

DESCRIPTION, CLASSIFICATION, AND INVENTORY  
OF THE COMPREHENSIVE SAMPLE FROM APOLLO 14

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*Houston, Texas*  
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## Comprehensive Sample from Apollo 14

### Introduction

The need for a statistically significant set of small rock samples for petrographic characterization of the distribution of rock types in various areas of the lunar regolith was recognized shortly after the first return of lunar samples. A raking tool was developed and utilized effectively for this purpose on the Apollo 15, 16, and 17 missions. Although this tool was under development before the Apollo 14 flight it was not quite ready in time for the mission. Therefore, an alternate method of collection was developed with the Apollo 14 crew. This involved, first, marking a 2 to 3 meter diameter circle in an appropriate area, second, collecting with the tongs all of the walnut sized rocks on the surface within the circle, and third, collecting a soil sample from within the circle.

Near the end of the first EVA a comprehensive sample location was selected about 100 to 125 m. west of the LM. Two weigh bags were used for the samples: weigh bag #1039 containing the rock fragments and weigh bag #1007 containing the soil. However, as discussed in the Apollo 14 Preliminary Science Report (p. 74) there was some confusion about the origin of the contents of a third weigh bag, #1027, which contained 20 small rock fragments, 14169 through 14188, and a large undocumented rock, 14303. On the basis of their association with two documented rocks (14304 and 14305) returned in the same weigh bag and collected near the comprehensive sample site the 20 fragments and 14303 were tentatively considered as parts of the comprehensive sample.

## Inventory of Apollo 14 Comprehensive Sample

Sample Number	Mass	Rock Type	Comments
14169	78.66	Fragmental matrix, polymict breccia	Fragment from 14303
14170	26.34	do.	do.
14171*	37.79	do.	do.
172	32.10	do.	do.
173	19.59	do.	do.
174	11.62	do.	do.
175	7.48	do.	do.
14176	4.12	do.	do.
177	2.32	do.	do.
178	2.88	do.	do.
179	3.03	do.	do.
180	4.75	do.	do.
14181	2.48	do.	do.
182	2.29	do.	do.
183	1.40	do.	do.
184	1.48	do.	do.
185	1.52	do.	do.
14186	1.26	do.	do.
187	1.90	do.	do.
188	1.60	do.	do.

\*Samples that have been previously allocated

Sample Number	Mass	Rock Type	Comments
14250	4.06	Friable, fragmental microbreccia (soil breccia)	
14251	1.51	do.	
252	0.86	do.	
253	1.23	Crystalline breccia	
254	1.01	Glass with adhering microbreccia	
255	22.15	Friable, fragmental microbreccia (soil breccia)	
14264	117.8	Vitric breccia	
265	65.79	Fragmental microbreccia	
14266	6.95	Fragmental matrix, polymict breccia	
267*	54.77	Vitric breccia	
268	23.12	do.	
269	17.19	Fragmental microbreccia	
270*	25.59	Fine-grained, crystalline breccia	
14271	97.41	Vitric breccia	
272	46.63	do.	
273	22.4	do.	
274	15.18	High-grade, crystalline, polymict breccia	
275	12.46	Low-grade, polymict breccia	
14276*	12.75	Medium-grained crystalline rock	
277	7.59	Vitric breccia	
278	7.6	Low-grade, polymict breccia	
279	5.67	Fragmental matrix, polymict breccia	
280	6.20	Vitric breccia	

\*Samples that have been previously allocated

Sample Number	Mass	Rock Type	Comments
14281	12.03	Vitric breccia	
282	1.89	Friable, fragmental, microbreccia (soil breccia)	
283	1.25	High-grade, crystalline, polymict breccia	
284	1.47	Fragmental microbreccia	
285	2.23	Low-grade, polymict breccia	
14286	4.42	Fragmental microbreccia	
287	1.07	do.	
288	3.44	Vitric breccia	
14303*	898.	Fragmental matrix, polymict breccia	Probably not from comprehensive sample

\*Samples that have been previously allocated

A summary of the contents of the three weigh bags is shown in the following table:

Weigh bag number	rock samples	soil samples
1007	*14250 (originally 14300) *14251 through 14255	14256 through 14259 14298 and 14299 (reserves)
1039	14264 through 14288	**14260 through 14263
1027	14169 through 14188 14303 through 14305	†14165 through 14168

\* rocks separated from soil samples.

\*\*soil collected simultaneously with rock fragments.

† residue from bottom of weigh bag (mostly 2-4 and 4-10 mm fragments).

All of the rock samples except 14304 and 14305 from the three weigh bags were studied and described with the aid of a binocular microscope. As the rocks from weigh bag 1027 were being studied two points became clear: 1) all of the small samples 14169 through 14188 are identical in their lithologies and they, in turn, are identical to 14303, 2) all of the small samples display freshly fractured surfaces with no patination or zap pits: Most have only freshly fractured surfaces and all of the remaining samples display patination or zap pits over only a very limited amount of their surfaces. The large sample of the same lithology, 14303, displays one end with many freshly fractured surfaces. It seems clear that all of the 20 samples, 14169 through 14188, are fragments that broke away from 14303 during packing and transport. Although the location of 14303 is still somewhat questionable, the rocks, 14169 through 14188, should not be considered as fragments collected as part of the comprehensive sample.

This document contains: 1) a description and photograph of each fragment from the comprehensive sample, 2) lithologic groupings of the comprehensive sample and 3) a single description of the group 14169 through 14188 and 14303.

## Lithologic Groupings of Apollo 14 Comprehensive Sample

Sample Number	Mass (gm)	Description	Comments
14303*	898.	Fragmental matrix, polymict breccia	Probably not from comprehensive sample
14169	78.66	do.	Fragment from 14303
14170	26.34	do.	do.
14171*	37.79	do.	do.
14172	32.10	do.	do.
14173	19.59	do.	do.
14174	11.62	do.	do.
14175	7.48	do.	do.
14176	4.12	do.	do.
14177	2.32	do.	do.
14178	2.88	do.	do.
14179	3.03	do.	do.
14180	4.75	do.	do.
14181	2.48	do.	do.
14182	2.29	do.	do.
14183	1.40	do.	do.
14184	1.48	do.	do.
14185	1.52	do.	do.
14186	1.26	do.	do.
14187	1.90	do.	do.
14188	1.60	do.	do.

\*Samples that have been previously allocated



Sample Number	Mass (gm)	Description	Comments
14266	6.95	Fragmental matrix, polymict breccia	
14279	5.67	do.	
14250	4.06	Friable, fragmental microbreccia (soil breccia)	
14251	1.51	do.	
14252	0.86	do.	
14255	22.15	do.	
14282	1.89	do.	
14254	1.01	Glass with adhering microbreccia	
14265	65.79	Fragmental microbreccia	Intermediate in color and coherence between friable microbreccias and vitric breccias
14269	17.19	do.	do.
14284	1.47	do.	do.
14286	4.42	do.	do.
14287	1.07	do.	do
14264	117.8	Vitric breccia	
14267*	54.77	do.	
14268	23.12	do.	
14271	97.41	do.	
14272	46.63	do.	
14273	22.4	do.	
14277	7.59	do.	

\*Samples that have been previously allocated

Sample Number	Mass (gm)	Description	Comments
14280	6.20	Vitric breccia	
14281	12.03	do.	
14288	3.44	do.	
14275	12.46	Low-grade, polymict breccia	
14278	7.6	do.	
14285	2.23	do.	
14274	15.18	High-grade, crystalline, polymict breccia	
14283	1.25	do.	
14270*	25.59	Fine-grained, crystalline breccia	
14253	1.23	Crystalline breccia	
14276*	12.75	Medium-grained crystalline rock	

\*Samples that have been previously allocated

Generic No: 14250

Rock Type: Fragmental, friable micro-breccia (soil breccia)

Weight (g): 4.06

Dimensions (cm): 2.7 x 1.5 x 1.5

Color (fresh): Medium gray (N5)

Shape: Blocky, subangular

Variability: Homogeneous

Coherence: Intergranular - moderately friable; fracturing - few, non-penetrative

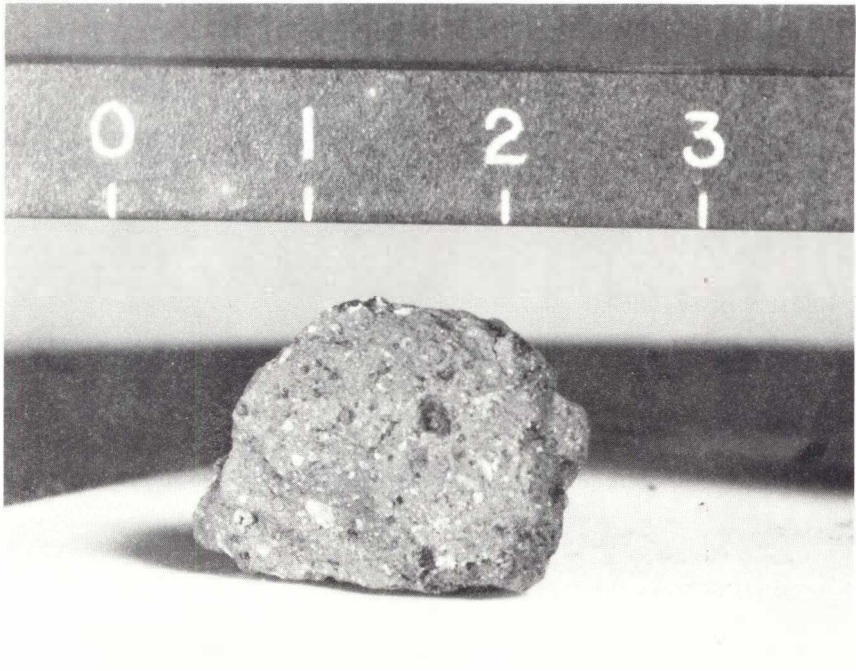
Fabric/texture: Seriate microbreccia

Cavities (%): None

Surface (face): Irregular

Zap pits (density/face): Pits lined with dark brown glass on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray (N5)	85	?	<0.1		Composed of individual fragments, not coherent glass
Lithic clast	Gray and white	<5	Round to subround	0.5	up to 1.0	Largely milky white feldspar with irregular gray areas
Mineral clast I	White	10-15	Subangular to subround	0.5	up to 1.0	Most appear to be crushed plagioclase
Mineral clast II	Light green	<5	Subangular to subround		up to 1.0	Probably olivine



14250



14251

Generic No: 14251  
Rock Type: Fragmental, friable, micro-breccia (soil breccia)

Weight (g): 1.51

Dimensions (cm): 1.5 x 1.0 x 0.3

Color (fresh): Medium gray (N5)

Shape: Block, angular, some corners rounded

Variability: Glass coating over one surface

Coherence: Intergranular - glass is tough, rock is friable; fracturing - several, non-penetrative

Fabric/texture: Seriate microbreccia

Cavities (%): 0.2 to 0.6 mm diameter vesicles make up 40% of glass, none in rock

Surface (face): Irregular with glass on one surface, striated or slicken sided on some surfaces

Zap pits (density/face): A few pits must have existed as evidenced by a few remains of glass linings.

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray (N5)	85	?	< 0.1		Composed of individual fragments, not coherent glass
Lithic clast	Gray and white	< 5	Round to subround	0.5	up to 1.0	Largely milky white feldspar with irregular gray areas
Mineral clast I	White	10-15	Subangular to subround	0.5	up to 1.0	Most appear to be crushed plagioclase
Mineral clast II	Light green	< 5	Subangular to subround		up to 1.0	Probably olivine

Special Features: Slicken sides, or grooves, converge towards a point for several surfaces as though from a shatter cone.

Generic No: 14252

Rock Type: Fragmental, friable micro-breccia (soil breccia)

Weight (g): 0.86

Dimensions (cm): 1.3 x 0.8 x 0.3

Color (fresh): Medium gray (N5)

Shape: Subround to angular, 1/4 sphere

Variability: Homogeneous

Coherence: Intergranular - moderately friable; fracturing - some, non-penetrative

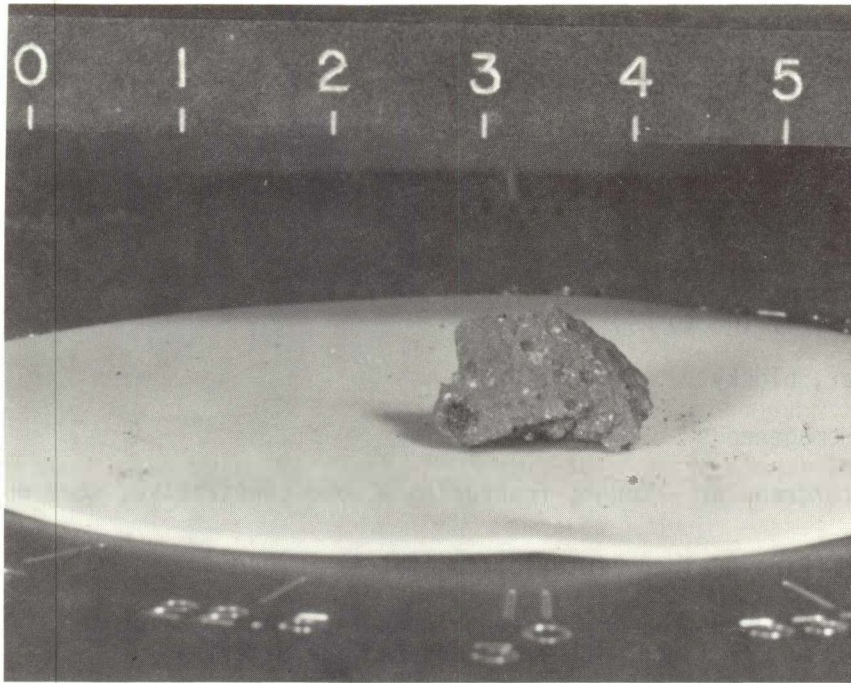
Fabric/texture: Seriate microbreccia

Cavities (%): None

Surface (face): Irregular to smooth on the rounded face

Zap pits (density/face): Several, dark-brown glass-lined on rounded surface, angular faces have no pits

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray (N5)	85	?	<0.1		Composed of individual fragments, not coherent glass
Lithic clast	Gray and white	<5	Round to subround	0.5	up to 1.0	Largely milky white feldspar with irregular gray areas
Mineral clast I	White	10-15	Subangular to subround	0.5	up to 1.0	Most appear to be crushed plagioclase
Mineral clast II	Light green	<5	Subangular to subround		up to 1.0	Probably olivine



14252



14253

Generic No: 14253  
Rock Type: Crystalline breccia

Weight (g): 1.23

Dimensions (cm): 1.6 x 1.0 x 0.4

Color (fresh): Gray (N3 to N4)

Shape: Angular, blocky

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - some penetrative, some non-penetrative

Fabric/texture: Fine-grained, interlocking matrix

Cavities (%): Vugs, 0.2 to 1 mm, concentrated at one end make up <5%. One large vug, 3 mm, is lined with white crystalline material.

Surface (face): Rough, hackly

Zap pits (density/face): Glass lined pits, 0.5 to 2.0 mm on two eroded surfaces. None on other hackly surfaces.

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Gray	95	Equant		0.1 - 0.2	Appears to be annealed
Mineral clast I	Very light gray	5	Round		<1.0	Plagioclase, some with gradational white to gray contacts with matrix
Mineral clast II	Light greenish yellow	1	Round		<0.5	Pyroxene and/or olivine



Generic No: 14254

Rock Type: Frothy black glass with some adhering soil

Weight (g): 1.01

Dimensions (cm): 1.6 x 1.1 x 0.8

Color (fresh): Glass is black, soil is brownish gray

Shape: Highly irregular

Variability: Mostly glass with adhering soil

Coherence: Intergranular - glass is tough, soil is very friable; fracturing - none in glass

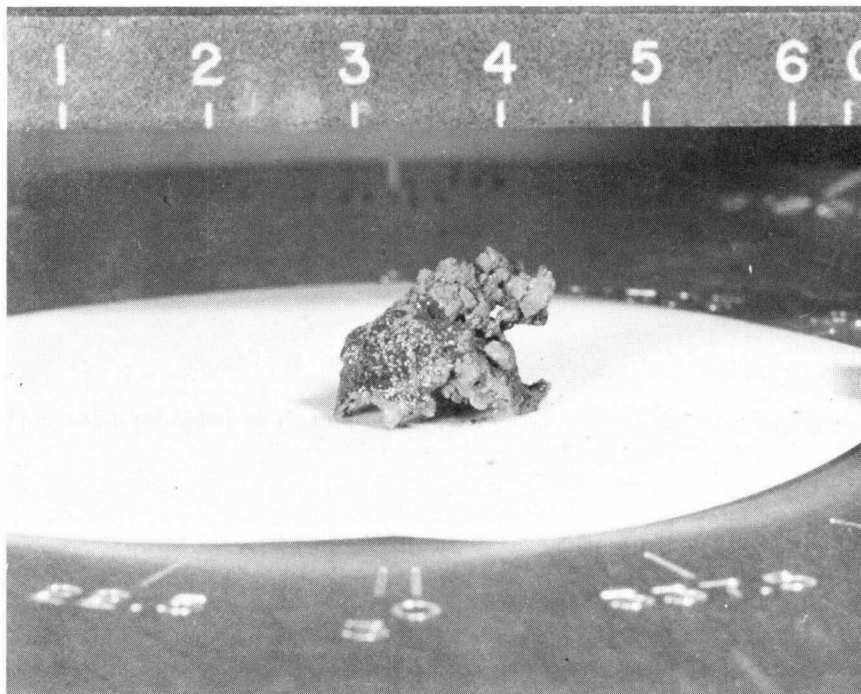
Fabric/texture:

Cavities (%): Vesicles, 0.1 to 1.0 mm, make up at least 30% of glass

Surface (face): Rough

Zap pits (density/face): None

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Glass	Black	80			Aphanitic	
Soil	Brownish gray	20		<0.1		Similar to 14250



14254



14255

Generic No: 14255

Rock Type: Fragmental, friable micro-breccia (soil breccia)

Weight (g): 22.15

Dimensions (cm): 1.2 x 2.2 x 2.5

Color (fresh): Medium gray (N5)

Shape: Blocky, subangular

Variability: Typical breccia with glass splash on some surfaces

Coherence: Intergranular - moderately friable, fracturing - few, non-penetrative

Fabric/texture: Seriate microbreccia

Cavities (%): None in rock, glass splash is very vesicular

Surface (face): Rock surface is rough, glass spatter 0.1 to 1 mm thick on three surfaces (25% of surface area), slicken sides on some surfaces.

Zap pits (density/face): Glass linings up to 1.0 mm in diameter indicate that pits were present on all surfaces.

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray (N5)	85	?	<0.1		Composed of individual fragments, not coherent glass
Lithic clast	Gray and white	<5	Round to subround	0.5	up to 1.0	Largely milky white feldspar with irregular gray areas
Mineral clast I	White	10-15	Subangular to subround	0.5	up to 1.0	Most appear to be crushed plagioclase
Mineral clast II	Light green	<5	Subangular to subround		up to 1.0	Probably olivine

Special Features: Slicken sides, or grooves, converge towards a point on some surfaces as though from a shatter cone.

Generic No: 14264  
Rock Type: Vitric breccia

Weight (g): 117.8

Dimensions (cm): 5.0 x 4.5 x 4.0

Color (fresh): Dark gray

Shape: Blocky, subrounded to angular

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - few, non-penetrative

Fabric/texture: Seriate microbreccia

Cavities (%): A few clusters of rounded cavities, <1 mm, make up <1% of rock, a few slit-like cavities on fresh surface.

Surface (face): Surfaces are relatively smooth except for one that is fresh and rough

Zap pits (density/face): Some pits on all surfaces except the fresh one

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark gray	65-70		aphanitic		Appears to be glassy
Lithic clast I	Very light gray	15	Round	<5	up to 14	Contain equal portions of crushed white material (plagioclase) and crushed light yellow-brown material in areas about 0.5 to 1 mm across. Also scattered black opaque material 0.1 - 0.3 mm across.
Lithic clast II	Medium gray	15	Subangular to subround	<1	up to 5	Most are mottled light and dark gray, the dark gray being somewhat vitreous



14264



14265

19

Generic No: 14265

Rock Type: Fragmental microbreccia

Weight (g): 65.79

Dimensions (cm): 5.5 x 4.5

Color (fresh): Rock is medium dark gray, glass is dark greenish gray to black

Shape: Angular

Variability: Half of rock surface is glass-coated, most of rock is homogeneous microbreccia with veins of glass

Coherence: Intergranular-coherent; fracturing - many, penetrative, some filled with glass

Fabric/texture: Seriate microbreccia

Cavities (%): None in rock, glass is finely vesicular

Surface (face): 50% glass coated, remainder is irregular

Zap pits (density/face): Traces of what may have been glass linings of zap pits on the breccia suggest that some surfaces may have been pitted but abrasion has removed most of the evidence. No pits on the glass.

<u>Component</u>	<u>Color</u>	<u>Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	85-90	?	<0.1		Does not have resinous appearance of glass, may be aphanitic crystalline
Lithic clast I	Very light gray	10-15	Subangular to subround	<1.0	up to 3	Various proportions of crushed white and gray material. Some of the gray is somewhat vitreous
Lithic clast II	Medium light gray	<1	Subround to subangular		<1.0	Appears to be finely recrystallized
Mineral clast I	Light yellow-green	<2	Subround		<1.0	Probably olivine
Mineral clast II	Reddish brown	<1	Subround		<1.0	Probably pyroxene

Special Features: Appears to be intermediate in color and coherence between vitric breccias and fragmental, friable microbreccias (soil breccias).

Generic No: 14266

Rock Type: Fragmental matrix, polymict breccia

Weight (g): 6.95

Dimensions (cm): 2 x 2 x 1

Color (fresh): Light medium gray (N6)

Shape: Rounded, slabby

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - very few, non-penetrative

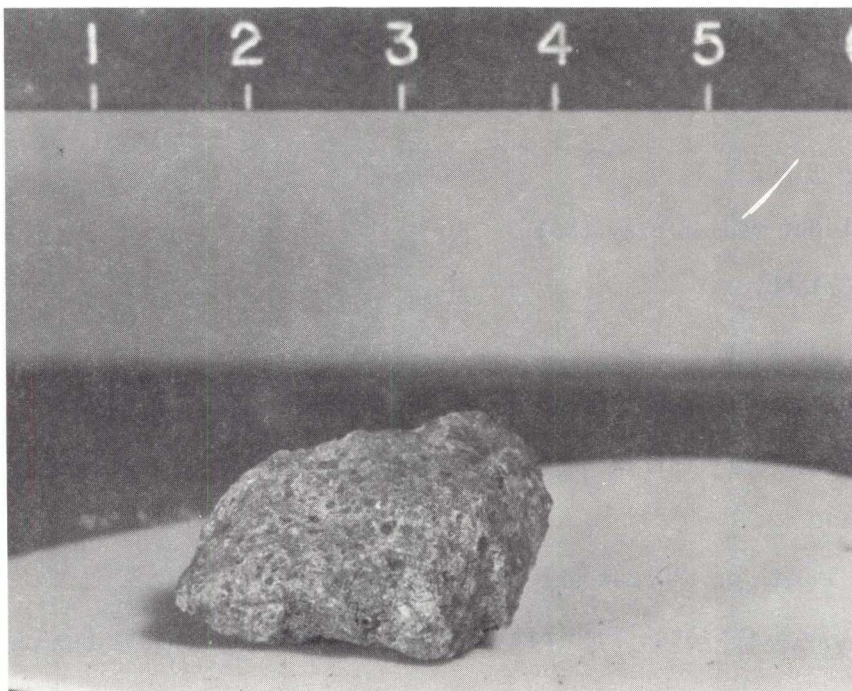
Fabric/texture: Fragmental matrix breccia with seriate clast size distribution

Cavities (%): None

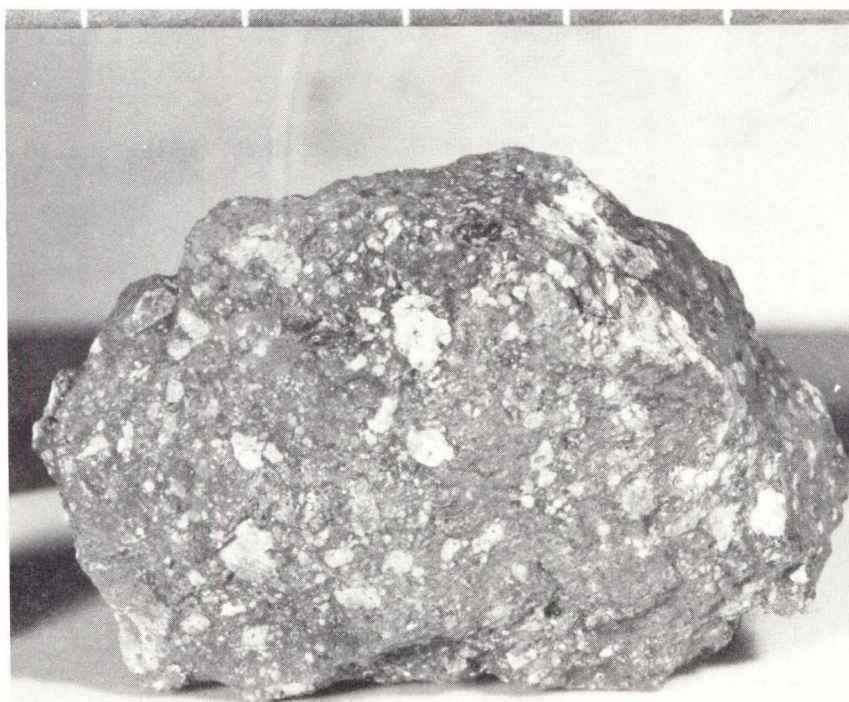
Surface (face): Smooth on all but one that is hackly

Zap pits (density/face): Glass-lined pits up to 1 mm diameter on all but one surface

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light gray	50-55			0.1 - 0.2	Sugary texture, mixture of white and gray material
Lithic clast	Gray	40	Subangular to subround	1.0	up to 3.0	Breccias with gray aphanitic matrix and a few small white clasts
Mineral clast I	White	5	Subangular to subround	<1.0	up to 3.0	Plagioclase grains in various degrees of crushing. One grain has a cleavage face about 1 mm across
Mineral clast II	Light green	<1	Subround		<1.0	Probably olivine
Mineral clast III	Light brown	<1	Subround		<1.0	Probably pyroxene



14266



14267

22



Generic No: 14267  
Rock Type: Vitric breccia

Weight (g): 54.77

Dimensions (cm): 5 x 3 x 2

Color (fresh): Dark gray

Shape: Blocky, angular

Variability: Homogeneous except for frothy glass coating on one surface

Coherence: Intergranular-tough; fracturing - few, non-penetrative

Fabric/texture: Seriate breccia

Cavities (%): None except in glass coating

Surface (face): Irregular except for the 40% that is glass-coated. Glass coating is discontinuous and appears to have been eroded and broken off in places

Zap pits (density/face): Glass-lined pits up to 1.2 mm on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark gray	50		aphanitic		Appears to be glassy
Lithic clast I	White	20	Mostly angular some sub- round	0.5	up to 10	Sugary texture with 0.1 to 0.2 grain size, usually more than one mineral present
Lithic clast II	Gray	25	Subangular to subround	0.5	up to 30	Fine grained (<0.1 mm), crystalline, probably annealed
Lithic clast III	Gray	1 grain	Subangular	2.0		50-50 mixture of plagioclase and a pinkish brown mineral (spinel?)
Mineral clast I	White	<5	Subangular to subround		0.1 to 0.3	Plagioclase in various degrees of crushing. Some contain small zones of vitreous gray material
Mineral clast II	Light green	<1	Subangular		up to 0.5	Probably olivine
Mineral clast III	Light brown	<1	Subround		up to 0.5	Probably pyroxene

Generic No: 14268  
Rock Type: Vitric breccia

Weight (g): 23.12

Dimensions (cm): 4.5 x 1.5 x 3.0

Color (fresh): Medium dark gray

Shape: Blocky, angular

Variability: Homogeneous except for glass coating over 30% of surface

Coherence: Intergranular - coherent; fracturing - many, penetrative, glass intruded into some fractures

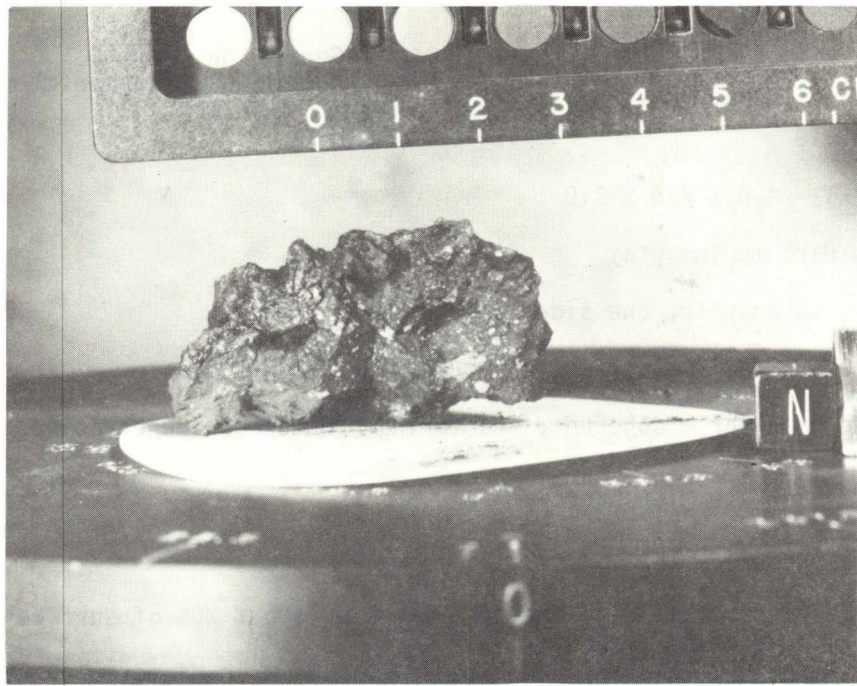
Fabric/texture: Seriate microbreccia

Cavities (%): None in rock, glass coating contains about 50% rounded vesicles <1 mm across

Surface (face): Irregular

Zap pits (density/face): Few, up to about 0.2 mm occur on glass coating

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray	70		aphanitic		Dark resinous luster, may be glassy
Lithic clast I	Very light gray	20	Subangular to Subround	<.2	up to 7.0	About 60 to 90% plagioclase, remainder is light gray
Lithic clast II	Medium dark gray	5	Round	0.2-0.5	up to 0.8	Aphanitic, featureless
Lithic clast III	Medium gray	5	Round	0.2-0.4	up to 0.5	Aphanitic
Mineral clast I	White	<1	Subround		<1.0	Plagioclase
Mineral clast II	Light yellow brown	<1	Subround		<1.0	Probably pyroxene



14268



14269

25

Generic No: 14269  
Rock Type: Fragmental microbreccia

Weight (g): 17.19

Dimensions (cm): 4.0 x 2.5 x 3.0

Color (fresh): Dark medium gray

Shape: Block, subangular, one side rounded

Variability: One side is glass-coated, otherwise homogeneous

Coherence: Intergranular - coherent; fracturing - numerous, penetrative, glass veins  
 along several fractures

Fabric/texture: Seriate microbreccia

Cavities (%): None

Surface (face): Glass coating on one side makes up about 20% of surface area, otherwise surface is irregular.

Zap pits (density/face): Glass-lined pits up to 0.3 mm in diameter on rounded side of breccia, pits also occur sparsely on glass-coating

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark medium gray	75		aphanitic		Lacks resinous luster of vitric matrix
Lithic clast I	Very light gray	20	Subround to subangular		<1.0	Fine, crushed appearance; about 60% feldspar, 40% mafic minerals
Lithic clast II	Medium light gray	4-5			<1.0	50-50 mixture of gray and white material in salt and pepper appearance
Mineral clast I	Pale orange	1 grain	irregular	0.5		Looks like feldspar coated with rust

Special Features: Appears to be intermediate in color and coherence between vitric breccias and fragmental, friable microbreccias (soil breccias)

Generic No: 14270  
Rock Type: Fine-grained crystalline breccia

Weight (g): 25.59

Dimensions (cm): 4.0 x 2.8 x 2.0

Color (fresh): Medium greenish gray

Shape: Blocky, subrounded

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - few, non-penetrative

Fabric/texture: Equigranular

Cavities (%): Smooth, spherical to irregular vugs up to 2 mm across make up 5 to 10% of rock. Also a few slit-like cavities 0.1 x 3 mm occur.

Surface (face): Irregular

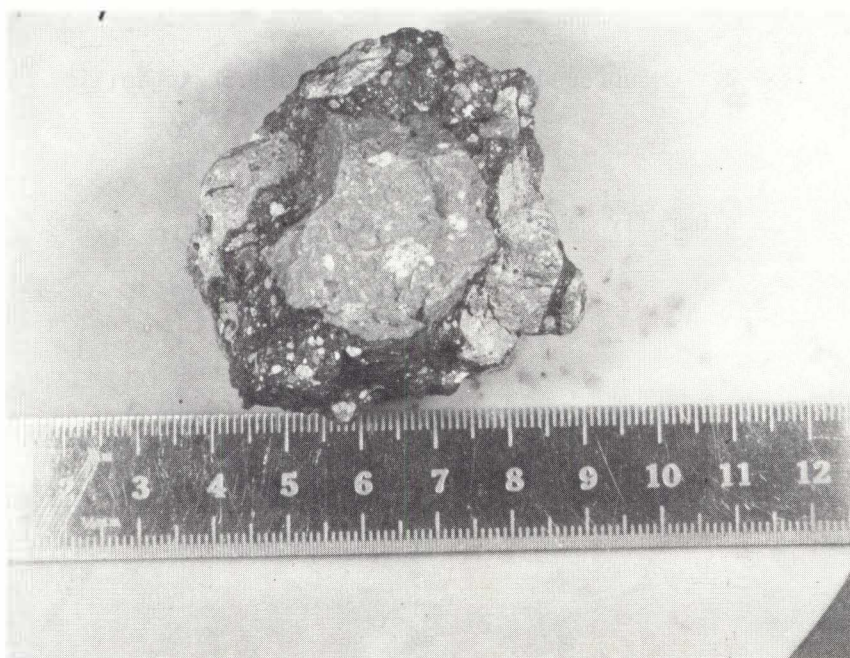
Zap pits (density/face): Some glass-lined pits averaging 0.5 mm across over most of rock

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium greenish gray	95			<0.1	Suggary texture with light and dark patches
Clast I	Light gray	2	Subround		0.1 to 1.5	Vitreous luster, shocked plagioclase?
Clast II	Light gray	3	Subround		0.1 to 1.5	Aphanitic

Special Features: Clasts generally have reaction rims



14270



14271

Generic No: 14271  
Rock Type: Vitric breccia

Weight (g): 97.41

Dimensions (cm): 5.0 x 4.7 x 3.0

Color (fresh): Dark medium gray matrix, light gray clasts

Shape: Blocky, angular, with one side rounded

Variability: Unusually large clasts

Coherence: Intergranular - tough; fracturing - some penetrative, some non-penetrative

Fabric/texture: Coarse breccia

Cavities (%): None

Surface (face):

Zap pits (density/face): Many pits up to 2 mm diameter on rounded side, very few pits on opposite side

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark medium gray	40		aphanitic		Vitreous or glassy appearance
Lithic clast I	Light gray	35	Subangular		47 x 40 and 30 x 25	These two large clasts are the same. Both are breccias with 90% light gray matrix with sugary texture of white and gray grains about 0.1 mm
Lithic clast II	Light gray	15	Angular to rounded		up to 5	Finely brecciated mixture of white and brownish gray material
Lithic clast III	Light gray	10	Subround		up to 30 x 10	Crushed zones of plagioclase and mafic minerals. Zones are about 1.0 mm across. Sugary texture.
Lithic clast IV		1 clast	Subround		2	Red-brown spinels make up about 1/2 of clast. Remainder is plagioclase

Special Features: Although there are some very large clasts in this specimen the matrix generally displays the same clast size distribution as in the other vitric breccias; i.e., usually <1 mm across. Veins of this matrix partially penetrate the large clasts.

Generic No: 14272  
Rock Type: Vitric breccia

Weight (g): 46.63

Dimensions (cm): 4.5 x 3.5 x 2.5

Color (fresh): Medium dark gray

Shape: Blocky, angular

Variability: Homogeneous except for dark gray glass-coating

Coherence: Intergranular-tough; fracturing - some non-penetrative

Fabric/texture: Seriate

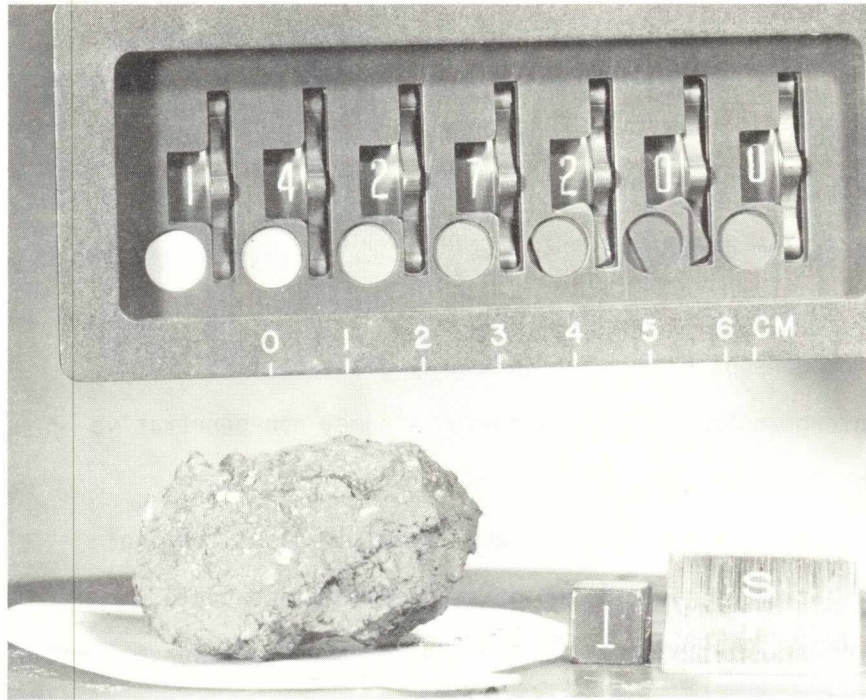
Cavities (%): None in rock, 30% vesicles, 0.5 mm, in glass coating

Surface (face): Irregular, over 30% of surface is glass coated.

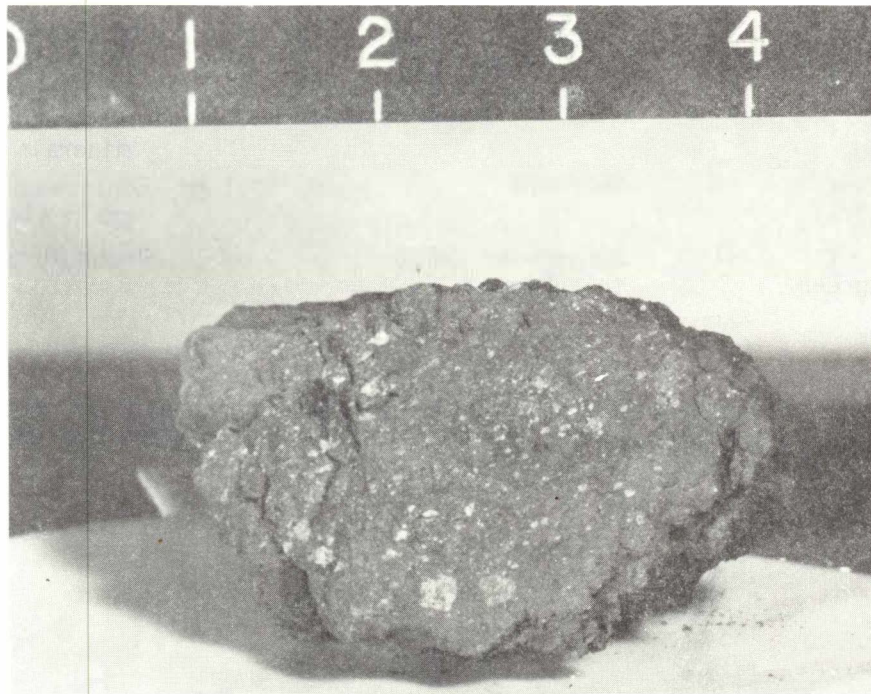
Zap pits (density/face): Glass-lined pits up to 0.5 mm on one side. None on others.  
 None seen on glass

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	70		aphanitic		Vitreous or glassy appearance
Lithic clast I	Very light gray	25-30	Angular to subround	<1.0	up to 20	Fine-grained mixtures of 60 to 70% white plagioclase and two light colored mafic minerals
Lithic clast II	Light grey	<1	Subround		up to 1.0	Equigranular 0.1 mm grain size
Mineral clast	Light green	<1	Subangular to subround	<1.0		Probably olivine





14272



14273

31

Generic No: 14273  
Rock Type: Vitric breccia

Weight (g): 22.4

Dimensions (cm): 3.5 x 3.0 x 2.0

Color (fresh): Medium dark gray

Shape: Blocky, angular

Variability: Homogeneous except for dark gray glass-coating

Coherence: Intergranular-tough; fracturing - some, non-penetrative

Fabric/texture: Seriate

Cavities (%): None in rock, 30% vesicles, <1 mm, in glass coating

Surface (face): Irregular, about 20% of surface is glass-coated

Zap pits (density/face): Maybe a few small pits on one surface but not distinct

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	70		aphanitic		Vitreous or glassy appearance
Lithic clast I	Very light gray	25-30	Angular to subround	<1.0	up to 10	Fine-grained mixture of 60 to 70% white plagioclase and two light colored mafic minerals
Lithic clast II	Light gray	<1	Subround		up to 1 mm	Equigranular 0.1 mm grain size
Mineral clast	Light green	<1	Subangular to subround	<1.0		Probably olivine

Special Features: Elongate clasts display foliation. In one part of the glass coating there is a series of parallel grooves in the glass as though something was dragged across the glass while it was still molten.

Generic No: 14274

Rock Type: High-grade, crystalline,  
polymict breccia

Weight (g): 15.18

Dimensions (cm): 3.0 x 2.5 x 1.5

Color (fresh): Light medium gray

Shape: Blocky, angular

Variability: Homogeneous texture but surfaces vary from smooth to rough

Coherence: Intergranular - tough; fracturing - numerous, non-penetrative

Fabric/texture: Seriate microbreccia

Cavities (%): A few rounded vesicles 1 to 2 mm across. There are also a few 0.1 to 0.2 mm irregularly shaped vugs making up <1% of rock.

Surface (face): 50% smooth, 50% rough

Zap pits (density/face): Many glass-lined pits up to 1 mm on rounded surfaces, very few on others.

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light medium gray	85			<0.1	Sugary texture
Lithic clast	Very light gray	<5	Subround		up to 2	50-50 mixture of fine grained plagioclase and light green mafic mineral
Mineral clast I	White	10	Subround		up to 1	Plagioclase in various degrees of crushing
Mineral clast II	Light green	<5	Subround		up to 1	Usually somewhat crushed
Mineral clast III	Light brown	1 grain	Subround		0.9	Crushed to 0.1 mm grains



14274



14275

34

Generic No: 14275  
Rock Type: Low-grade polymict breccia

Weight (g): 12.46

Dimensions (cm): 1.2 x 1.2 x 3.1

Color (fresh): Medium light gray

Shape: Blocky, subangular

Variability: Homogeneous

Coherence: Intergranular - coherent; fracturing - few, non-penetrative

Fabric/texture: Seriate

Cavities (%): None

Surface (face): Irregular, rounded and knobby on one side

Zap pits (density/face): Glass-lined pits up to 2.0 mm in diameter over most of rock. One surface has none

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium light gray	65-70			<0.2	Fragmental but partially recrystallized. A mixture of mostly plagioclase and at least two mafic minerals
Lithic clast I	Very light gray	20	Subangular to Subround		up to 6.0	Some are crushed mixtures of plagioclase and mafic material. Others are mostly crushed plagioclase
Lithic clast II	Dark gray	<5	Subangular to Subround		up to 2.0	Very fine-grained. Some contain white specks
Lithic clast III	Medium gray	<5	Subround		up to 4.0	Mixtures of white and gray material. Gray is partly vitreous. Maybe mixtures of crushed and melted plagioclase
Mineral clast I	White	<5	Subangular to Subround		<1.0	Plagioclase grains in various stages of crushing
Mineral clast II	Black	<5	Subangular		<2.0	Probably pyroxene. Some show cleavage faces

Generic No: 14276  
Rock Type: Medium-grained  
 crystalline rock

Weight (g): 12.75

Dimensions (cm): 3.0 x 2.2 x 2.0

Color (fresh): Brownish gray

Shape: Blocky, subrounded

Variability: Homogeneous

Coherence: Intergranular-coherent; fracturing - some, penetrative

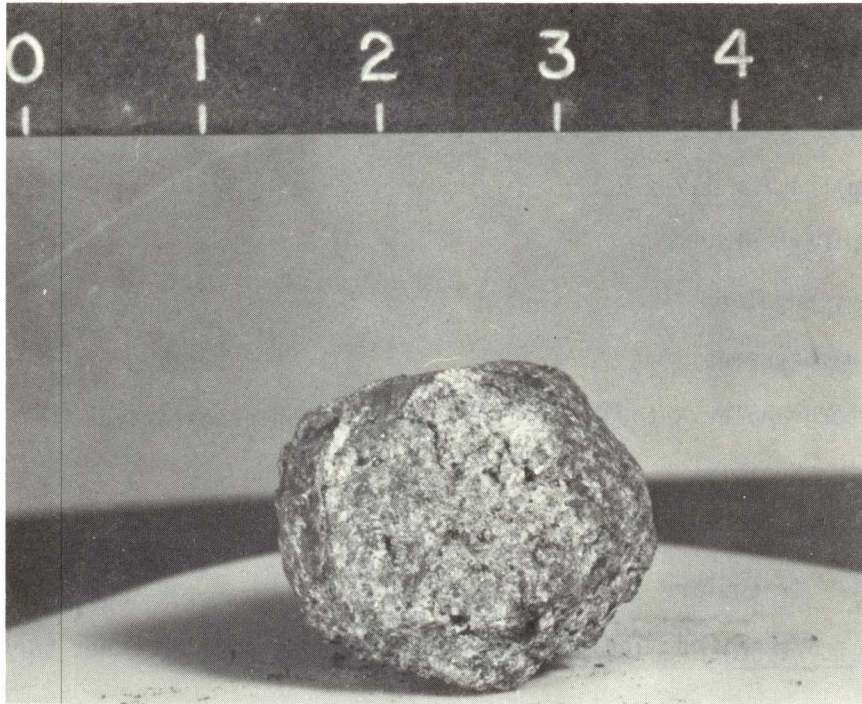
Fabric/texture: Equigranular, massive

Cavities (%): Irregularly shaped vugs from 0.2 to 1 mm make up 10% of rock

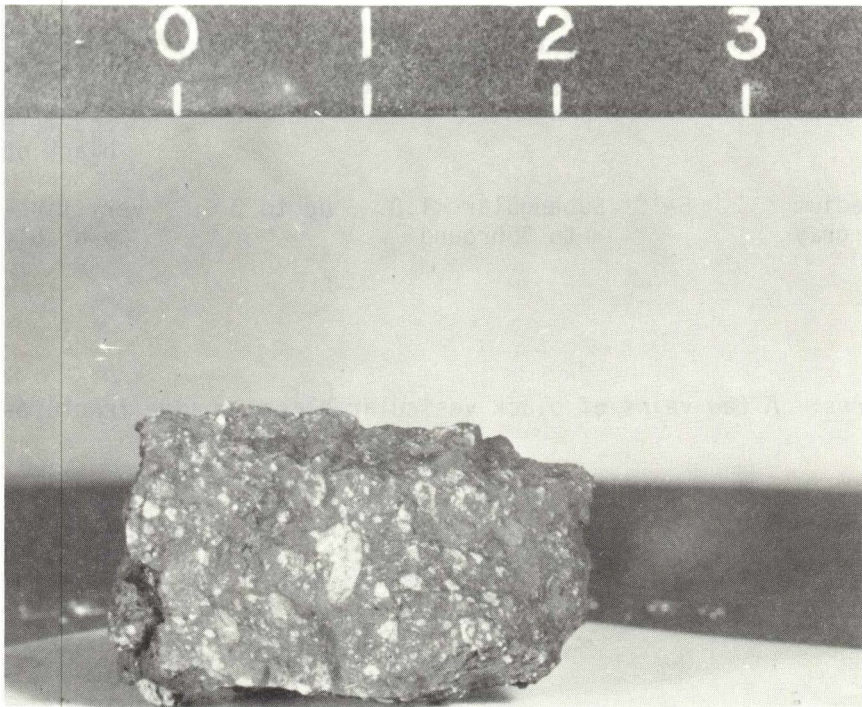
Surface (face): Most are smooth but one fresh surface is irregular

Zap pits (density/face): Few on rounded surfaces, none on fresh surface

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Plagioclase	White to clear	60-65	Laths, ellipsoidal areas	Laths	up to 0.5 areas up to 2.0	Ellipsoidal areas contain crushed equigranular grains <0.1 across
Mafic mineral	Light yellow-brown	15	Subhedral equant, ellipsoidal areas	Subhedral	0.2-0.4 areas up to 3.0	Probably pyroxene in two distinct morphologies, ellipsoidal areas contain crushed equigranular grains
Mafic mineral	Light yellow-green	<1	Euhedral	0.3		Probably olivine
Mafic mineral	Brown	5-10	Euhedral elongate	0.3		Probably pyroxene
Mafic mineral	Light gray	10	Anhedral	0.2		
Opaque	Black	1-2	Elongate	0.1		Probably ilmenite



14276



14277

37

Generic No: 14277  
Rock Type: Vitric breccia

Weight (g): 7.59

Dimensions (cm): 1.2 x 1.7 x 2.5

Color (fresh): Dark gray

Shape: Blocky, angular

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - few non-penetrative

Fabric/texture: Seriate

Cavities (%): None

Surface (face): Irregular

Zap pits (density/face): Few on one side and two ends, none on other surfaces

<u>Component</u>	<u>Color</u>	<u>% of</u>		<u>Size (mm)</u>		<u>Comments</u>
		<u>Rock</u>	<u>Shape</u>	<u>Dom.</u>	<u>Range</u>	
Matrix	Dark gray	65-70		aphanitic		Vitreous or glassy appearance
Lithic clast I	Very light gray	25-30	Subangular to Subround	1.0	up to 4	Crushed mixture of plagioclase and gray material. Scattered specks of black opaque mineral
Lithic clast II	Medium gray	5-10	Subangular to Subround	<1.0	up to 2	Very fine-grained; probably annealed

Special Features: A few veins of black vesicular glass in some fractures.



Generic No: 14278

Rock Type: Low-grade polymict breccia

Weight (g): 7.6

Dimensions (cm): 1.5 x 3.0 x 1.5

Color (fresh): Medium light gray

Shape: Subrounded

Variability: Homogeneous

Coherence: Intergranular - coherent; fracturing - few, non-penetrative

Fabric/texture: Seriate

Cavities (%): None

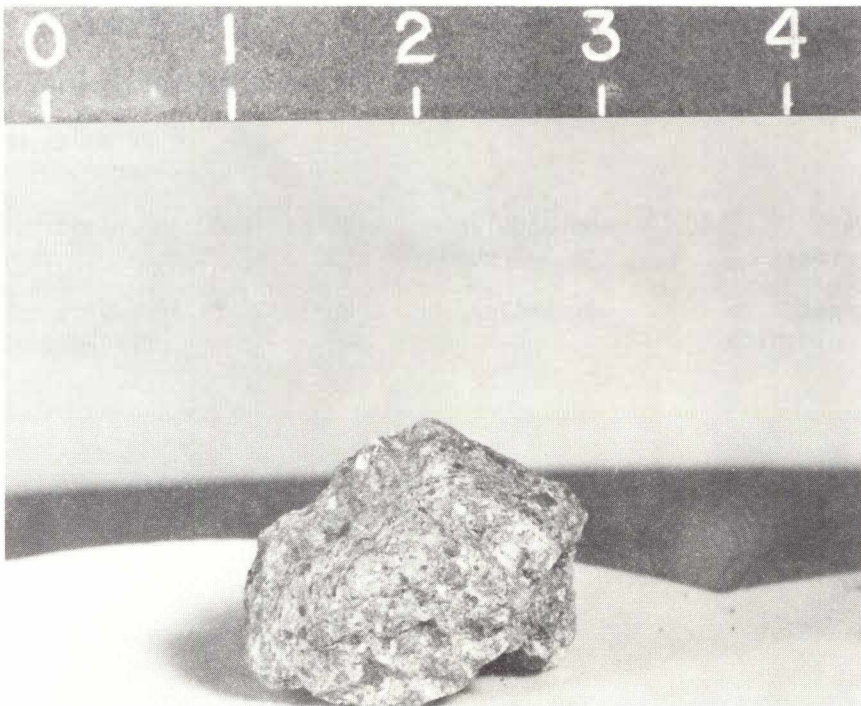
Surface (face): Most surfaces smooth, one irregular and fresh

Zap pits (density/face): Glass-lined pits, 0.5 to 2.0 mm in diameter, on most surfaces, none on fresh surface

<u>Component</u>	<u>Color</u>	<u>% of</u>		<u>Size (mm)</u>		<u>Comments</u>
		<u>Rock</u>	<u>Shape</u>	<u>Dom.</u>	<u>Range</u>	
Matrix	Medium light gray	75			<0.2	Fragmental but partially recrystallized. A mixture of mostly plagioclase and at least two mafic minerals
Lithic clast I	Light gray	15	Subangular to Subround	up to	1.0	Mostly plagioclase with scattered mafic minerals in salt and pepper arrangement
Lithic clast II	Dark gray	10	Subangular to Subround	up to	1.0	Aphanitic texture
Mineral clast I	Light greenish	<5	Irregular	up to	2	Appear to be crushed pyroxene and/or olivine



14278



14279

40

Generic No:14279

Rock Type: Fragmental matrix,  
polymict breccia

Weight (g): 5.67

Dimensions (cm): 2.0 x 1.8 x 1.5

Color (fresh): Medium light gray (N6)

Shape: Blocky, subrounded to rounded

Variability: Homogeneous

Coherence: Intergranular - moderately tough

Fabric/texture: Seriate

Cavities (%): None

Surface (face): Slightly irregular

Zap pits (density/face): Glass-lined pits over all surfaces but one

<u>Component</u>	<u>Color</u>	<u>% of</u>		<u>Size (mm)</u>		<u>Comments</u>
		<u>Rock</u>	<u>Shape</u>	<u>Dom.</u>	<u>Range</u>	
Matrix	Medium light gray	85-90		0.1		Mixture of white and gray fragments
Lithic clast	Medium gray	<5			up to 1.0	Very fine-grained
Mineral clast I	White	10	Angular	0.3-0.4	up to 1.0	Plagioclase in various stages of crushing
Mineral clast II	Light yellowish green	<5	Subangular		up to 0.5	Probably olivine and/or pyroxene

Generic No: 14280  
Rock Type: Vitric breccia

Weight (g): 6.20

Dimensions (cm): 1.0 x 1.3 x 3.6

Color (fresh): Medium dark gray

Shape: Blocky, angular

Variability: Homogeneous

Coherence: Intergranular-tough; fracturing - several penetrative

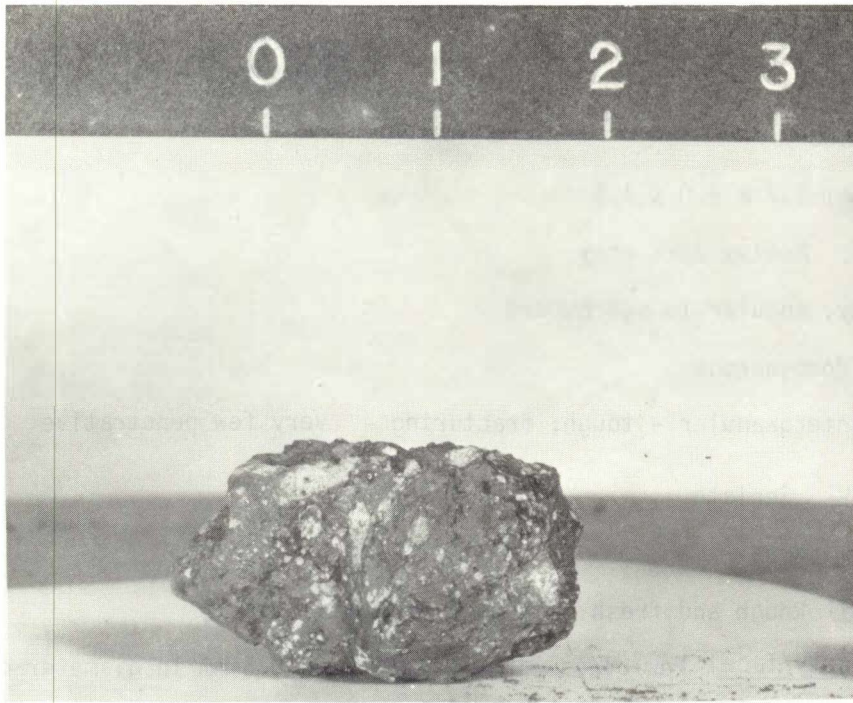
Fabric/texture: Seriate clast population

Cavities (%): None except in glass coating

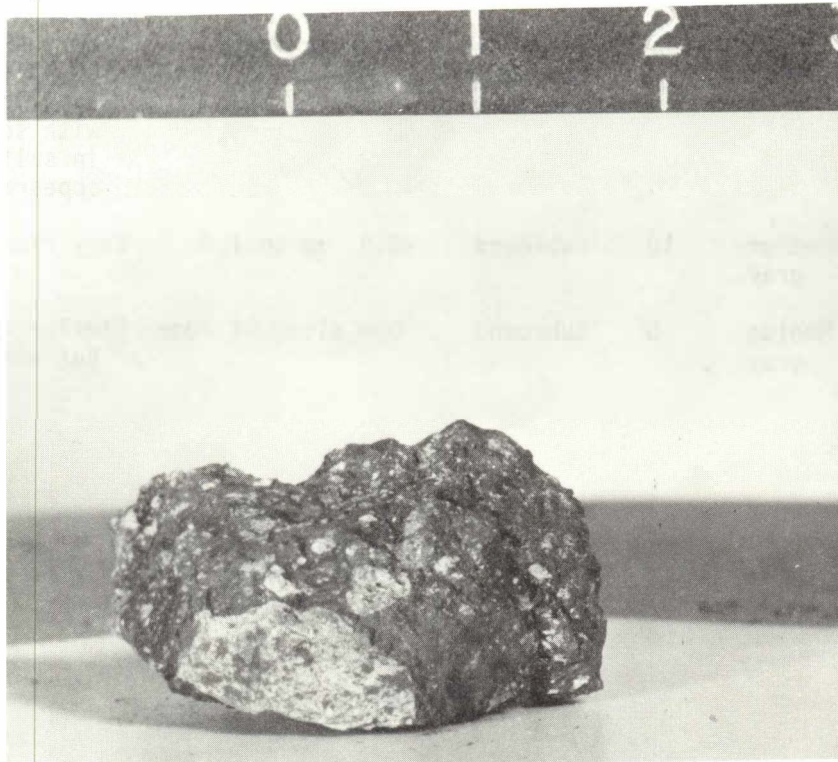
Surface (face): Glass coating over about 20% of the surface

Zap pits (density/face): Numerous pits on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of</u>		<u>Size (mm)</u>		<u>Comments</u>
		<u>Rock</u>	<u>Shape</u>	<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	55		aphanitic		Vitreous or glassy appearance
Lithic clast I	Very light gray	30	Subround	0.3-0.5	up to 3.0	Crushed or sugary mixture of mostly plagioclase with some pale brown mafic mineral and specks of black opaques
Lithic clast II	Medium gray	15	Subround	0.3-0.4	up to 2.0	Very fine-grained with a few white spots.



14280



14281

43

Generic No: 14281  
Rock Type: Vitric breccia

Weight (g): 12.03

Dimensions (cm): 2.7 x 2.0 x 1.5

Color (fresh): Medium dark gray

Shape: Blocky, angular to subrounded

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - very few penetrative

Fabric/texture: Seriate

Cavities (%): None

Surface (face): Rough and fresh over most surfaces

Zap pits (density/face): Few glass-lined pits 0.2 to 0.5 mm in diameter on one

<u>Component</u>	<u>Color</u>	<u>Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	70-75		aphanitic		Vitreous or glassy appearance
Lithic clast I	Light gray	15	Round to Subangular	0.5	up to 10	Sugary to crushed mixture of white plagioclase and light gray material with scattered opaques in salt and pepper appearance
Lithic clast II	Medium gray	10	Subround	<0.5	up to 1.0	Very fine-grained
Lithic clast III	Medium gray	<5	Subround	One clast of 10mm		Similar to Lithic Clast II but with white clasts.

Generic No: 14282  
Rock Type: Friable fragmental  
microbreccia (soil  
breccia)

Weight (g): 1.89

Dimensions (cm): 2.1 x 1.4 x 1.1

Color (fresh): Medium gray (N5)

Shape: Blocky, angular

Variability: Breccia is homogeneous, nearly half of surface is glass-coated up to  
2 mm thick

Coherence: Intergranular - friable; fracturing - several, non-penetrative

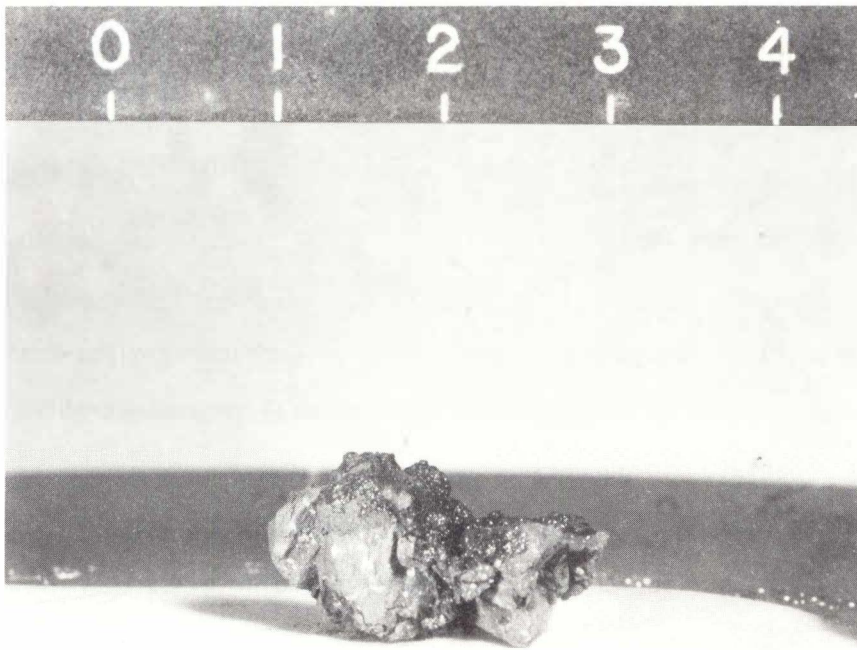
Fabric/texture: Seriate microbreccia

Cavities (%): Glass coating is highly vesicular (>20%), no cavities in rock

Surface (face): 45% of surface coated with black vesicular glass

Zap pits (density/face): None

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray	85			<0.1	Fragmental texture
Mineral clast I	Very light gray	10-15	Subangular to Subround		<0.5	Primarily crushed plagioclase, some with a bit of gray material
Mineral clast II	Light green	1 grain	Round	0.5		Mafic silicate (olivine or pyroxene)



14282



14283

46



Generic No: 14283  
Rock Type: High-grade, crystalline polymict breccia

Weight (g): 1.25

Dimensions (cm): 1.5 x 1.2 x 0.6

Color (fresh): Light gray

Shape: Slabby, angular

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - few penetrative

Fabric/texture: Some lineation of clasts, seriate

Cavities (%): None

Surface (face): Smooth

Zap pits (density/face): Few on one face only

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium light gray	65-70			<0.1	Fine-grained, granular, crystalline
Lithic clast I	Very light gray	15	Subround	0.5	up to 4.0	Mostly white plagioclase with 10-20% mafic minerals
Lithic clast II	Light gray	5	Subround	0.5	up to 2.0	50-50 mixture of white sugary material and gray vitreous material
Lithic clast IV	Light gray	<5		1.0		Equigranular 0.2 mm grains of 80% plagioclase, 20% mafic silicate and trace of opaque
Mineral clast	Light brown to light green	<1			1.0	Probably pyroxene and/or olivine

Generic No: 14284  
Rock Type: Fragmental microbreccia

Weight (g): 1.47

Dimensions (cm): 1.5 x 1.2 x 0.8

Color (fresh): Medium gray

Shape: Slabby, subrounded

Variability: Typical breccia, homogeneous

Coherence: Intergranular - coherent; fracturing - few, non-penetrative

Fabric/texture: Seriate, microbreccia

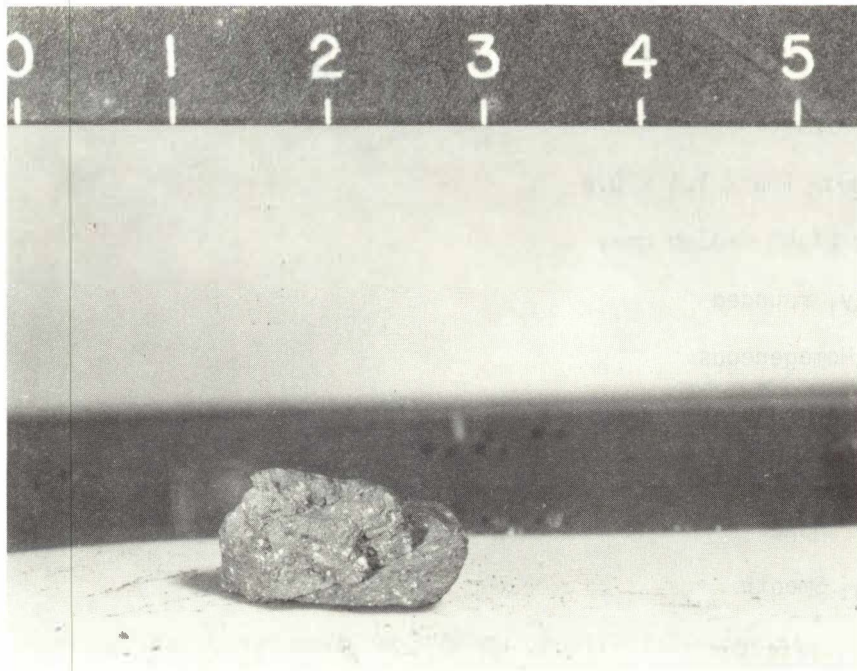
Cavities (%): None

Surface (face): Smooth

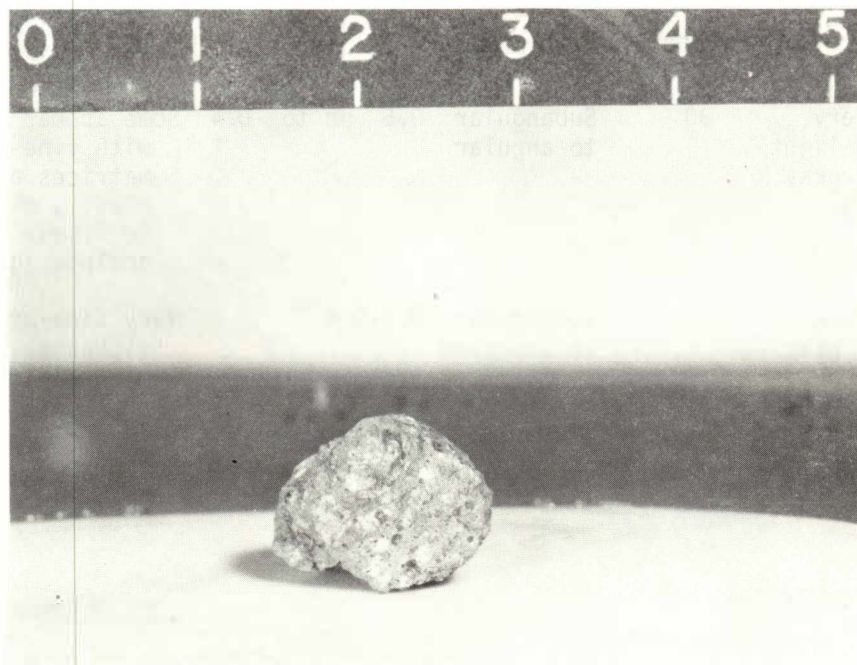
Zap pits (density/face): Glass-lined, up to 2.0 mm diameter on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of</u>		<u>Size (mm)</u>		<u>Comments</u>
		<u>Rock</u>	<u>Shape</u>	<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray	70-80			<0.2	Does not have vitreous appearance of vitric matrix
Lithic clast I	Very light gray	10-15	Subangular to Subround	0.5	up to 1.0	Some may be individual plagioclase grains but most are polycrystalline, probably crushed
Lithic clast II	Dark gray	5-10	Angular	0.2-0.4		Very fine-grained

Special Features: Appears to be intermediate in color and coherence between vitric breccias and fragmental, friable microbreccias (soil breccias)



14284



14285

Generic No: 14285  
Rock Type: Low-grade polymict breccia

Weight (g): 2.23

Dimensions (cm): 1.5 x 1.1 x 0.9

Color (fresh): Light medium gray

Shape: Blocky, rounded

Variability: Homogeneous

Coherence: Intergranular - coherent; fracturing - one, non-penetrative

Fabric/texture: Seriate

Cavities (%): None

Surface (face): Smooth

Zap pits (density/face): Glass-lined, up to 1 mm diameter on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium light gray	60-70			<0.2	Fragmental but partially recrystallized. A mixture of mostly plagioclase and at least two mafic minerals
Lithic clast I	Very light gray	30	Subangular to angular	0.5	up to 0.4	Some appear to be breccias with fine-grained matrices and dark gray clasts, others appear to be finely crushed medium-grained igneous rocks
Lithic clast II	Dark gray	5	Subangular to Subround	0.2-0.4		Very fine-grained to vitreous. Some may be mineral fragments

Generic No: 14286  
Rock Type: Fragmental microbreccia

Weight (g): 4.42

Dimensions (cm): 1.4 x 1.1 x 0.5

Color (fresh): Medium gray with brownish tint

Shape: Blocky, angular

Variability: Unusual metal coating up to 1 mm thick over about 50% of surface;  
breccia is homogeneous

Coherence: Intergranular - coherent; fracturing - none

Fabric/texture: Seriate

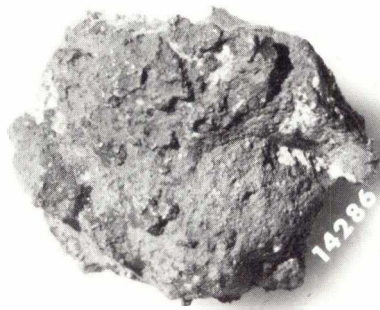
Cavities (%): None

Surface (face): Irregular breccia surface. 50% covered with metal coating. One small area of glass splash

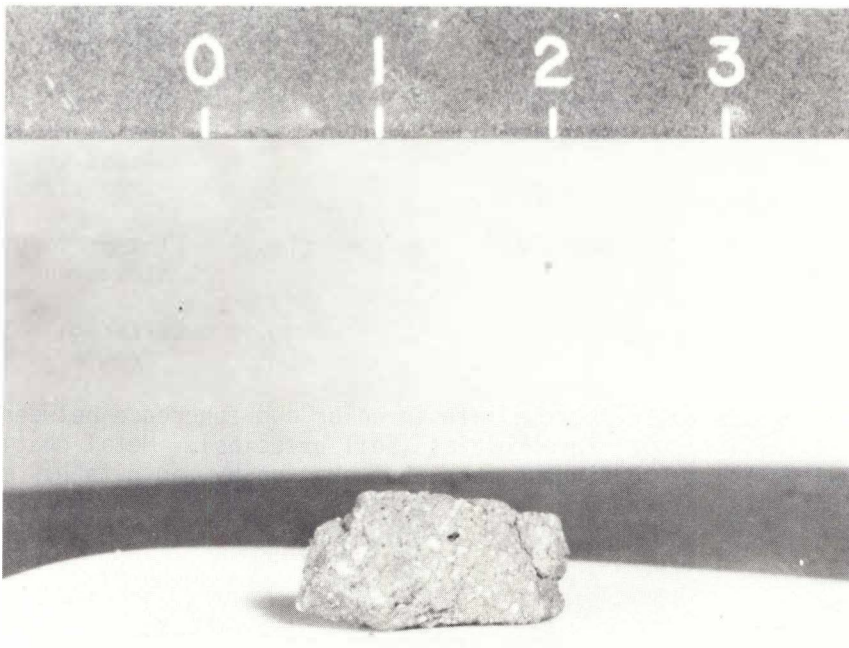
Zap pits (density/face): Pits in breccia are glass lined, up to 2 mm diameter. Pits on metal coating have upturned flange-like rims. Differing extent of tarnish on various pits suggest different ages.

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray	70-80			<0.2	Does not have the vitreous appearance of vitric breccias. Seems to be a mixture of brown, white and gray fragments
Lithic clast I	Very light gray	15	Subround to Subangular	0.5	up to 5.0	50-50 mixture of crushed white plagioclase and light green mineral in 1 mm sized areas
Lithic clast II	Light gray	<5	Subangular	5 mm	(one clast)	Finest grained rock in breccia
Metal	Silver	5				Differing shades of tarnish from gray to black

Special Features: Appears to be intermediate in color and coherence between vitric breccias and fragmental, friable microbreccias (soil breccias). Metal coating appears to have been deposited in one continuous mass, but erosion by zap pits has made coating discontinuous.



14286



14287

52

Generic No: 14287  
Rock Type: Fragmental microbreccia

Weight (g): 1.07

Dimensions (cm): 1.5 x 0.8 x 0.5

Color (fresh): Medium gray with brownish tint

Shape: Blocky, angular

Variability: Homogeneous

Coherence: Intergranular - coherent; fracturing - few penetrative

Fabric/texture: Seriate microbreccia

Cavities (%): <1% cavities of <1 mm diameter

Surface (face): Smooth on some surfaces, irregular on others

Zap pits (density/face): Few on all surfaces

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium gray	80			<0.1	Not vitreous as in vitric breccia. More granular or fragmental
Lithic clast I	Very light gray	10	Subangular to Subround	0.5	up to 2.0	Mostly crushed plagioclase with some light colored mafic minerals
Lithic clast II	Dark gray	10	Subangular to Subround	0.4	up to 1.0	Aphanitic

Special Features: Appears to be intermediate in color and coherence between vitric breccias and fragmental, friable microbreccias (soil breccias)

Generic No: 14283  
Rock Type: Vitric breccia

Weight (g): 3.44

Dimensions (cm): 0.7 x 1.3 x 1.7

Color (fresh): Medium dark gray

Shape: Blocky, angular

Variability: Homogeneous

Coherence: Intergranular - tough; fracturing - many penetrative

Fabric/texture: Seriate

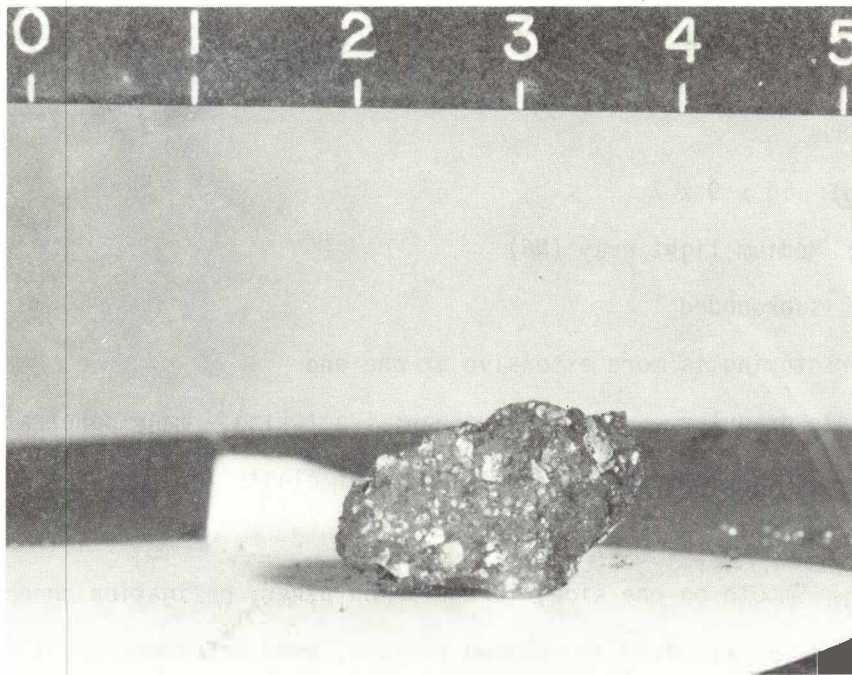
Cavities (%): None

Surface (face): Irregular

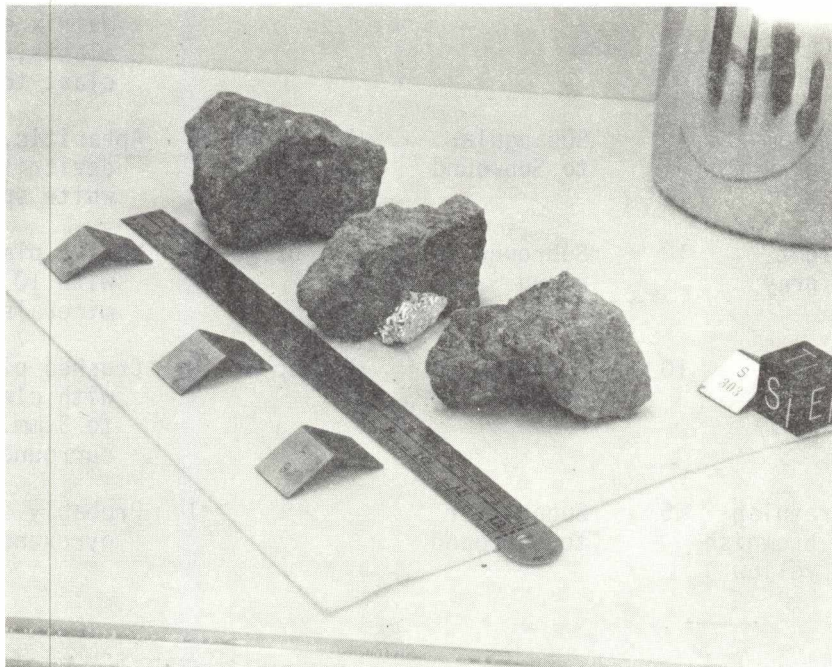
Zap pits (density/face): Glass-lined, up to 1 mm diameter on all sides

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Medium dark gray	60		Aphanitic		Vitreous or glassy appearance
Lithic clast	Light gray	20	Subangular	0.5	up to 5.0	Plagioclase-rich but with 20 to 40% mafic minerals and scattered black opaque grains <0.1 mm in size
Lithic clast II	Dark gray	20	Subround	0.4	up to 1.0	Very fine-grained, almost vitreous appearance





14288



14303

55

Generic No: 14303

Rock Type: Fragmental matrix,  
polymict breccia

Weight (g): 898.

Dimensions (cm): 16 x 9 x 7

Color (fresh): Medium light gray (N6)

Shape: Blocky, subrounded

Variability: Fracturing is more extensive at one end

Coherence: Intergranular - moderately tough; fracturing - many penetrative

Fabric/texture: Seriate breccia, weak foliation of clasts

Cavities (%): None

Surface (face): Smooth on one side, irregular on other, patination on one surface

Zap pits (density/face): Many on rounded surface, some on others but a few fresh surfaces have none

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light gray	40	Round to angular	<0.1	<0.2	Entirely fragmental but maybe slightly annealed. Mostly white grains (probably plagioclase). Matrix encloses most clasts, i.e., very few clast to clast contacts.
Lithic clast I	Medium gray	40	Subangular to Subround	4	up to 15	Aphanitic, may be in part devitrified. Contains white spots up to 0.5 mm
Lithic clast II	Light gray	10	Subround to round		up to 10	Mostly plagioclase grains with 10 to 20% mafic minerals and 1% opaques
Mineral clast I	White	10	Subround to round	1	up to 10	Crushed plagioclase. Some with cleavage faces up to 3 mm. Some are surrounded by a gray rind
Mineral clast II	Greenish brownish yellow	<5	Subangular to subround		<1	Probably olivine and/or pyroxene

Generic No: 14169-14188  
Rock Type: Fragmental matrix,  
 polymict breccia

This entire set of samples are fragments from 14303. Therefore, the matrix description is the same as for 14303. They contain a seriate distribution of clasts up to 2 cm across. Most clasts (40-50% of rock) are the medium gray aphanitic type referred to as lithic clast I in 14303. The bulk of the remaining clasts (10-15% of rock) are the white to light gray types referred to as lithic clast II and mineral clast I in 14303.

In order to better characterize the clast population all of the clasts larger than 5 mm across are described below for the set of fragments 14169-14188.

	Clast Descriptions			
	<u>Color</u>	<u>Shape</u>	<u>Size (mm)</u>	<u>Comments</u>
14169	Medium gray	Subround	20	Similar to main matrix of 14303 but somewhat darker and more annealed. Sharp contact with matrix. Contains many white clasts and a large olivine clast.
14169	Medium gray	Subround	20	Identical to previous clast
14169	Light gray	Round	6.0	Dark gray rind around 1.0 mm size mixture of white plagioclase, resinous brown material and gray vitreous patches.
14169	Dark gray		10	Aphanitic, crystalline with white feldspar specks
14170	Dark gray	Angular	5.0	Aphanitic, crystalline, contains 10% white feldspar clasts
14170	Medium dark gray	Angular	5.0	Aphanitic, crystalline with a few white specks <0.1 mm
14171	Pinkish brown to dark gray	Round	10	Band of pinkish brown, fine-grained material across center. On one side is black, aphanitic, crystalline material with a few white feldspar clasts. On other side is a mixture of medium gray and white material

Clast Descriptions

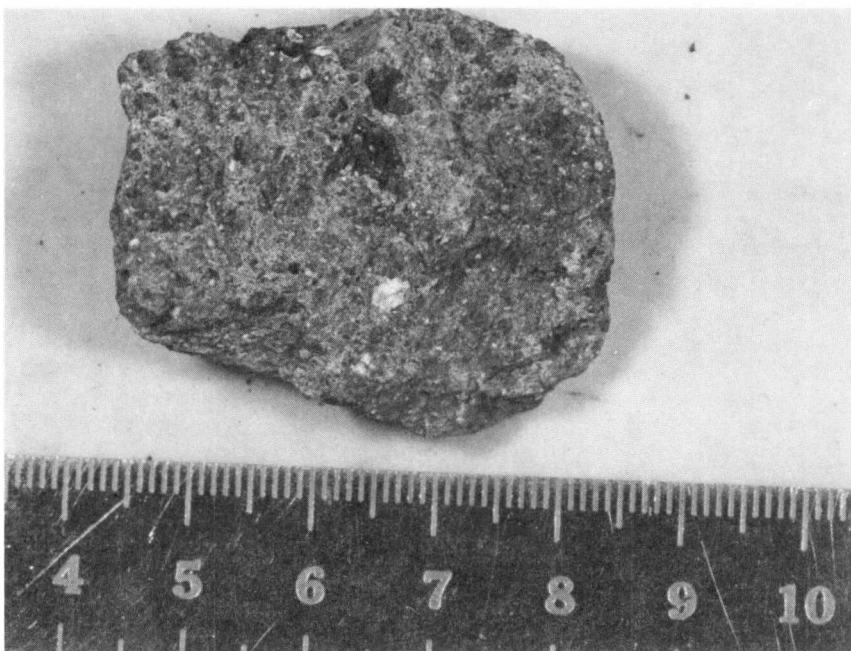
	<u>Color</u>	<u>Shape</u>	<u>Size (mm)</u>	<u>Comments</u>
14171	Dark gray	Subround	10	Aphanitic, crystalline with a few white feldspar clasts
14171	Light medium gray	Round	5.0	Mare basalt? 5-10% opaques as stringers 2 to 3 mm long and 0.1 mm wide through a mixture of plagioclase and pinkish brown mafic minerals
14172	Gray and white	Subround	15 x 7	Core of white plagioclase as 0.5 mm grains mantled by dark gray aphanitic material
14172	Medium gray	Angular	5.0	Very similar to main matrix of 14303 but sharp contacts definitely indicate a clast
14173	Greenish gray	Diffuse boundaries	7.0	Primarily vitreous gray plagioclase with 30% green mafic silicate as 1.0 mm crystals and <1% black opaques
14173	Medium dark gray	? makes up entire end of rock	20	Aphanitic, crystalline with many white specks
14174	Medium gray	Angular	10	Aphanitic, crystalline with many white specks of feldspar
14179	Gray and light green	Angular	5.0	3.0 mm patch of fractured green mafic silicate and 5.0 mm patch of gray, vitreous feldspar probably from a coarse-grained gabbroic rock
14180	Medium dark gray	Angular	15	Clastic to somewhat annealed breccia with many subround white feldspar clasts and one subround crystalline clast with mottled appearance of poikilitic melt rocks.
14181	Entire sample is two clasts		7.0	1. Medium gray aphanitic crystalline rock with many white feldspar specks
			10	2. Troctolitic anorthosite with 0.5-1.0 mm plagioclase as crushed white or vitreous gray material, 10% 0.5-1.0 mm green mafic silicate (olivine) and a few <0.5 mm dark red grains (spinel)

Clast Descriptions

	<u>Color</u>	<u>Shape</u>	<u>Size (mm)</u>	<u>Comments</u>
14182	Medium gray	Subround	5.0	Very similar to main matrix of 14303 but somewhat darker and a bit more annealed
14186	Medium gray		10 x 6	Very similar to main matrix of 14303 but somewhat darker and a bit more annealed

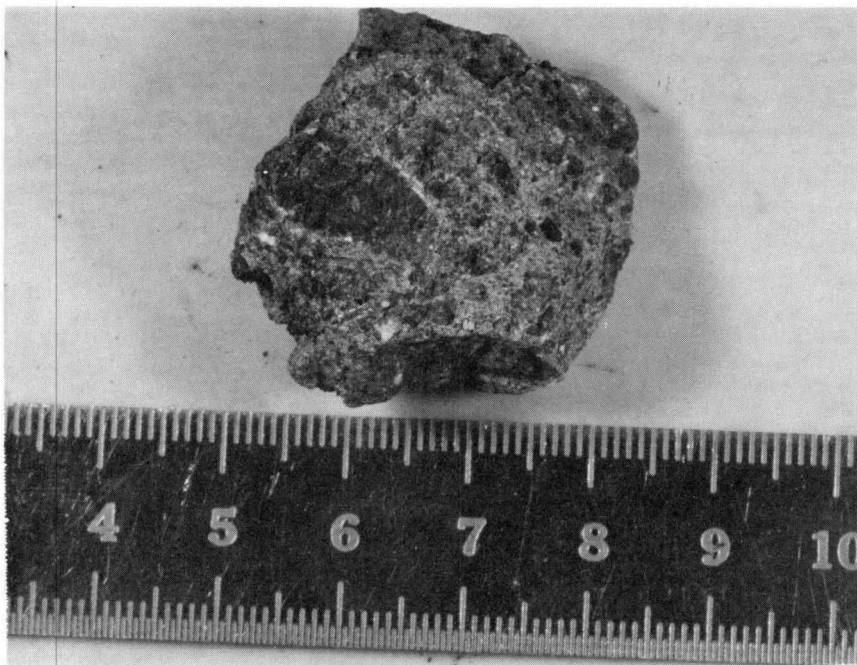


14169



14170

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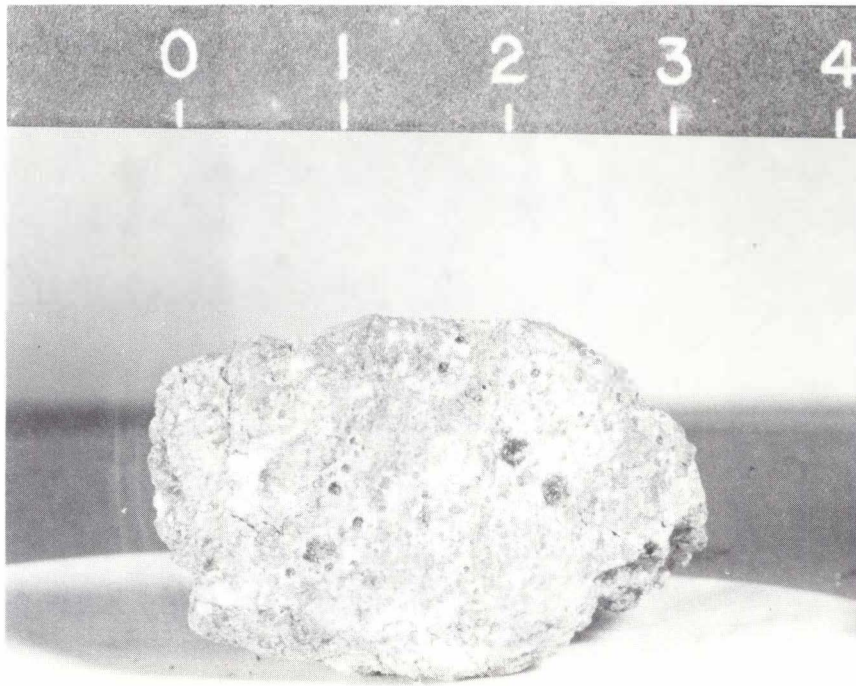


14171

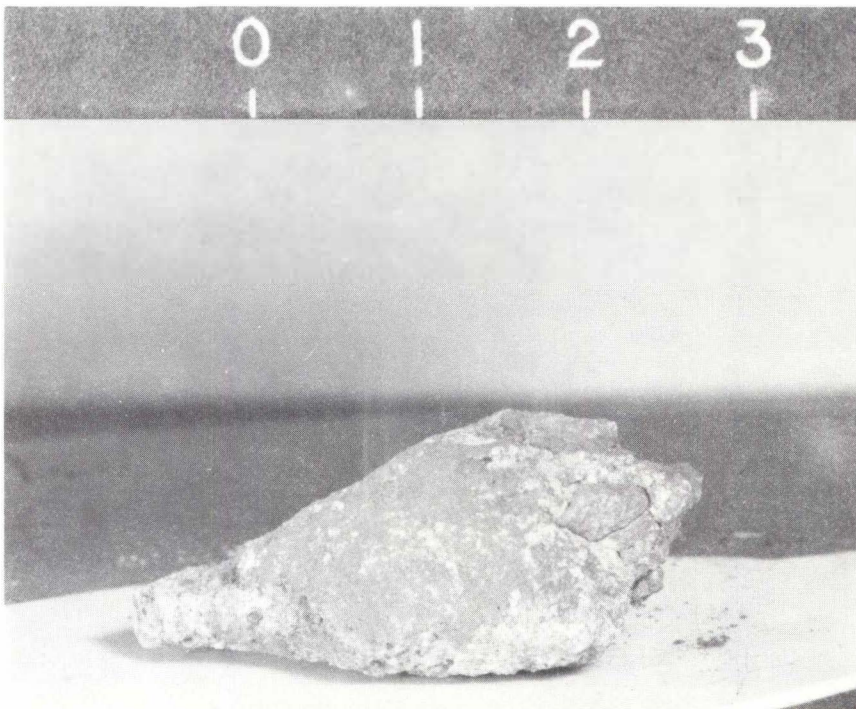


14172

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14173



14174

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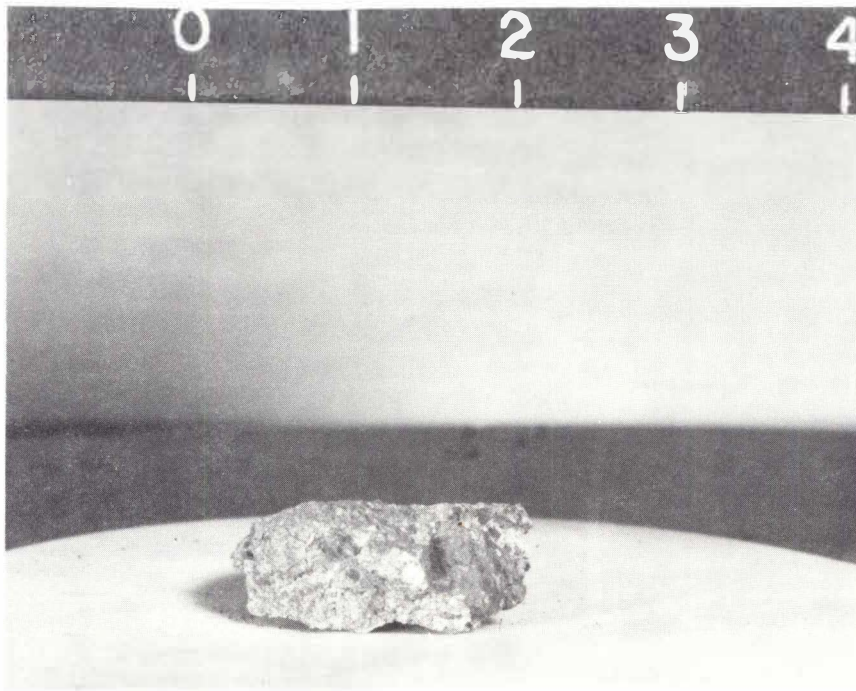


14175

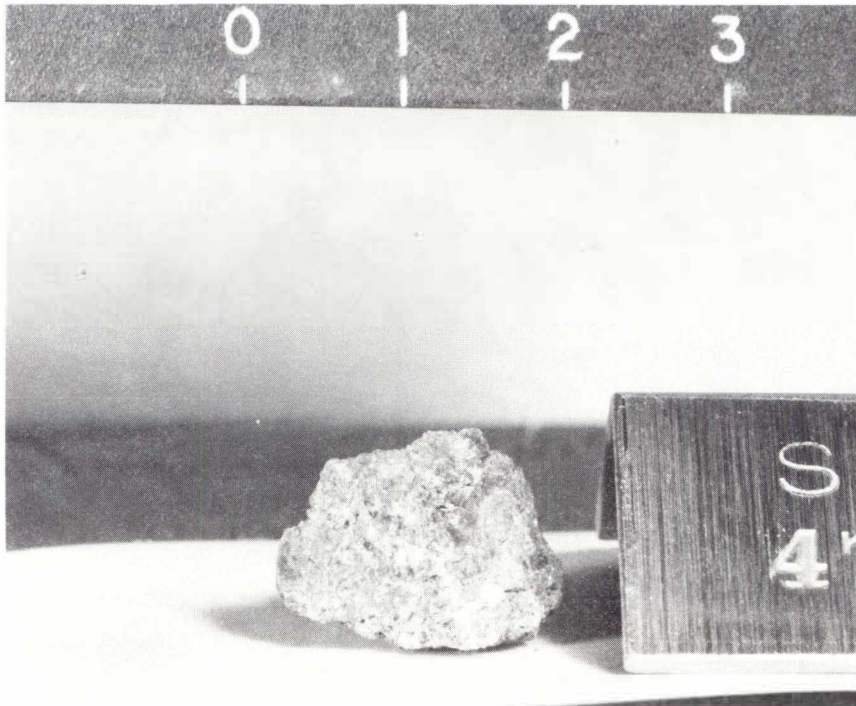


14176

63

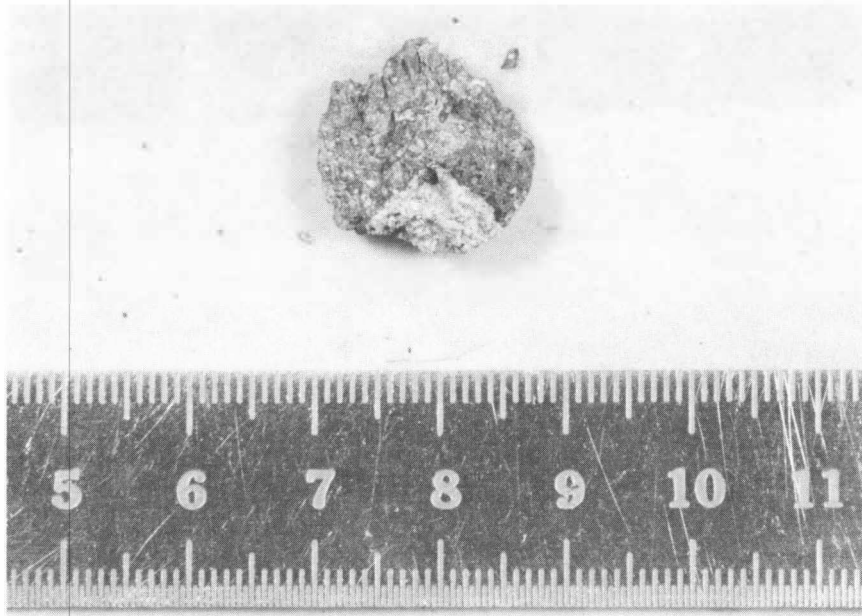


14177



14178

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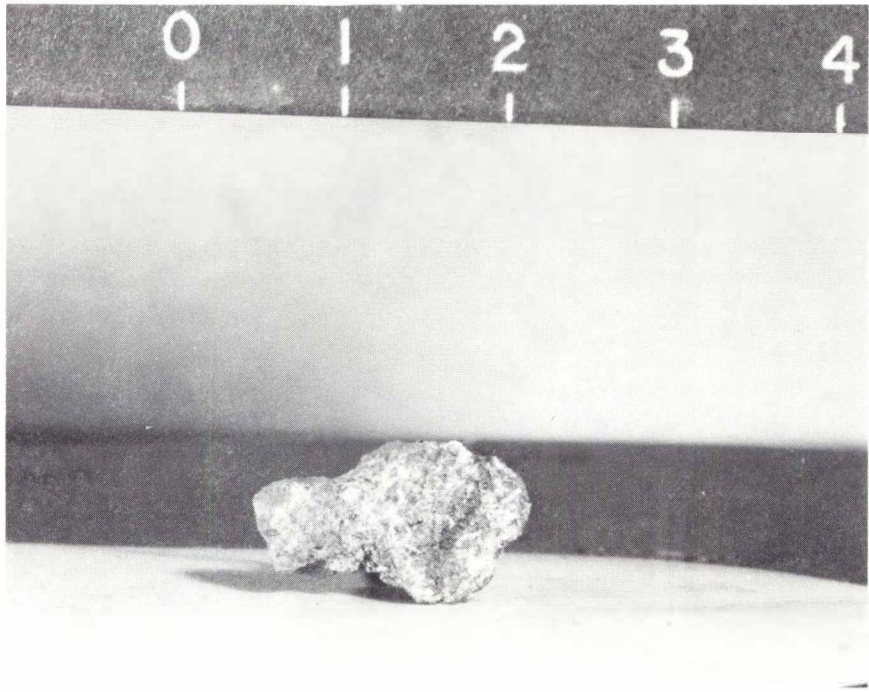


14179

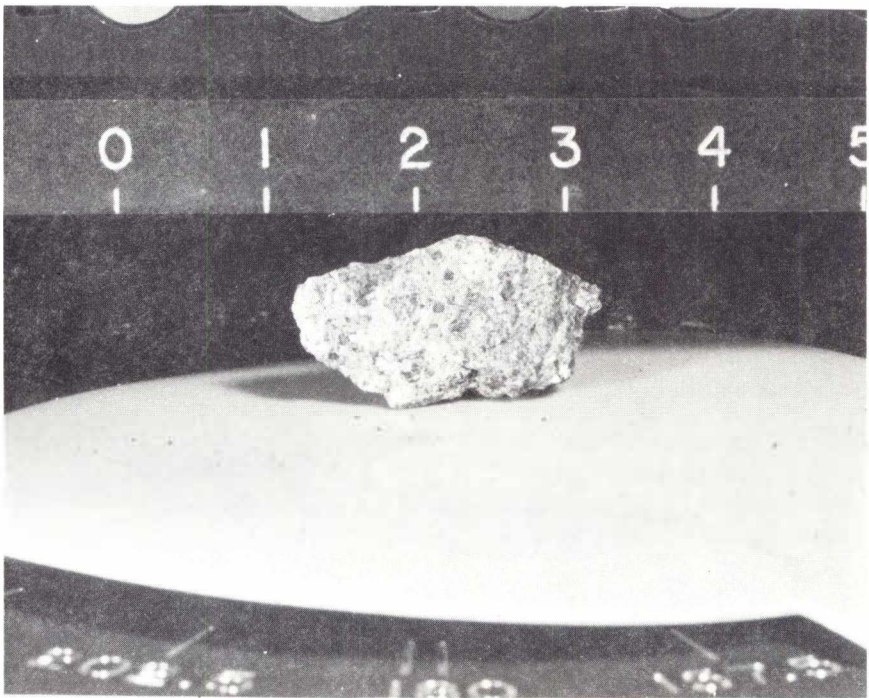


14180

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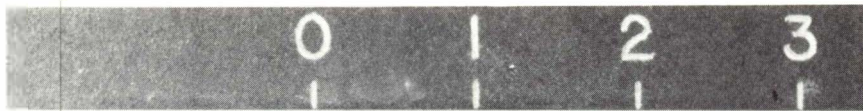


14181

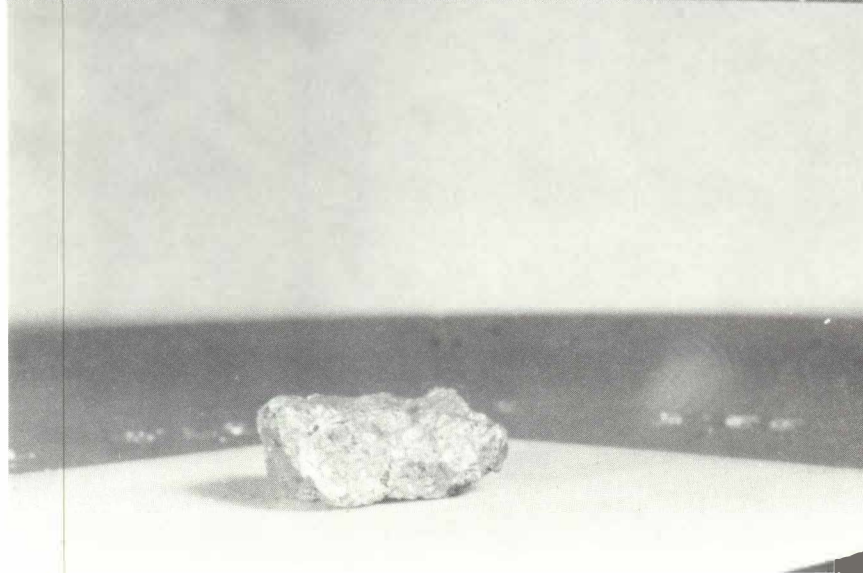
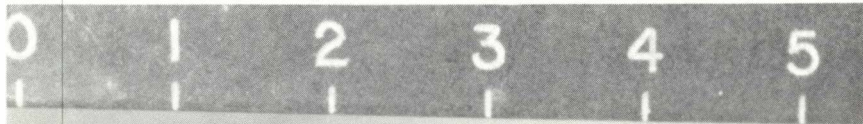


14182

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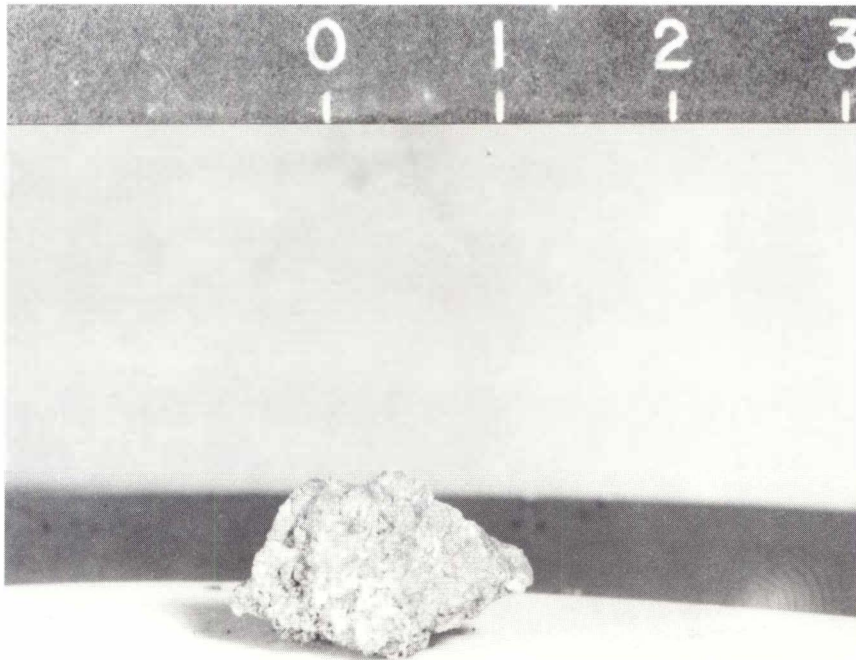


14183

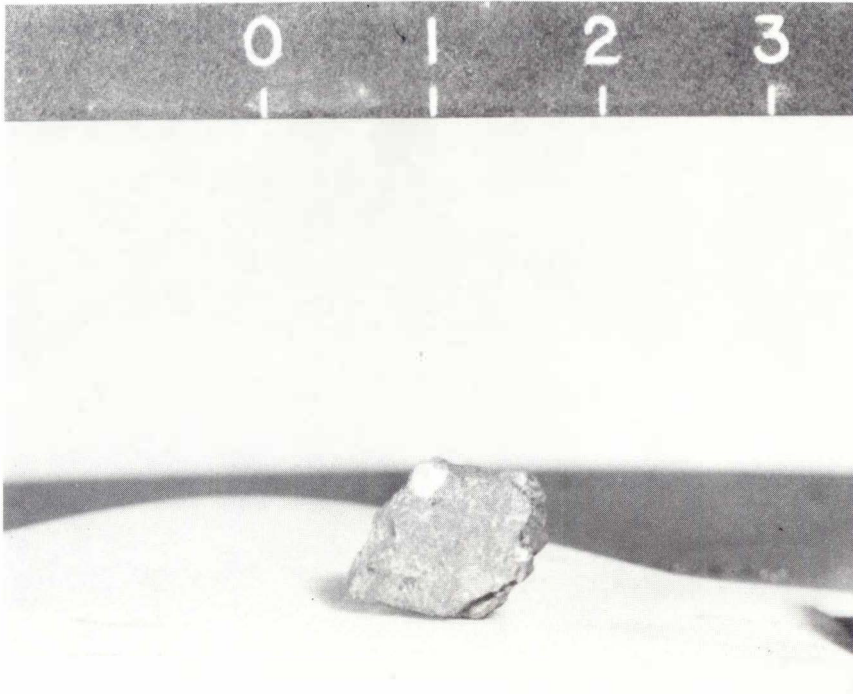


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