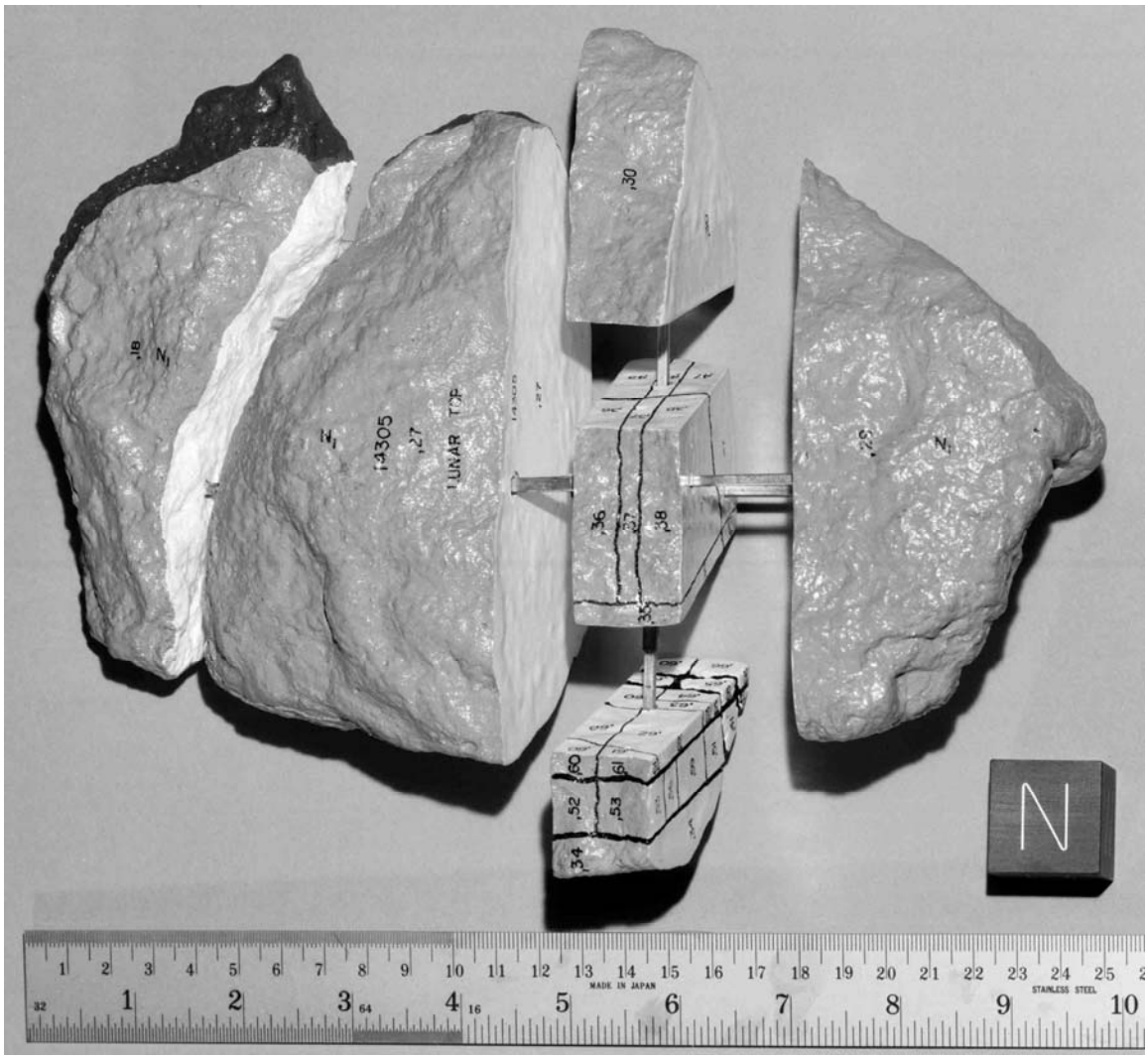


Figure 4b. Map of clasts in reconstructed slab of sample 14305.

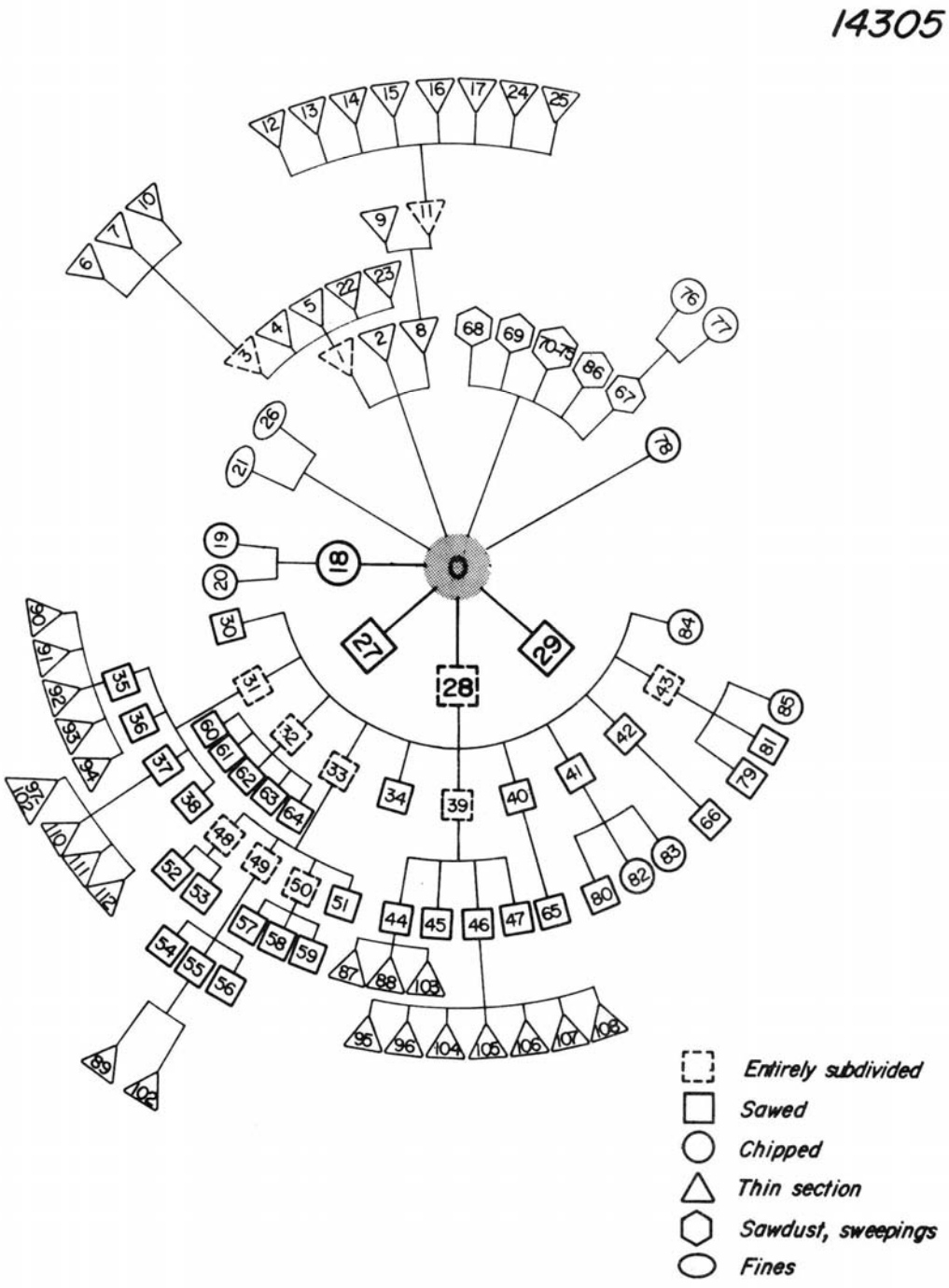
SAMPLE MODELS AND GENEOLOGIES

In order to facilitate the job of determining specific sample orientation and orientation within the parent, as well as for historical interest, models of the larger lunar samples have been constructed by the curatorial staff. Photographs of the models made of Apollo 14 samples are included in this section to acquaint the scientific community with their availability and to help lunar scientists identify the original location of their sample within the parent rock.

Genealogies of several Apollo 14 samples have been made and are also included. These genealogies do not reflect any processing which has taken place since the first thin section was made of each sample. It is hoped that these methods of illustrating samples will prove useful, and will become a routine part of sample documentation procedure.



Model of 14305, S-78-26755



Sample Genealogy