

14303 and 14304

These samples are pieces of a football-size rock collected from a location 80 m NNW of the LM during EVA I. This rock was almost completely buried in the regolith and its orientation is unknown. Both of these samples have freshly broken surfaces. They were first identified as pieces of the same rock in March, 1977, when the models of the rock were found to fit together along their freshly broken surfaces. They share a common lithology which is especially evident along the broken surfaces. These samples were returned together in weigh bag 1027 which also contained sample 14305/302 and various smaller chips (see Phinney et al., 1975). These samples were examined in the CRA and NNPL by the PET, and 14303 was extensively distributed for scientific experimentation. Sample 14304 has been designated a posterity sample.

PHYSICAL CHARACTERISTICS

Mass	Dimensions
14303 898. g	16 x 9 x 7 cm
14304 2499. g	20 x 11 x 10 cm

This rock is a coherent, gray, blocky to subrounded breccia.

SURFACEFEATURES

The sample is saturated with zap pits and is considerably fractured in some places. The zap pits range in size from less than 0.1 - 7 mm on 14303 to 0.1 - 3 cm for 14304. The pits are lined with a dark brown botryoidal to bubbly glass. This glass is 0.2 mm thick in the larger zap pits.

There are at least two sets of fractures on these samples, so that although the rock is tough with clasts firmly imbedded in the matrix, the rock would break apart if handled roughly.

PETROGRAPHIC DESCRIPTION

14303: This rock is a polymict breccia with a holocrystalline matrix. The average grain size is approximately 0.2 mm with 95% of the grains less than 1 mm. Approximately 40% of the rock is white, turbid plagioclase averaging 0.1 mm in size. Olivine fragments are rare as are pyroxene fragments. Thin coatings of black glassy material on part of the lithic fragments give them the appearance of black glass fragments.

14304: This sample is also a polymict breccia with a holocrystalline matrix and it appears to have the same grain size distribution as 14303 (Simonds et al., 1977, their figure 1).

Approximately 35% of the fragments are larger than 1 mm. These are rounded to subangular. The large fragments are darker than those in 14303, consisting of dark gray, microbreccia fragments from an earlier generation. The clast mineralogy is subhedral, white, feldspar and brownish green olivine. Pyroxene is also present but is difficult to resolve except in thin section.

Mapping of 14303,7 and 14304,0 shows the distribution of pits, clasts, and fractures on various faces (Twedell et al., 1978).

In an attempt to characterize the nature of this generic, 3 thin sections with different parents were chosen for modal analysis of the ≥ 1 mm clasts. The samples examined with the proper parent designated were:

<u>Sample</u>	<u>Parent</u>	<u>Dominant Clast \geq 1 mm</u>
14303,49	,17	Plagioclase shards, dark metaclastic rocks, light metaclastic rocks and coarse-grained plutonic rocks
14303,51	,23	Coarse-grained plutonic rocks, dark metaclastic rocks, light metaclastic rocks and plagioclase shards
14303,52	,19	Dark metaclastic rocks, light metaclastic rocks, coarse to fine-grained plutonic rocks and coarse-grained cumulates to crystalline breccias

In summing the results of this summary, the predominant type of rock clast in this generic is the dark metaclastic variety. This is in agreement with Wilshire and Jackson (1972). As can be seen from the results, local variations increase other types of clasts, but the general trend is the same.

Weigand and Hollister (1972) studied adjacent polished thin sections 14303,47 and 14303,53. They found that the sample consists of mineral, lithic, and fragmental clasts. Mineral clasts range up to 2 mm in size and are predominantly plagioclase with pyroxene, olivine, and small disseminated opaque minerals also present. Three distinct fragmental clasts are described: plagioclase and pyroxene in a light matrix (the largest of which is at least 2.5 x 3.5 mm in size), with accessory opaque minerals; one with a gray matrix with a few opaque grains and many disseminated ones, and the main constituent mineral clasts are plagioclase and pyroxene. The plagioclase grains have a fine mosaic texture, probably a shock effect, and the pyroxene grains are described as being unusually large. Basaltic lithic fragments are also present.

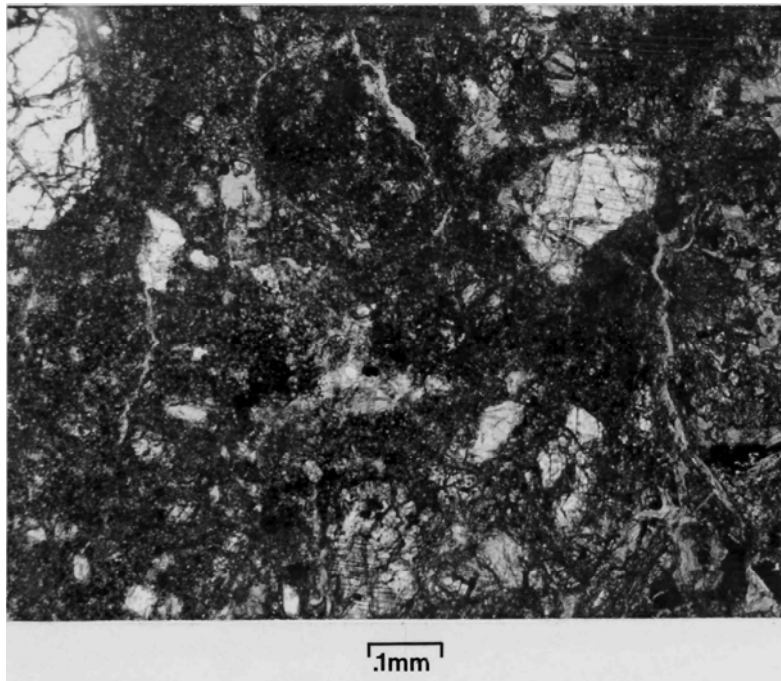
DISCUSSION

Wilshire and Jackson (1972) found this sample to be coherent with dark clasts, placing it in their F₄ category. Chao et al. (1972) described 14303 and 14304 as shocked, strongly annealed Fra Mauro breccias (2c) and Warner (1972) placed them in his group 6. Quaide and Wrigley (1972) placed them in their annealed breccia group and Simonds et al. (1977) list them as crystalline matrix breccias (CMB). Weigand and Hollister (1972) interpret their study of polished thin sections as indicating that the pyroxenes originally crystallized in a plutonic-metamorphic environment beneath the pre-Imbrium crust. Groundmass pyroxenes are mainly pigeonites and augites, and are interpreted as being fragments of quickly cooled surface basalts.

Roedder and Weiblen (1972) studied melt inclusions in 14303 and found much evidence of a complex thermal history. They note that the groundmass of sample 14303 must have excess (normative) SiO₂ in it, because all olivine grains in contact with it (other than fayalite) have reacted to form thin, almost monomineralic, rims of pyroxene. They find, as did Weigand and Hollister (1972) that at least some of the original rocks have undergone slow cooling. They note that some plagioclase single crystal clasts are almost spherical, presumably by abrasion in transport.



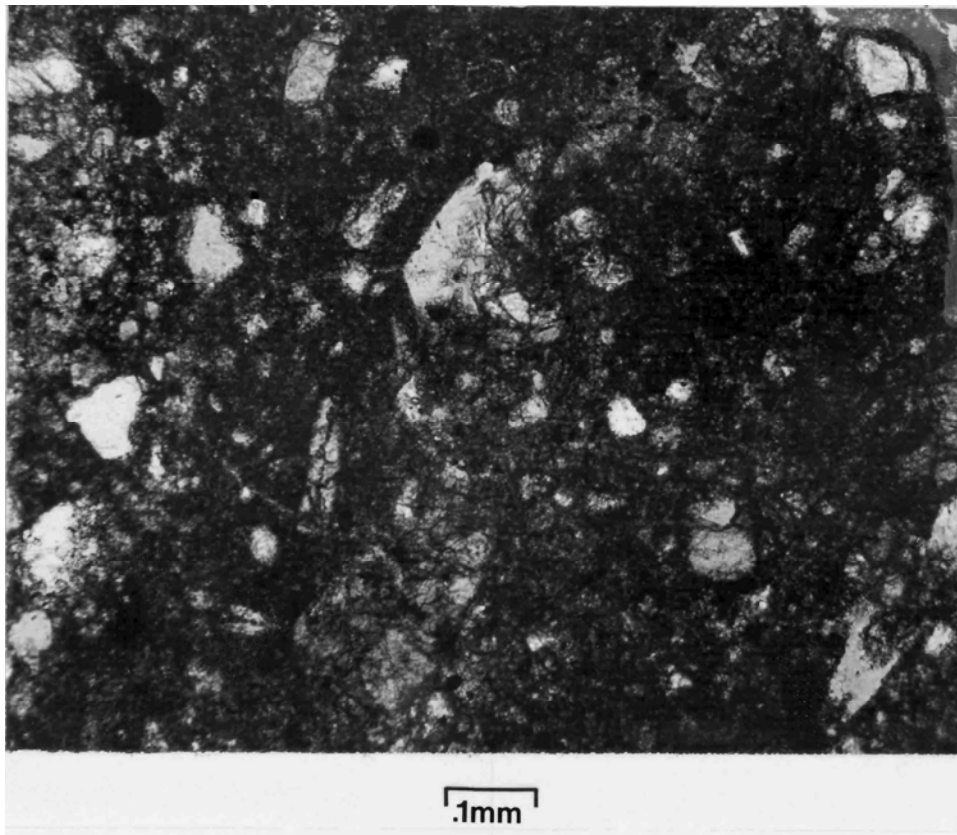
14303: width of image is approximately 7.5 cm, the block is 1 cm, S-77-23372



14303,52



14304: width of image is approximately 8 cm, the block is 1 cm, S-77-23099

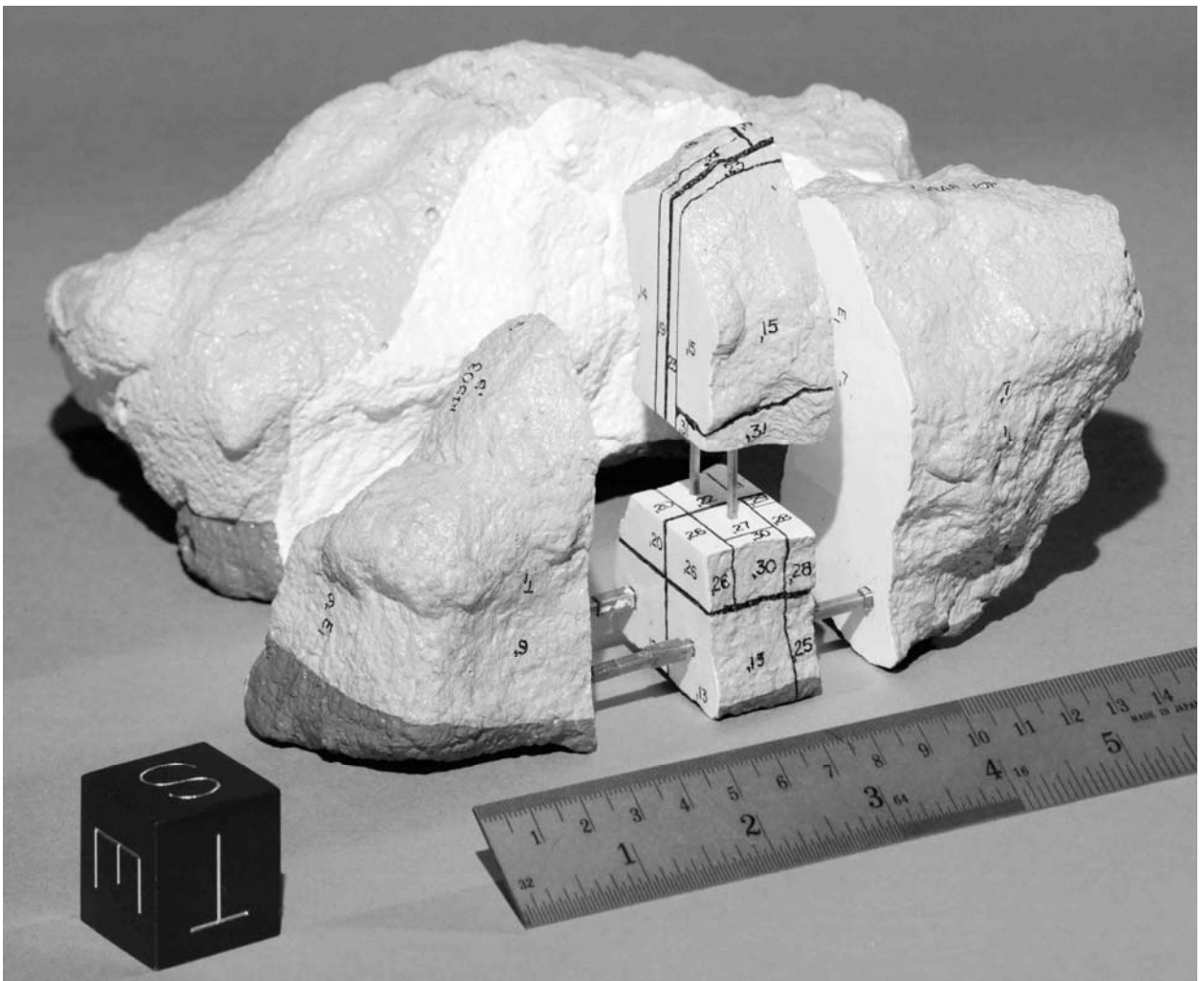


14304,13

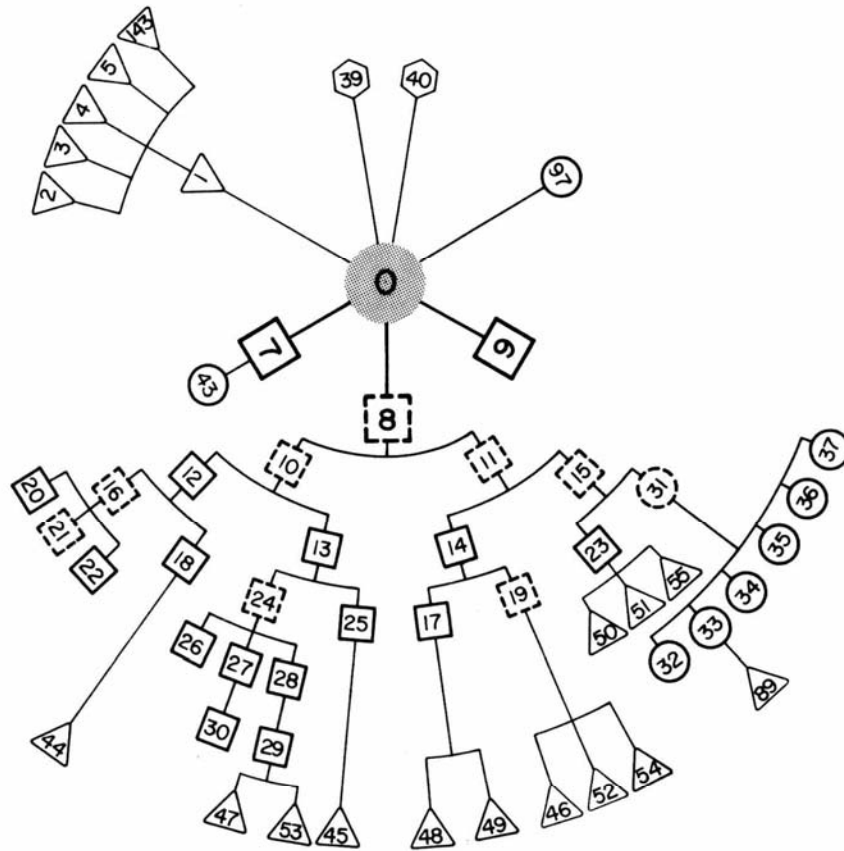
SAMPLE MODELS AND GENEALOGIES

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 for 14303/304



- Entirely subdivided
- Sawed
- Chipped
- △ Thin section
- ⬡ Sawdust, sweepings

Sample genealogy