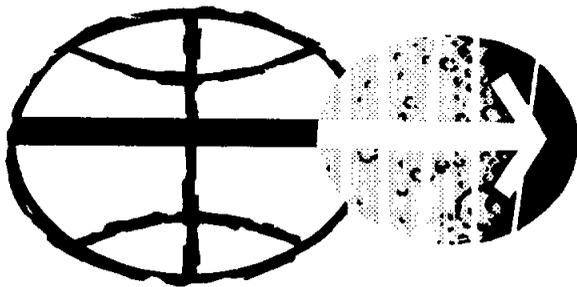




NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

DESCRIPTION, CLASSIFICATION, AND INVENTORY
OF APOLLO 16 RAKE SAMPLES FROM
STATIONS 1, 4, AND 13



LYNDON B. JOHNSON SPACE CENTER
HOUSTON, TEXAS

May, 1973

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NASA

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Apollo 16 Rake Samples, Stations 1, 4, and 13

Introduction

A preliminary description of the rake samples was included in the Apollo 16 Lunar Sample Information Catalog.

This newer document contains more detailed data developed during binocular microscopic examination of four of the Apollo 16 rake samples. The data consists of at least one binocular description and photograph from each group of similar rocks within each rake sample. Grouping was accomplished by simultaneously studying all rocks in a given rake sample and placing them side by side in a tray until at least two persons were in agreement that all samples in a given group were the same rock type.

Grouping of Rake Samples

Sample Number	Mass	Description	Location
61515	2.00 gm	Very light gray, friable, polymict breccia	Station 1, Flag Crater rim
16*	2.38	do	do
17	.47	do	do
18	.16	do	do
19	.33	do	do
61525*	10.35	Medium light gray, moderately friable, polymict breccia	do
26	4.08	do	do
27	.52	do	do
28	.24	do	do
29	.28	do	do
61535*	.23	Medium gray, tough breccia	do
36	85.99	do	do
37	6.62	do	do
38*	4.76	do	do
39	5.78	do	do
61545	3.61	do	do
46*	110.74	Glassy aggregates	do
58*	3.00	do	do
67	.19	do	do
47*	17.93	Glass-matrix breccia	do

Sample Number	Mass	Description	Location
61548*	24.18 gm	Glass-matrix breccia	Station 1, Flag Crater rim
49*	3.76	do	do
55	3.46	do	do
56*	2.23	do	do
57	.93	do	do
61559*	.62	Glassy agglutinates	do
65	.88	do	do
66	.66	do	do
68*	19.32	Medium gray, fine-grained, crystalline rock	do
69*	12.02	Medium dark gray, fine-grained, crystalline rock	do
61575*	5.26	Crushed anorthosite	do
76	5.87	Single plagioclase crystal	do
77*	.21	Cataclastic anorthosite	do

64535*	256.50	Dark gray and white breccia	Station 4
36	177.45	do	do
37*	124.25	do	do
38	30.03	do	do
39	17.76	do	do

Sample Number	Mass	Description	Location
64545	14.09 gm	Dark gray and white breccia	Station 4
46*	12.80	do	do
47	10.90	do	do
48*	8.49	do	do
49	6.47	do	do
64555	5.29	do	do
56	5.15	do	do
57	4.79	do	do
58	3.13	do	do
59*	21.82	Gray, fine-grained, crystalline breccia with white clasts	do
64566	14.13	do	do
78	5.60	do	do
65*	14.73	Dark gray, fine-grained, crystalline (devitrified?) rock	do
67*	13.86	Medium gray, fine-grained, crystalline rock	do
68*	9.38	Medium gray, very fine-grained, crystalline rock	do
64569*	14.32	Medium gray, recrystallized breccia	do
75*	6.84	Medium gray, crystalline breccia	do
76*	6.92	Light gray, very fine-grained, crystalline rock	do
77*	5.69	Medium dark gray, very fine-grained to vitreous, crystalline rock	do
79*	4.80	Medium dark gray, crystalline breccia	do

Sample Number	Mass	Description	Location
64585*	4.70 gm	Medium gray crystalline breccia	Station 4
86*	3.34	Dark gray, very	do
87*	7.18	Glass-coated, polymict breccia	do
88*	2.55	Soil breccia	do
89	4.04	Plagioclase crystal (or crystals?)	do

64815*	20.90	Light olive gray, very mafic rock	do
16*	3.83	Medium gray, fine-grained crystalline rock	do
17*	8.98	Light gray, fine-grained, crystalline rock	do
18*	15.98	Medium gray, very fine-grained crystalline breccia	do
19*	11.76	Crushed plagioclase with glass coating	do
64825	21.50	Medium gray, moderately friable, polymict breccia	do
26*	11.33	do	do
36	1.76	do	do
37	2.18	do	do
27*	8.11	Light gray, very friable, soil breccia	do
64828	0.97	do	do
29	2.20	do	do
35	2.32	do	do

63525	6.68	Medium dark gray, non-vesicular, very fine-grained, crystalline rock	Station 13
26	2.91	do	do

Sample Number	Mass	Description	Location
27	6.10	do	do
28	4.12	do	do
29	23.48	do	do
63535*	6.85	do	do
39	.39	do	do
46	9.23	do	do
48	1.13	do	do
55	3.38	do	do
63557*	7.53	do	do
36	1.02	Medium gray, vesicular, fine-grained, crystalline rock	do
37	4.78	do	do
45*	15.95	do	do
38	35.06	Medium gray, recrystallized breccia	do
63547*	4.90	Light gray, very fine-grained crystalline rock	do
49*	26.57	do	do
56*	18.10	Medium gray, fine-grained crystalline rock	do
58*	7.09	Medium gray, fine-grained, recrystallized breccia	do
59	6.04	Glass with white inclusions	do
63565	0.94	Glass with white inclusions	Station 13
66*	19.61	do	do
67	3.21	do	do

Sample Number	Mass	Description	Location
68	4.06 gm	do	do
69	.43	do	do
63575*	4.72	do	do
76	1.23	do	do
77	12.41	Medium to light gray recrystallized breccia	do
78*	19.60	do	do
79	11.35	do	do
63585*	32.62	do	do
86	1.98	do	do
87	20.51	do	do
88	2.40	Light gray, moderately friable, polymict breccia	do
89*	13.51	do	do
63595	2.10	do	do
96	6.40	Medium gray, very porous, sintered, plagioclase-rich breccia	do
97	5.67	do	do
98*	12.66	do	do

*chip taken for thin section study

Generic No.: 61515-519
Rock Type: Polymict breccia

Weight (g): ---
Dimensions (cm): ---
Color (fresh): Very light gray (N8)
Variability: Uniform clast distribution
Shape: Rounded to subrounded
Fabric/texture: Clastic, seriate
Coherence: Intergranular - friable to very friable
fracturing - few, some penetrative
Surface: Granulated
Cavities (%): Clast molds only
Zap pits: 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	Very light gray	75		<.1		
Gray clasts	Light to medium gray	15	Angular to sub-angular	<1	.1 to 2	Cherty appearance
Plagioclase	White to clear	10	Angular to sub-angular		.1 to 1	



61516
as an example

Generic No.: 61525-61529
Rock Type: Polymict breccia

Weight (g): ---
Dimensions (cm): ---
Color (fresh): Medium light gray to light gray (N6-N7)
Shape: Subrounded to subangular
Variability: Some have zap pits, some do not
Coherence: intergranular - moderately friable
 fracturing - few, non-penetrative
Fabric/texture: Granular seriate
Surface: Irregular - granular
Cavities (%): None
Zap pits: 61525 has many on one surface, 61527 few on 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	75	--	<.1		
Plagioclase	White to vitreous white	15-20	Sub-rounded		.1 to 1	
Light gray clasts	Light gray	5-10	Sub-rounded		.1 to 1	Very fine grained



61525 as an example



61535 as an example



61538 as an example

Generic No.: 61535-39, 61545
 (description is for 61536)
Rock Type: Gray matrix breccia

Weight (g): 86
Dimensions (cm): 5.5 x 5 x 3
Color (fresh): Medium gray (N5)
Variability: Homogeneous except for glass coating (other such as 61538 also have glass coating)
Shape: Irregular hemisphere
Cavities (%): 25% vesicles in glass coating
Coherence: intergranular - tough
 fracturing - non-penetrative set parallel to B, and several sets of open joints which are more or less random.

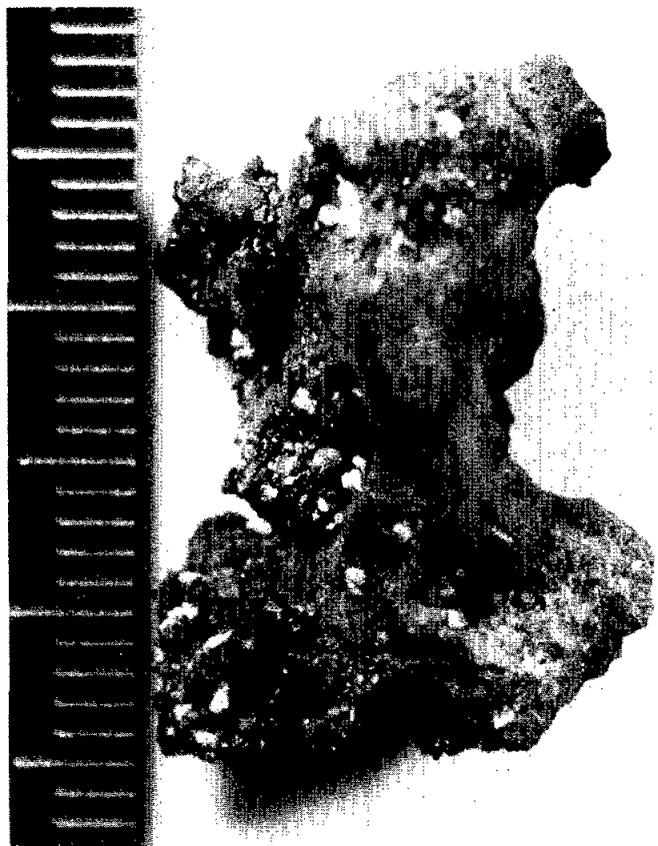
Fabric/texture: Breccia

Surface: All faces are rough, on B side of N there appear to be slicken-sides although surface is zapped. T and part of N are glass-coated.

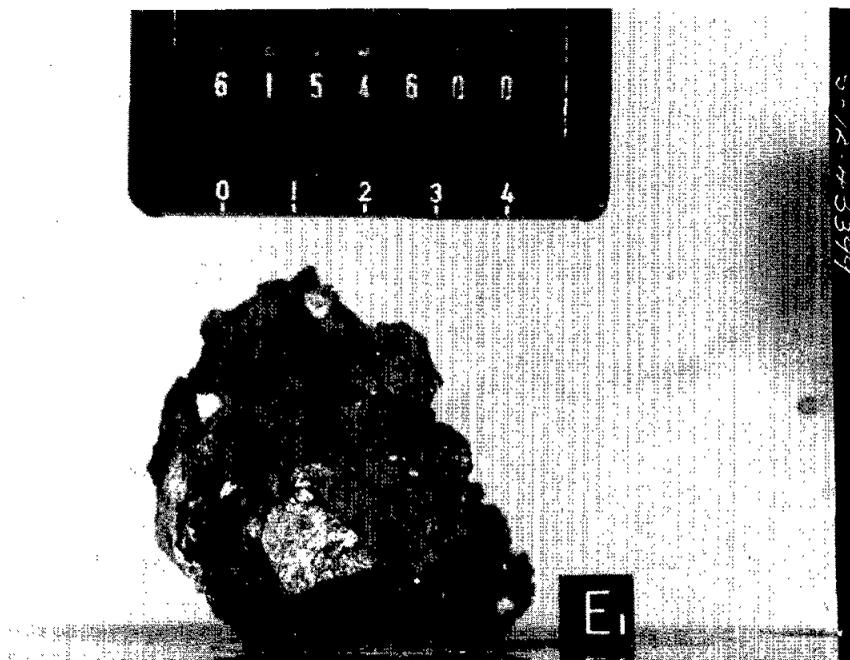
Zap pits: B, and parts of S, W, and E have few

<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)	50	Irreg		Aphanitic	
Clasts	White (N9)	40	Round-angular	1	<0.2-20	See (1)
Glass	Colorless to greenish and black	10	Irreg	2		See (2)
Mineral I	Red to yellow to pink metallic	Tr	Irreg	0.2		See (3)
Mineral II	Metallic	Tr	Round	0.2		Metal or sulphide

- (1) Chalky white with about 0.5% of minute dark specks. Some 0.5 mm "cleavage" flashes seen. Almost invariably surrounded by dark glass selvage which occasionally penetrates clast. Appears to grade down to size of matrix. Some have a pink color near cracks.
- (2) Thick splash on T, and parts of S, W, and N. Vesicular greenish areas may be devitrified.
- (3) Colors may represent differing thickness of same material. Appears most commonly near cracks.



61558



61546

11

Generic No.: 61546, 61558, 61567
Rock Type: Glassy aggregate

Weight (g): 111 (61546)

Dimensions (cm): 5 x 6 x 8

Color (fresh): Black glass (perhaps microcrystalline) with white clasts

Shape: Irregular (with projections)

Variability: Rock is vesicular black glass (microcrystalline) incorporating fragments of white, mostly microfractured, crystalline rock.

Coherence: intergranular - rock is coherent, but may be fragile or easily fractured due to abundant vesicles

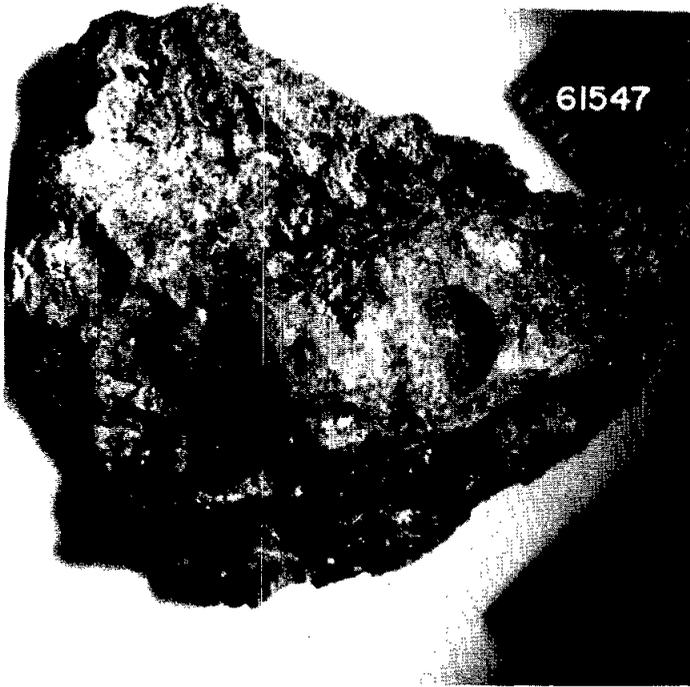
Fabric/texture: See "Comments" below

Cavities (%): ~25% vesicles in black glass (microcrystalline)

Surface: Most faces very irregular with reentrants due to vesicular nature of rock. SE face somewhat rounded.

Zap pits: SE face has numerous zap pits and probably was up when rock was collected.

<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	60	Essentially matrix			Fresh fracture shows microcrystalline (aphanitic) texture.
Clasts	White	15	Sub-rounded		Up to 10	Strongly microfractured, but with some clear grains in clasts.
Dirt coating	Brownish gray					Continuous coating of soil-like material covers part of N face (probably down at time of collection)
Vesicles		25				See "Cavities" above.



61547

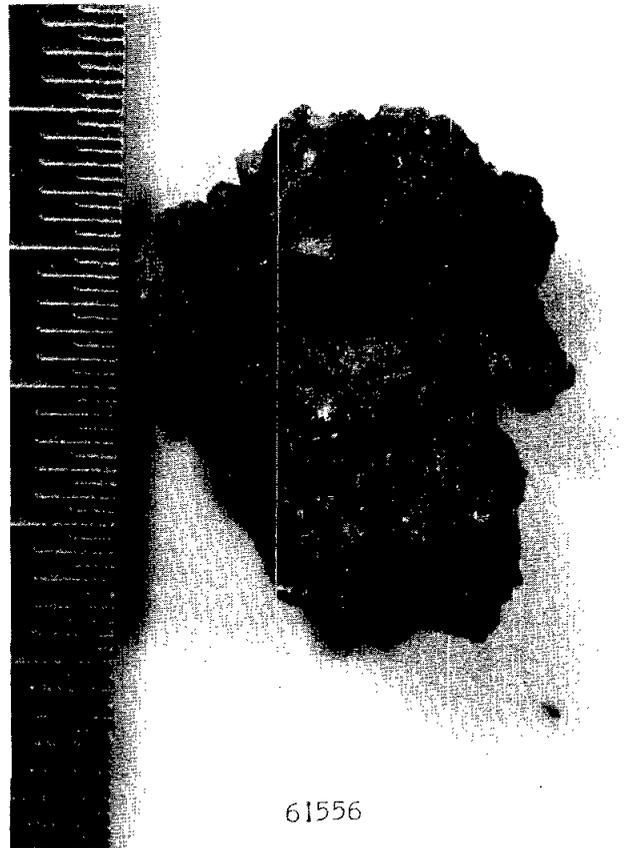
61547



61548



61549



61556

Generic No.: 61547-49, 61555-57

Rock Type: Breccia, glassy

Weight (g): ---

Dimensions (cm): ---

Color (fresh): Medium to medium dark gray (N4-N5)

Shape: Angular to subangular

Coherence: intergranular - tough
fracturing - few, non-penetrative

Variability: See "Special Features"

Cavities (%): Rounded, some irregular, <1 mm to ~10 mm, average 2-3 mm,
fine-grained crystalline lining; 15-50%

Fabric/texture: Aphanitic to fine-grained

Surface: Irregular, some hackly (fresh), some smooth

Zap pits: Few on 61555 and 48, others absent to rare

<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	Medium to med. dark gray	~90				Devitrified in part, some crystals
Clasts	White	10	Sub-angular to sub-rounded	.1 m to <2 mm		Very fine-grained
Metal	Silver	~1	Rounded	.1 mm to 3 mm		61547, 55, 56, 57, large metal grain on 61557 (~3- 4 mm)

Special Features: 61548 and 49 have no metal grains; 61547 has spectacular crystal lining of vesicles.

Generic No.: 61559, 61565, 61566

Rock Type: Glass agglutinate

Weight (g): ---

Dimensions (cm): ---

Color (fresh): Dark gray vitreous luster (N3)

Shape: Angular

Coherence: intergranular - coherent
fracturing - non-penetrative, few

Variability: Greenish near (numerous tiny) bubbles

Fabric/texture: Glass-bonded agglutinate

Cavities (%): 60-70% vesicles - round

Surface: Smooth, bumpy, vitreous

Zap pits: 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		40-80				
Gray breccia		60-20				

Special Features: Same as glass coatings on 61535-61545. Some gray breccia fragments are similar to 61525-61545.



61559 as an example.

Generic No.: 61568
Rock Type: Crystalline

Dimensions (cm): 2.5 x 2 x 1.5

Color (pitted): Medium gray (N5)

Shape: Blocky

Variability: Uniform

Coherence: intergranular - tough

fracturing - few; non-penetrative, one penetrative

Fabric/texture: Equigranular

Cavities (%): Very few (<1%) vesicles, most are spherical, one is elongate, 0.5 mm diameter

Surface: Hackly to smooth

Zap pits: Many 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	Gray	100		0.1 is average	<0.5	



Generic No.: 61569
Rock Type: Crystalline

Dimensions (cm): 3 x 1 x 1.5
Color (fresh): Medium dark gray (N4)
Shape: Blocky to irregular
Variability: Uniform
Coherence: intergranular - tough
 fracturing - few, non-penetrative
Fabric/texture: Equigranular
Cavities (%): 5%, 0.2 to 2 mm, rounded to elongate vesicles with
 fine, drusy crystal linings, metal blobs occur in some.
Surface: Hackly to smooth
Zap pits: 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	Gray (N4)	99		<.1		Nearly aphanitic
Metal	Silver	1	Rounded			In rock and on vesicle walls





61575

Generic No.: 61575
Rock Type: Crystalline

Dimensions (cm): 1.5 x 1 x 1

Color (fresh): Medium gray (N5)

Shape: Irregular

Variability: Irregularly distributed white, gray, and vitreous areas

Coherence: intergranular - coherent

fracturing - many, non-penetrative

Cavities (%): None

Surface: Irregular

Zap pits: Rare

<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	Light gray	65-70	Blocky	Cleavage faces	Up to 5.0	Size difficult to determine
Plagioclase	White	20	Irreg		Up to 3	Surrounded by light gray (may be remains of zap pit)
Glass	Medium dark gray	10-15		Aphanitic		Vitreous, fills in dike-like fractures

Special Features: In a few cases the remains of the central glass area of a zap pit is in the white area. Probably this is a coarse-grained plagioclase rock that has been partially melted and shocked by zap pits to form white, zoned areas.

Generic No.: 61576
Rock Type: Plagioclase crystal

Dimensions (cm): 2 x 1 x 1.5

Color (fresh): White (N9)

Shape: Blocky

Variability: Gray vitreous material adhering at one side with zap pits

Coherence: intergranular - coherent
fracturing - many, penetrative

Fabric/texture: Probably single crystal with many cleavage surfaces

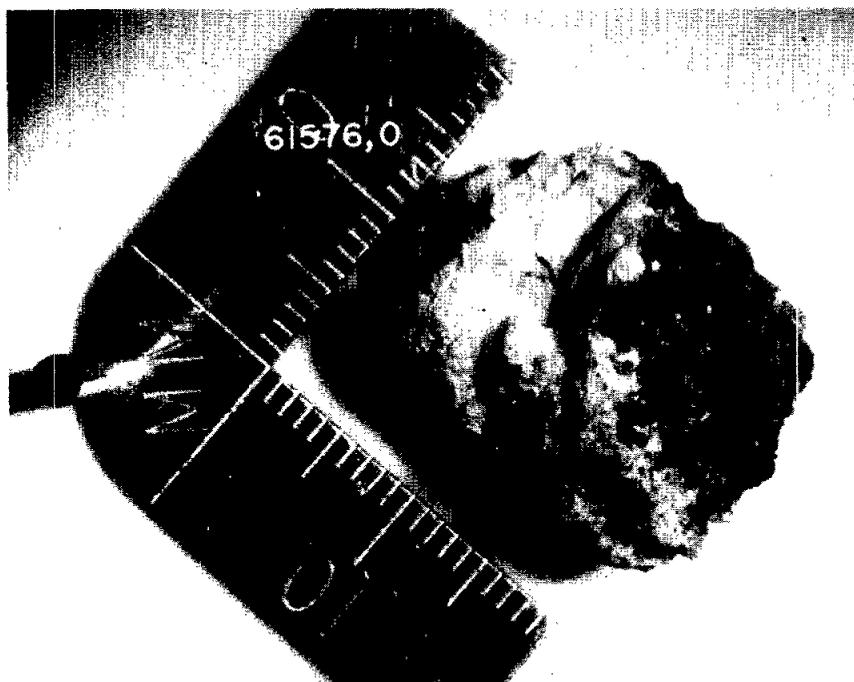
Cavities (%): In gray material only, few vesicles, 1-2 mm

Surface: Blocky by cleavage

Zap pits: Only on gray 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	95	Blocky			Single crystal
Coating	Gray	4				All on one side, vitreous material
Glass	Gray	1	Irreg	1-2		

Special Features: One large plagioclase crystal.



Generic No.: 61577
Rock Type: Cataclastic
plagioclase

Dimensions (cm): .5 x .5 x .25
Color (fresh): White (N9)
Shape: Subrounded
Variability: Some black areas, irregularly distributed, glass-coating
Coherence: intergranular - friable
 fracturing - none
Fabric/texture: Granular
Cavities (%): None
Surface: Glass coating (black), 20% on one side
Zap pits: Many, all over

<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	100 with glass coating not considered		<.1		





64535

Generic No.: 64535 (This sample
 plus 64536-38 are representative
 also of 64539, 64545-49, 64555-58)
Rock Type: Breccia

Weight (g): 256
Dimensions (cm): 9 x 7 x 5

Color (fresh): White (N9) and dark gray (N3)
Shape: Ovoid
Variability: Inhomogeneous
Coherence: intergranular - friable
 fracturing - several penetrative cracks which make the
 rock friable

Fabric/texture: Breccia
Cavities (%): 10-20% in glassy material on S
Zap pits: Few on N, E, and T
Surface: N, E, T smooth, S irregular, W and B hackly

<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	White (N9)	70	Irreg			Aphanitic white mixture also occurs as clasts in both clasts & glass
Lithic clast	Dark gray (N3)	20	Irreg	2	20- 0.5	See (1)
Glass	Dark gray (N3)	10	Irreg			A 10 mm thick coating on S and blobs on N, E, and T. Vesiculated.
Metal	Metallic	Tr	Spheri- cal	0.1	0.1	Associated with glass

(1) Contains dark specks less than 0.01 mm long. About 10% aphanitic gray material like glass but no vesicles evident. Contains clasts of matrix.

Special Features: Vesicles often have opalescent coating or a lining of feld crystals. Glass has a very dull luster on several areas; may be either microvesicles, dust coating (adhering to glass) or devitrified. Glass contains clasts of matrix. It is definitely more glassy near contact with matrix or clasts than elsewhere.

Generic No.: 64536 (This sample
 plus 64535, 64537-38 are
 representative also of 64539,
 64545-49, 64555-58)
Rock Type: Black & white breccia

Dimensions (cm): 6 x 5 x 3.5
Color (fresh): Half black, half white
Shape: Tabular, subangular
Variability: Extreme variation in amount of black clast in white
 matrix, most in end of rock
Coherence: intergranular - tough to slightly friable
 fracturing - few; non-penetrative
Fabric/texture: Isotropic
Cavities (%): None
Surface: B fresh, hackly; others hackly with some tightly adhering dust
Zap pits: Many T, N, S, E, W; none B, black glass in pits on black rock,
 white glass on white 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	White (N9)	60			<.5	See (1)
Fragments	Dark gray to greenish black (N2-N3)	40	Rec- tangu- lar		2.5- 20	See (2)

(1) White granular crystalline material with a few percent black mafic sil. grains <0.5 mm. Probably crushed anorthositic material. A few percent of the white material contains green vitreous luster areas 0.5 mm across.

(2) Crystalline with flinty to sugary luster. Bits of white vitreous to sugary material included in black material up to 0.5 mm across.

Special Features: Contact between black and white is everywhere sharp but varies from planar to sutured to embayed.



64537

Generic No.: 64537 (This sample plus 64535-36 and 64538 are representative also of 64539, 64545-49, 64555-58)
Rock Type: Crystalline (recrystallized breccia)

Weight (g): 124.25

Dimensions (cm): 5.6 x 5.5 x 4

Color (fresh): Dark to medium dark gray (N3 to N4) and white (N9)

Shape: Blocky subround

Coherence: intergranular - coherent
fracturing - few, non-penetrative, mostly on W and adjacent parts of T and B

Variability: Dark and light

Fabric/texture: Microcrystalline and fine breccia

Surface: T, N, W, parts of others - hackly. S, B, and bottom half of E - irregular to hackly. White phase is irregular, non-hackly.

Cavities (%): Open fractures and irregular, angular holes; angular holes may be due to plucking of tiny blocks or to sintering; some elongate angular holes may be old fractures, healed by sintering (they are too irregular to be due to plucking). Total <5%. One round vesicle in glass on S edge of T.

Zap pits: Many on all faces at E end of S; one pit beautifully developed in metal. Glass in larger pits may be fractured. Apparently the specimen was rotated many times during gardening of the soil.

<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>	
Dark	Dark to medium dark gray	85				See "Special Features"
White	White	15+	Crudely tabular to angular			See "Special Features"
Clast	Light gray	<1	Equant blocky, subround	5x5		Clast in dark material apparently homogeneous
Metal	Light yellow	1	Spheroid	0.1	<0.15	Tarnished metal, may include some sulfide, surface commonly micro-rough. In dark phase only, where it is uniformly distributed.

<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>	
Spinel	Red	Tr	Blocky angular	0.1		One fractured, transparent, vitreous grain in dark phase on W

Special Features: Soil cover heavy on E, moderate on S and B, minor elsewhere. Origin of rock is not clear. Evidence can be found to support the view that the white injected the dark, or the view that the white was the less competent matrix of a breccia in which the dark formed clasts, or the view (preferred) that the white areas were larger clasts in a dark matrix breccia and were deformed during a shock event which led to recrystallization of the dark matrix. This last view is supported by the small distinct clasts of plagioclase in the dark phase and by a comparison with 65757 which is composed of dark, sintered, recrystallized material, much like the hackly dark phase of this specimen; in addition, 65757 is coated by dark vesicular glass, suggesting that the sintering and recrystallization were part of a shock event which also induced melting; a remnant of similar glass is present on the S edge of T of this specimen, which suggests that N and T were once covered by glass, now removed. The less recrystallized part of this specimen was most distant from that glass coat and its character is consistent with the implied thermal gradients. The white phase is matched by similar white relics in 65757, the main difference being the deformation of the relict clasts in this specimen. This deformation is probably a scale effect, 64537 is from a much larger specimen than 65757.

Dark: Grades from dark gray on T, N, and W to medium dark gray on S, B, and bottom half of E. The color gradations correspond to distinct changes of lithology.

The dark gray is microcrystalline, minutely blocky, subtly mottled in shades of gray, fracture is hackly due to plucking of the blocks. Apparently it is recrystallized breccia. Luster is generally dull, lithic, locally vitreous (rootless glass veins). S edge of T includes patch of vesicular black glass. Contains plagioclase inclusions from <1 to several mm, total about 1 or 2%, no definite mafics identified through a brownish gray mass (with cleavage) may be a relict mafic grain.

The medium gray areas have a distinct mottling composed of a light gray mass traversed by vermicular dark gray seams. This material is microcrystalline, but not blocky and surface is irregular, but generally not plucked and hackly. It is less recrystallized than the dark gray and appears to have been further removed from a heat source. It also has a rootless glass vein.

White: Two crudely tabular masses parallel to E and W, opaque white due to shock; the thicker is about 2 cm wide, the thinner from 2 to 8 mm wide. Boundaries against the dark material are sharp but highly irregular. The white sends out irregular filaments into the dark, and may surround and enclose fairly sharp, angular or subangular dark "clasts." On the other hand, isolated white masses in the dark are irregular in shape and grade down to the plagioclase clasts in the dark. The collective evidence suggests that the white was relatively mobile, the dark relatively competent and brittle. No mafic grains. Dark patches on surface in places may be glass from zap pits, if so, color must be influenced by whatever caused the zap pit, because most zap pits are buried by colorless to light brownish transparent glass.

Generic No.: 64538 (This sample
 plus 64535-37 are representative
 of 64539, 64545-49, 64555-58)
Rock Type: Breccia (black & white)

Dimensions (cm): 3.8 x 4.2 x 2.6

Color (fresh): Light gray and medium gray (N8/N7/N5)

Shape: Subangular. Roughly approaches 3-sided pyramid.

Coherence: intergranular - coherent to friable
 fracturing - numerous small fractures; larger fractures
 are roughly parallel and perpendicular to banding.

Variability: Coarse variable banding in color and lithology. This "layering"
 goes from white (plagioclase) to dark gray breccia to light gray
 breccia perpendicular to base of "pyramid."

Fabric/texture: Banding is lens-like. Clasts range from <1 mm in gray
 to slightly less than 1 cm in white layer.

Cavities (%): Less than 2% small (<.5 mm) vugs in small clusters predominantly
 in dark gray.

Surface: N and S - irregular to vuggy/hackly surfaces; there are white
 clasts in the dark gray, numerous dark gray in the white layer and
 numerous whitish clasts in the light gray but few if any dark gray
 clasts in the light gray layer.

Zap pits: Many - N, 5 in a cluster, all with glass linings; S - few,
 little 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>	
White breccia clasts		5-10	Irreg	6-10		This white area has glass splashes (clear) and zap pits. It consists of 80-90% white shocked plagioclase and 5-10% gray clasts
Dark gray breccia		15-20	Lens- shaped	Apha- nitic matrix	2-10 thick on N	Contains <5% white clasts
Light gray breccia		~70%	Massive	2-3	.8 cm	Probably contains much plagioclase

Special Features: In the light gray there are small thin glassy shards
 or lenses of glass (not numerous), also could be in dark gray; white
 layer shows some plagioclase crystals, plagioclase crystals also in
 light gray - more numerous in some areas.

Generic No.: 64559

Rock Type: Crystalline breccia

Dimensions (cm): 3 x 2 x 1.5

Color (fresh): Medium gray (N5)

Shape: Blocky to irregular

Variability: White clast concentrations

Coherence: intergranular - coherent
fracturing - few, non-penetrative

Fabric/texture: Breccia

Cavities (%): None

Zap pits: None

Surface: Smooth to hackly

<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>	
Crystalline matrix	Medium gray	90		<0.1		White and gray salt and pepper mixture at <0.1 mm.
Plagioclase	White	~10	Angular	1-2	Up to 2x10	Clasts
Glass	Dark gray	1-2	Angular	~1-2		Usually as clasts but some as veinlets



Generic No.: 64566

Rock Type: Crystalline breccia

Dimensions (cm): 2 x 2 x 1.5

Color (fresh): Dark to medium gray (N3-N4)

Shape: Blocky

Variability: Localized white clasts

Coherence: intergranular - coherent
fracturing - few, non-penetrative; one penetrative

Fabric/texture: Breccia

Surface: Irregular

Cavities (%): None

Zap pits: 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	N5-N4	90		<0.1		Salt and pepper, fine-grained
Plagio- clase	White	5-8	Sub- angular to sub- round	1.0		Largest clast 1 cm
Glass	Dark gray vitreous	2-3	Sub- angular	2.0		

Special Features: Like 64559 in matrix.

Generic No.: 64578
Rock Type: Crystalline

Dimensions (cm): 2 x 1.5 x 1.5
Color (fresh): Medium dark gray (N4)
Shape: Blocky
Variability: Uniform
Fabric/texture: Equigranular
Coherence: intergranular - tough
 fracturing - many, non-penetrative
Cavities (%): None
Surface: Small area of splash glass
Zap pits: Few, most surfaces
Special Features: Like 64559 and 64566.

Generic No.: 64565
Rock Type: Crystalline

Dimensions (cm): 3 x 2 x 1.5

Color (fresh): Dark to medium dark gray (N3 to N4)

Shape: Irregular

Coherence: intergranular - tough
fracturing - very few; non-penetrative

Variability: Uniform

Surface: Hackly

Fabric/texture: Fine-grained, crystalline

Zap pits: None

Cavities (%): Crystal-lined vesicles, up to 1 cm, one 2-3 mm, ~15% - 20.

<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>	
Fine crystalline	N3-N4	98		<0.1		Devitrified
Plagio- clase	White	2	Subang to sub- round	<1		
Shiny	Metallic	< 1		<1.0		Metal



Generic No.: 64567
Rock Type: Crystalline

Dimensions (cm): 3 x 2 x 1.5

Color (fresh): Medium gray (N5)

Shape: Irregular

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

Variability: Uniform

Fabric/texture: Nearly aphanitic, equigranular

Surface: Hackly

Cavities (%): Vugs with projecting crystals and vesicles 1-2 mm, <5%

Zap pits: Few, but not on all surfaces; one surface has many

<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>	
Crystalline	Gray	100		<0.3		Equigranular
Mafic Sil.	Yellow- brown	Tr	Elon- gate	1.0		Seen in one area only

Special Features: Rusted metallic fragment on surface with many zap pits, not as hackly as other surfaces. Rock has much dust on most surfaces.

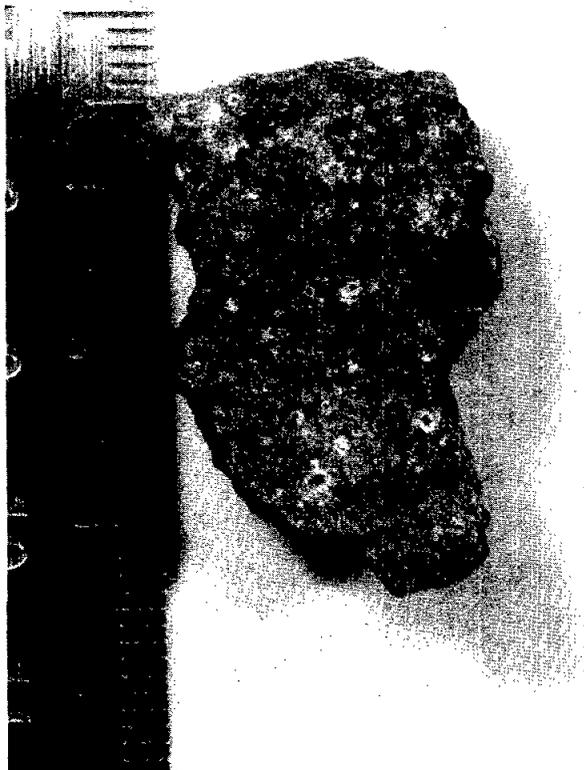


Generic No.: 64568
Rock Type: Crystalline

Dimensions (cm): 3 x 1.5 x 1
Color (fresh): Medium gray (N5)
Shape: Blocky
Variability: Uniform
Coherence: intergranular - tough
 fracturing - few, non-penetrative
Fabric/texture: Equigranular, cherty
Surface: Smooth
Cavities (%): Tiny irregular vugs ~.4-.5 mm, crystals projecting inward
Zap pits: Many, all over

<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>	
Crystalline	Gray	98		~0.1		Grain size by reflections off cleavage of crystalline faces
Vitreous patches	Dark gray	1-2	Sub-rounded	.3-.4		Irregularly distributed

Special Features: Vugs along apparently healed fractures, some fractures an echelon.



Generic No.: 64569

Rock Type: Crystalline breccia

Dimensions (cm): 2.5 x 2 x 1.5

Color (fresh): Medium gray (N5)

Shape: Blocky to irregular

Variability: Dust covered, uniform where observed

Coherence: intergranular - coherent

fracturing - few; non-penetrative

Fabric/texture: Breccia; recrystallized, generally equigranular

Cavities (%): Crystal-lined vesicles <5%, ~1 mm

Surface: Irregular

Zap pits: 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 to dark gray	95		.3-.4		Mixture of light and dark gray grains. Light gray areas are rounded with dark gray filling in around light gray
Plagio-clase	Light medium gray	3-4	Sub-angular sub-rounded	1-2		
Maf Sil	Light green	<1	Subround	1.0		

Special Features: High percent of dust cover limits description.



Generic No.: 64575

Rock Type: Crystalline breccia

Dimensions (cm): 2.5 x 1.5 x 1

Color (fresh): Medium light gray (N6)

Shape: Irregular

Coherence: intergranular - tough
fracturing - very few; non-penetrative

Variability: Large metal grain 2.5 x 1 mm

Cavities (%): None

Fabric/texture: (Breccia) granular

Zap pits: Few on one surface

Surface: Hackly

<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		.6-.4		Light gray with dark gray surrounding it like 69.
Metal fragments	Shiny metallic	1-2	Rounded		1-.5	2.5 x 1 mm largest
Plagioclase	Light gray	2		~.5	Up to 1	



Generic No.: 64576
Rock Type: Crystalline

Dimensions (cm): 2.5 x 1.5 x 1.0

Color (fresh): Light gray (N7)

Shape: Tabular

Variability: Too dust covered to be sure, fairly uniform

Coherence: intergranular - tough
fracturing - very few; non-penetrative

Fabric/texture: Cherty; equigranular

Surface: Hackly

Cavities (%): 1% vugs, ~1 mm

Zap pits: None seen, dust coated

<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	100		~0.1	Up to .4	Crystal reflections, some needle like crystals

Special Features: Highly dust covered with light gray dust. One large vitreous crystal ~2 mm.



Generic No.: 64577

Rock Type: Very fine-grained
crystalline

Dimensions (cm): 2.5 x 1.5 x 1.0

Color (fresh): Medium gray to medium dark gray (N4-N5)

Shape: Angular

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

Variability: Uniform

Fabric/texture: Aphanitic

Cavities (%): Vugs or healed fractures

Surface: Areas without zaps are vitreous

Zap pits: Many zaps over all but one end

<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		Aphanitic		
Vitreous	Dark gray	5	Irregular elongate		Up to 3-4	Vein-like



Generic No.: 64579

Rock Type: Crystalline breccia

Dimensions (cm): 2 x 1.5 x 1

Color (fresh): Medium dark gray (N4)

Shape: Tabular

Coherence: intergranular - tough
fracturing - very few; non-penetrative

Variability: White clasts are locally concentrated

Fabric/texture: Aphanitic

Cavities (%): Vugs, crystal-lined, up to 4-5 mm, usually 2 mm, 5-10%

Surface: Smooth to hackly

Zap pits: Few on some 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 dark gray	95				Aphanitic
Plagio-clase	White	5	Sub-round	~1	Up to 4	Bimodal either ~1 mm or 3-4 mm



Generic No.: 64585

Rock Type: Crystalline breccia

Dimensions (cm): 1.5 x 1.5 x 1

Color (fresh): Medium gray (N5)

Shape: Blocky

Variability: One large glass fragment; uniform otherwise

Coherence: Intergranular - coherent

fracturing - few; penetrative; many non-penetrative

Cavities (%): Vesicles in the glass, none elsewhere

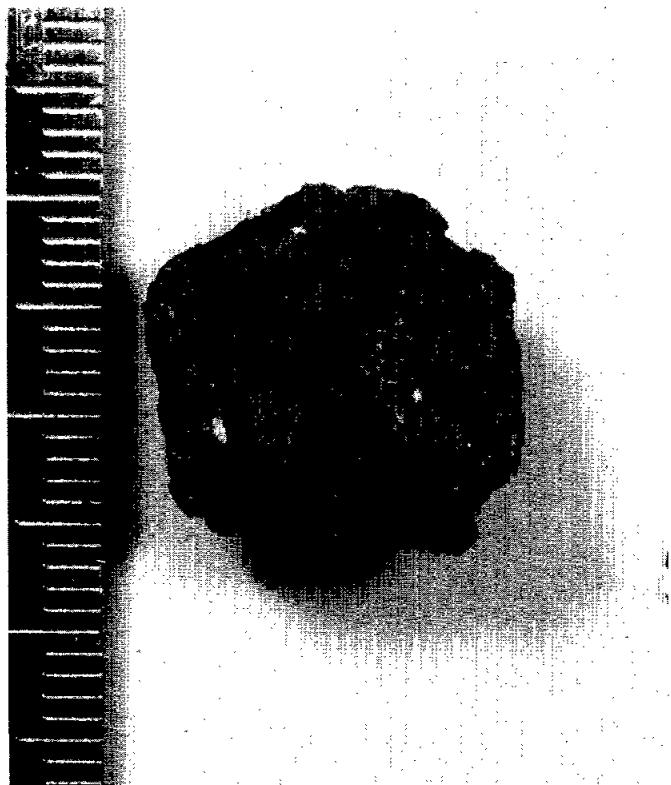
Fabric/texture: Equigranular

Surface: Irregular

Zap pits: Few on most 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	95				Salt and pepper matrix (see 64559)
Plagioclase	White	2-3	Sub-round	1		Even distribution
Glass	Dark gray	2	Tabular			2 mm x 5 mm long

Special Features: One large tabular glass fragment.



Generic No.: 64586
Rock Type: Crystalline

Dimensions (cm): 1.5 x 1.5 x 1
Color (fresh): Medium dark gray (N4)
Shape: Irregular
Variability: Uniform
Coherence: intergranular - tough
 fracturing - few; non-penetrative
Fabric/texture: Aphanitic, vitreous
Cavities (%): None
Surface: Smooth, locally glass-coated
Zap pits: 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 dark gray	99				Aphanitic-vitreous
Plagioclase	White	1	Sub-round	1		

Special Features: Vitreous fine-grained matrix quite different from rest of samples in this rake population. Within aphanitic matrix rectangular areas up to 2-3 mm in length have single reflection but are comprised of numerous small grains.



Generic No.: 64587

Rock Type: Glass-coated, polymict
breccia

Dimensions (cm): 3 x 2.5 x 1.0

Color (fresh): Medium light gray (N6)

Shape: Slabby

Variability: Uniform clast distribution

Fabric/texture: Fine breccia

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

Cavities (%): Vesicles in glass only

Surface: Greenish, vesicular, glass-coated, 70%

Zap pits: 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	70		Seriate	Up to 1	
Plagioclase	White	10	Sub-round	1-2		
Clasts	Medium gray	20	Sub-round	1-2	Up to 3	Aphanitic



Generic No.: 64588
Rock Type: Breccia - soil

Dimensions (cm): 2 x 1 x 0.5
Color (fresh): Medium gray (N5)
Shape: Subrounded
Variability: Uniform
Coherence: intergranular - friable
 fracturing - none
Fabric/texture: Breccia
Cavities (%): None
Surface: Granular
Zap pits: 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	90		0.1		
Plagio- -class	White	5	Sub- round to sub- angular	0.5		
Clasts	Light gray	2	Rounded	3		Light gray matrix breccias
Clasts	Dark gray to black	2	Rounded		Up to 0.5	Aphanitic

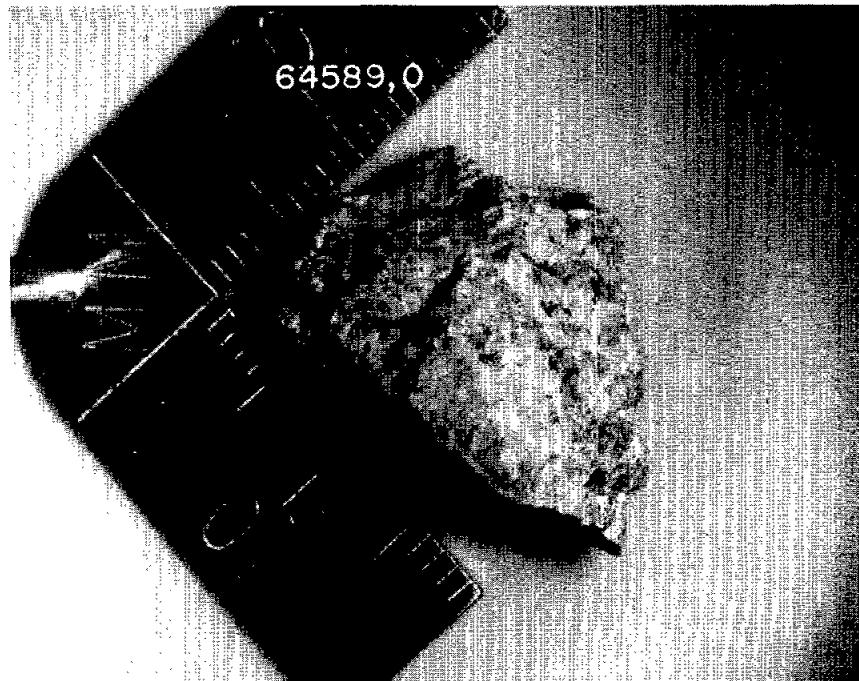


Generic No.: 64589
Rock Type: Plagioclase

Dimensions (cm): 2 x 1.5 x 1
Color (fresh): White (N9)
Shape: Irregular
Coherence: intergranular - coherent
 fracturing - few; non-penetrative
Variability: None
Fabric/texture: Granular
Cavities (%): None
Surface: Blocky-cleaved
Zap pits: 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>	
Plagioclase	White	100				

Special Features: Some cleavage surfaces ~1 cm in length - probably one or few plagioclase crystals.





64815

Generic No.: 64815
Rock Type: Ultramafic

Dimensions (cm): 3 x 3 x 1
Color (fresh): Light olive gray 5Y6/1
Shape: Tabular
Variability: Local concentrations of mafic minerals
Fabric/texture: Inequigranular
Cavities (%): None
Coherence: intergranular - tough
fracturing - few; non-penetrative
Surface: Smooth to hackly
Zap pits: Few on 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>	
Mafic Sil.	Pale yellow green	85-90	Probably subhedral	.1-.2		
Opaque	Black	3-5	Elongate to anhedral		.5-1	Maybe ilmenite. Irregularly distributed.
Mafic Sil	Reddish brown	1-2	Subhedral to anhedral		.1-1	Locally concentrated in cm patches of uniform grain size. Rare in other parts of rock.
Mafic Sil	Greenish yellow	3-4				Probably olivine, irregularly distributed
Plagioclase	Translucent to white	3-4	Anhedral to subhedral		.5-1	

Special Features: Coarser crystals occur as clusters of black opaque, reddish-brown silicate, greenish-yellow mafic silicate, and plagioclase. There is very little of the pale yellow-green mafic silicate in these clusters.

Generic No.: 64816

Rock Type: Fine-grained, crystalline

Dimensions (cm): 1.5 x 1.5 x 1.5

Color (fresh): Medium gray (N4)

Shape: Subangular

Variability: Uniform

Coherence: intergranular - tough
fracturing - very few, non-penetrative

Fabric/texture: Isotropic

Cavities (%): None

Surface: Dust coating on three surfaces

Zap pits: 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>	
Plagioclase	White	40	Sub-angular	0.5		
Crystalline	Medium gray to medium dark gray	60	Sub-angular	0.5		
Metal	Silvery	1	Spheres	0.5	0.3-0.8	

Special Features: Plagioclase and gray crystalline material have salt and pepper appearance. Both may be plagioclase.



Generic No.: 64817
Rock Type: Fine-grained,
 crystalline

Dimensions (cm): 3 x 1.5 x 1

Color (fresh): Medium, light gray (N5)

Shape: Tabular

Variability: A few irregularly distributed larger grains

Fabric/texture: Generally equigranular

Coherence: intergranular - tough
 fracturing - very few; non-penetrative

Cavities (%): Rare, spherical, vesicles, <1%, < 0.5 mm diameter

Surface: Much dust on some surfaces, hackly

Zap pits: None obvious, a few white areas may be remnants of previous 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>	
Plagio- clase	White	30	Sub- angular		0.5- 0.8	
Crystalline	Medium gray	70	Euhedral elongate		0.5- 0.8	See (1)

(1) Those cleavage faces that can be seen are elongate and euhedral but only a few can be seen. A very few are up to 1.5 mm long.



Generic No.: 64818
Rock Type: Crystalline breccia

Dimensions (cm): 3 x 2 x 2
Color (fresh): Medium gray to medium dark gray (N4-N5)
Shape: Subangular, irregular
Fabric/texture: Breccia
Variability: Concentration of large plagioclase grains is irregular
Cavities (%): None
Coherence: intergranular - tough
fracturing - very few; non-penetrative
Surface: Irregular, hackly
Zap pits: Many on most surfaces, none 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	Medium dark gray	75			<0.1	Aphanitic
Plagioclase	White	25	Subhedral		1-3	Plagioclase clast concentration at one end

Special Features: None



Generic No.: 64819
Rock Type: Plagioclase

Dimensions (cm): 2.5 x 2 x 1

Color (fresh): White (N9) with dark gray (N3) partial coating

Shape: Tabular

Variability: Dark gray aphanitic material 1-3 mm thick on top and bottom of plagioclase making a sandwich

Coherence: intergranular - coherent
fracturing - many, non-penetrative

Cavities (%): None

Surface: Rough to hackly

Zap pits: 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>	
Plagio- clase	Chalky white	90				No crystal out- lines visible, possible cleavage faces 3-4 mm
Devitri- fied glass	Black	10				Aphanitic with a few small (1 mm) white clasts in it

Special Features: Black material penetrates plagioclase as small veinlets.





64826 as an example

Generic No.: 64825, 26, 36, 37

Rock Type: Polymict breccia

Dimensions (cm): Largest is 3.5 x 3.5 x 2

Color (fresh): Medium gray (N5)

Variability: Uniform distribution of clasts

Shape: Subrounded

Fabric/texture: Fine breccia

Coherence: intergranular - moderately friable
fracturing - very few, non-penetrative

Cavities (%): None

Surface: Granular, 64837 has partial dark gray glass coating which appears greenish where thin.

Zap pits: None, except for a few on one surface of 64825

<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			Up to .1	
Plagioclase	Chalky white	15	Sub-angular	1	Up to 3	Some plagioclase is a bit more translucent than others but chalky white is predominant
Clasts	Dark gray	5	Sub-angular	.5	.1-2	Aphanitic
Glass	Dark gray	1 grain	Sphere	1		Occurs only in 64826.
Metal	Silvery	1 grain	Round, ellipsoid	1		Occurs only in 64825.
Glass	Green	1 grain	Sub-angular	1		Occurs only 64825.

Special Features: Glass coating of 64837 has a few fragments of the breccia within it.

Generic No.: 64827, 28, 29, 35

Rock Type: Breccia

Dimensions (cm): Largest is 2 x 1.5 x 1

Color (fresh): Medium light gray (N6)

Shape: Subrounded

Variability: Uniform clast distribution

Coherence: intergranular - very friable
fracturing - none

Fabric/texture: Fine breccia

Cavities (%): None

Surface: Granular

Zap pits: 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	85-90			<0.1	
Plagioclase	White	5-7	Sub-angular	.5	.1-1	Finely crushed
Clasts	Dark gray	5-7	Sub-angular	.5	.1-1	Probably aphanitic

Special Features: Probably a soil breccia (similar to the friable Apollo 11 breccias).



64827 as an example

Generic No.: 63525-535, 539,
 546, 548, 555, 557
Rock Type: Fine-grained crystalline

Dimensions (cm): Up to 3.5 x 3 x 2.5
Color (fresh): Medium dark gray (N4)
Shape: Angular
Variability: Quite uniform
Fabric/texture: Aphanitic, isotropic
Coherence: intergranular - tough
 fracturing - few; non-penetrative
Cavities (%): None
Surface: Smooth to hackly on fresh surfaces
Zap pits: Few on some surfaces of each fragment

<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	98			Aphanitic to 0.2	
Plagioclase	White	1-2 except 63557	Sub-round		Up to 5.0	Clasts

Special Features: 63557 has more white clasts than others (~10%) and cleavage flashes in matrix are a bit coarser than remainder of group. Also 1 or 2 darker gray clasts.



63535 as an example

Generic No.: 63536, 537, 545
Rock Type: Fine-grained crystalline

Dimensions (cm): Largest is 3 x 2 x 2
Color (fresh): Medium gray (N5)
Shape: Subangular to subrounded
Variability: Vesicles are concentrated in a few areas
Coherence: intergranular - tough
 fracturing - few; non-penetrative
Fabric/texture: Uniform, equigranular, isotropic
Cavities (%): Vesicles, rounded, crystal-lined, 1-3 mm, 20-25%
Surface: Hackly
Zap pits: 545 has many pits on most surfaces. Other two have few on most 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	100		0.5	Up to 1 mm	See (1)

(1) Slightly coarser-grained than 525-35 group. Suggestive of a porphyritic texture in 545. May be relict clasts.

Special Features: 536 may be a chip from 37 or 45 but cannot be replaced in an exact position.



63545 as an example



63538

Generic No.: 63538

Rock Type: Crystalline (recrystallized
breccia)

Dimensions (cm): 9 x 3.5 x 3.0

Color (fresh): Medium gray (N5)

Shape: Blocky, angular

Variability: Heterogeneous development of crystals

Coherence: intergranular - very coherent
fracturing - none

Fabric/texture: Cryptocrystalline to crystalline

Cavities (%): 2% cavities, some are spherical, smooth-walled, and vesicle-like, others are irregular and smooth-walled without projecting crystals. Where walls are clearly seen they are lined with interlocking laths of feldspar. This disappears away from vesicle walls and is best developed on S and W faces.

Zap pits: Many on S, W, E, N; few on B, none on T

<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>	
Plagio- clase	Milky white	1-2	Sub- round blocky	2-3	1-3	See (1)
Mafic Sil	Gray green	1	Angular			Only one seen, vitreous. Has striations like twinning.
Glass	Green	1	Round			Only one seen
Breccia clast	White	1		3x1		See (2)
Matrix	Medium gray	95+		Apha- nitic		2 mm crystals occur at edges of vesicles. Seriata fragment. distribution.

(1) Clasts show gray reaction rim with matrix. Continuous cleavage across largest clast indicates coarse plagioclase crystals as original clast material.

(2) Only one seen, white matrix with medium gray clasts. Matrix is probably crushed equivalent of clasts

Special Features: Radiating pattern of acicular crystals in matrix.
Rock has many features found on 15418.

Generic No.: 63547

Rock Type: Fine-grained crystalline

Dimensions (cm): 1.5 x 1.5 x 1

Color (fresh): Medium light gray (N6)

Shape: Subangular

Variability: Very few fresh surfaces because of heavy impact density

Coherence: intergranular - coherent
fracturing - few; non-penetrative

Cavities (%): Very few irregularly shaped, about 0.5 mm

Fabric/texture: Granular, isotropic

Surface: Irregular

Zap pits: Many on most 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>	
Fine-grained crystalline	Medium light gray	99		0.1		Nearly aphanitic, some white specks
Maf sil	Yellow green	<1	Sub-round		1-2	Only a few grains

Special Features: Some areas near cavities have slightly coarser grain sizes.



Generic No.: 63549

Rock Type: Igneous

Weight (g): 26.6

Dimensions (cm): 4 x 3 x 2.5

Color (fresh): Medium light gray (N6)

Shape: Irregular

Fabric/texture: Isotropic

Variability: Homogeneous

Cavities (%): 20% - range in size from 1 mm to 0.2 mm and shape from irregular to round. Some have projecting crystals.

Coherence: intergranular - tough
fracturing - a few cracks

Surface: All are hackly

Zap pits: All faces have few, glass-lined

<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>	
Crystalline material	Medium light gray (N6)	100		0.5		See (1)

(1) The shape and sizes are guesses. Nothing can be made out but a number of 0.2 - 0.5 mm "cleavage" flashes. The rock is probably igneous but may be an extremely high grade breccia.



Generic No.: 63556

Rock Type: Fine-grained crystalline

Color (fresh): Medium gray (N5)

Dimensions (cm): 4 x 2 x 2

Shape: Subangular

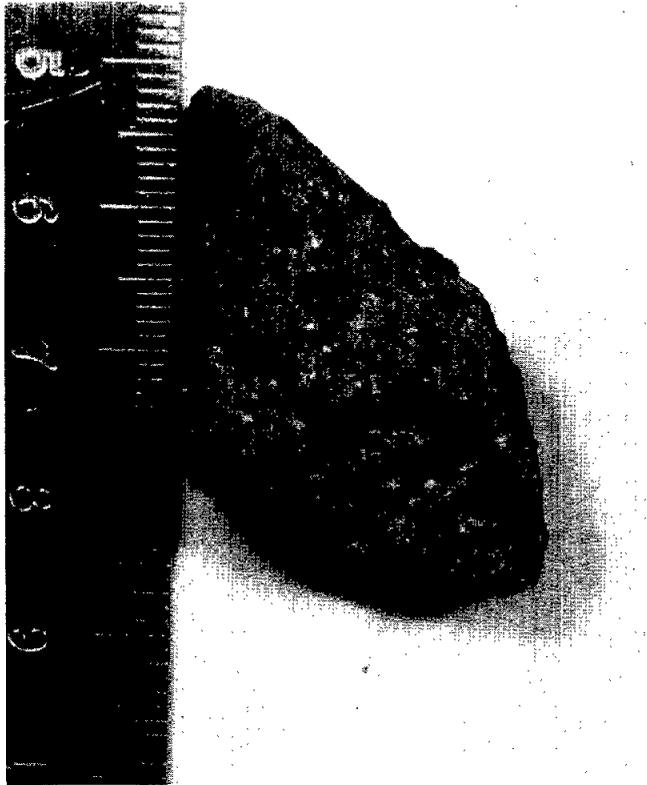
Cavities (%): None

Coherence: intergranular - coherent
fracturing - few; non-penetrative

Surface: Irregular, no fresh surfaces, differentially eroded surface has many small, irregular protrusions

Zap pits: Many on one surface, few on other

Special Features: Cannot see components clearly through pitted surface but a few cleavage or crystal faces are on the order of .2 - .4 mm with no obvious clasts of mm or larger size.



Generic No.: 63558

Rock Type: Recrystallized breccia

Dimensions (cm): 2 x 1.5 x 1.5

Color (fresh): Medium gray (N5)

Shape: Subangular, blocky

Variability: Irregular distribution of metal fragments and clasts

Coherence: intergranular - coherent
fracturing - few; one penetrative

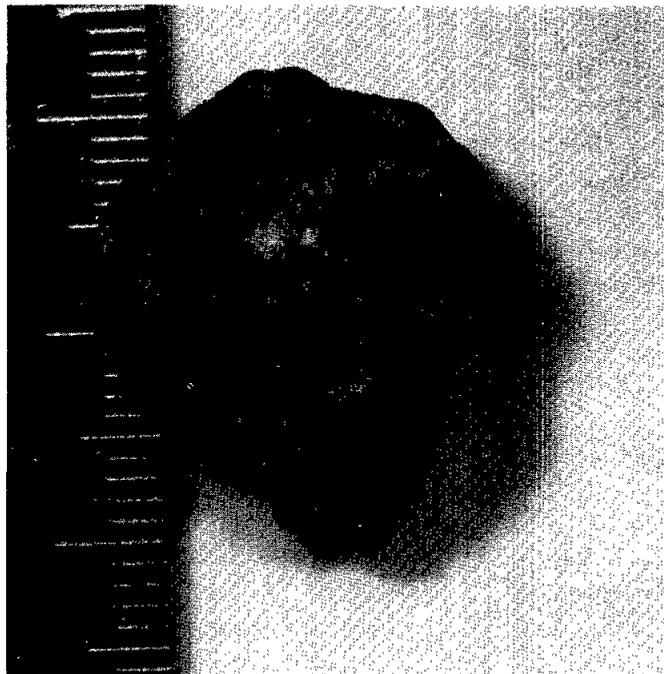
Fabric/texture: Breccia

Cavities (%): Irregularly shaped with round metal spheres, which do not fill cavities, 15%

Surface: Irregular

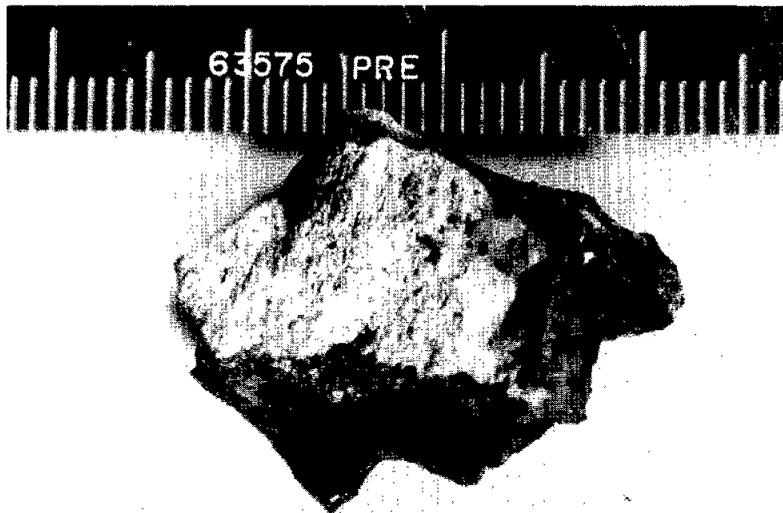
Zap pits: Many on all surfaces, may have glass linings

<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u> <u>Dom.</u> <u>Range</u>	<u>Comments</u>
Matrix	Medium gray	80		.1	Cleavage reflections are only clue to grain size
Silicate	Very pale greenish yellow	20	Elongate subround	1 .5-2.0	Polycrystalline but may be crushed single grains
Metal	Silvery	1-2	Irreg to	Up to 1.5 mm	Largest are spheres, most metal associated with a cavity





63566



63575

Generic No.: 63559, 63565-69,

63575-76

Rock Type: Glass with inclusions

Dimensions (cm): Up to 4 x 2.5 x 2

Color (fresh): Dark gray with white spots

Shape: Irregular, angular, largest (566) is subrounded

Variability: White clasts irregularly distributed

Coherence: intergranular - coherent glass but friable clasts
fracturing - few

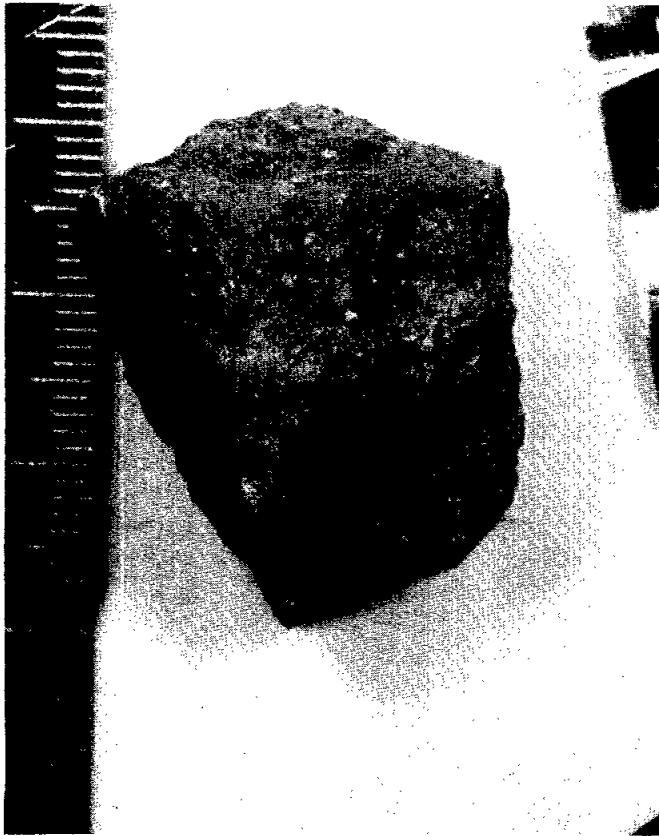
Cavities (%): Spherical to elongate, 1 mm to 2 cm, vesicles, 50%

Surface: Smooth on glass

Zap pits: None to few on most surfaces, many on most surfaces of 566

<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	70	Sub-			
Plagio- clase	White	10-15	Sub- round	0.5	0.1- 1.0	Clasts
Plagio- clase	White	15-20	Sub- round to sub- angular		2- 10	See (1)
Breccia	Light gray	2-3	Sub- round	3		Clasts (559 and 568)

(1) Cataclastic anorthosite with a small % of mafic minerals and small black patches. Some are associated with cavities.



63578 as an example



63585 as an example
65

Generic No.: 63577-79, 63585-87
Rock Type: Recrystallized breccia

Dimensions (cm): Up to 4 x 2.5 x 2.5

Color (fresh): Medium gray (N5)

Shape: Hackly

Coherence: intergranular - coherent
fracturing - few, non-penetrative

Cavities (%): None except for a few in 587 which are irregular to spherical cavities, 0.5 mm to 1.0 mm, 10%

Zap pits: Many on all but one surface of 578, pitted surfaces have many 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	Light gray	40			<0.1	
Clast	Medium dark gray	50	Angular to sub-angular		0.1-8.0	Fine-grained crystalline like 63525.
Maf sil	Pale yellow green	1	Sub-angular	0.5		
Plagio-clase	White	9	Tabular		0.5-	Some are translucent. Excellent cleavage reflections

Special Features: Description is of 578. May be some change in percent of components but population is same in all fragments. 587 has higher percent of plagioclase.

Generic No.: 63585

Rock Type: Recrystallized breccia

Dimensions (cm): 4 x 2.5 x 2.5

Color (fresh): Light gray (N7)

Shape: Blocky, subrounded

Coherence: intergranular - moderate to rough
fracturing - penetrative, glass-filled sets

Variability: Homogeneous except for large clasts

Fabric/texture: Breccia matrix appears to be granulated but not sugary

Cavities (%): None

Zap pits: Moderate to high density on all faces

<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>	
Lithic clast	Dark gray	5	Blocky	Largest = 5x4	Smallest = <1	Vitreous, dense, fine- grained poly- crystalline, ranges from 0.5 cm clast to scattered dark gray in matrix
Matrix						
1. Plagio- clase	White	80		<1		Fine-grained
2. Opaque	Metallic	2-3		<1		Occurs as both spherules and irregularly shaped fragments
3. Opaque	Rusty red	4		<1		Occurs as rounded and irregularly shaped fragments

Special Features: Random dispersion of small metal particles and small rusty particles. Veinlets penetrate rock and some are glass-filled.

Generic No.: 63588-89
Rock Type: Polymict breccia

Dimensions (cm): Largest is 3 x 2.5 x 1
Color (fresh): Very light gray (N8)
Shape: Subrounded
Fabric/texture: Fine breccia
Cavities (%): None
Coherence: intergranular - moderately friable
fracturing - very few; non-penetrative
Surface: Granular, fairly smooth
Zap pits: Few on some 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	Very light gray	70-75			0.1	
Clast	Medium dark gray	15-20	Sub-angular		0.5-2.0	Aphanitic
Plagio-	Chalky white	5	Round		.3-.5	
Maf sil	Yellowish green	<1	Sub-rounded		.3-.5	



63589 as an example

Generic No.: 63596-98
Rock Type: Plagioclase

Dimensions (cm): Largest is 4.5 x 2 x 1.5

Color (fresh): Medium light gray to medium gray (N4 to N5)

Shape: Subangular

Coherence: intergranular - coherent
fracturing - none

Cavities (%): Irregular spaces between welded grains, approximately 50%

Fabric/texture: Porous

Surface: Very rough

Zap pits: Few on most 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>	
Plagio- clase	Medium gray	95	Angular			Aphanitic fragments ~.5 to 1 mm
Plagio- clase	Chalky white	2-3	Angular			
Plagio- clase	Dark gray	2-3	Angular			

Special Features: Very porous but grains seem sintered together rather than glass bonded. This is a unique rock type not seen on previous missions.



63598 as an example

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