

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER

APOLLO 16 RAKE SAMPLES 67515 TO 68537
SAMPLE CLASSIFICATION, DESCRIPTION AND INVENTORY

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September 1972

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INTRODUCTION

This report presents the results of a binocular microscopic examination of 109 rake samples from the Apollo 16 mission. The primary purpose was to provide information from which samples could be allocated for study by the various possible techniques. Unfortunately, this optical examination has not permitted unequivocal identification of all the samples, but has resulted in preliminary detection of some samples which deserve thorough study by several techniques. Particularly important are some specimens with ultramafic affinities. The casual reader should find Table 1 sufficient for most of his needs.

SAMPLE NUMBERING

Sample numbering procedures are described on pp. 4-5 of Apollo 16 Lunar Sample Information Catalog (MSC 03210).

SAMPLE LOCATIONS AND PRELIMINARY DESCRIPTIONS

Samples 67515-67776 numbering 96 in all are from Station 11, and their source is given in Figure 2I on page 41 of MSC 03210, here reproduced as Figure 1.

Samples 68515-68537 numbering 13 in all are from Station 8, and their source is given in Figure 2F on page 39 of MSC 03210, here reproduced as Figure 2.

Preliminary descriptions were given in MSC 03210 as follows:

P. 22	67515-67576	P. 313-315
P. 23	67615-67676	P. 318-320
P. 24-25	67715-67776	P. 321-323
P. 39	68515-68537	P. 361-362

The preliminary descriptions classified the rake samples into several groups. Photographs were given of specimens lying in trays approximately natural size.

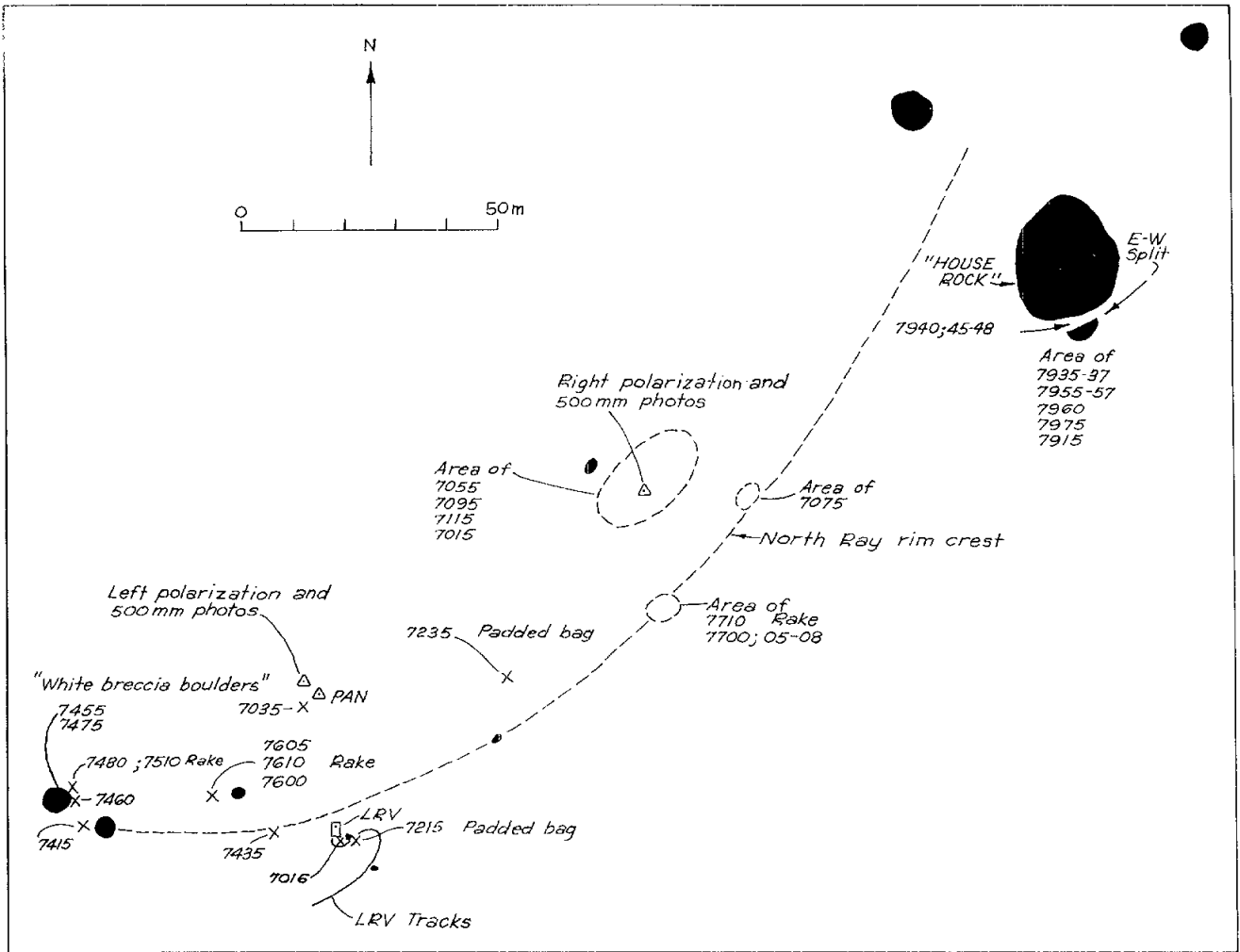


FIGURE 1 - Planimetric Sketch Map of Station 11

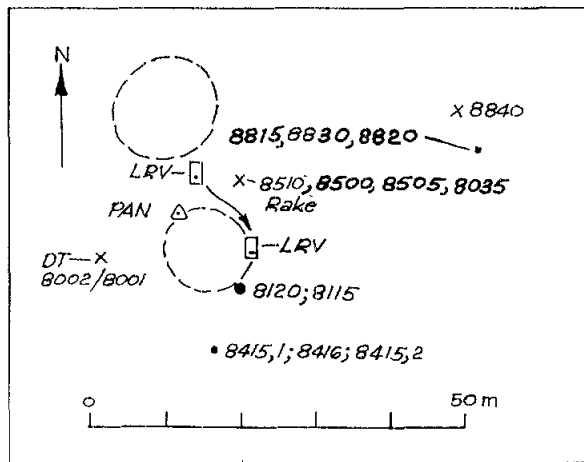


FIGURE 2 - Planimetric Sketch Map of Station 8

SAMPLE INVENTORY

Table I summarizes some of the important features of the rake samples. A short name describes the important petrographic features. Note that some names are uncertain, as specified by a question mark. The weight and coherency are also given. Some specimens are so friable that they have little or no value for some types of study.

TABLE I
SAMPLE NUMBERS, SHORT NAME, WEIGHT, AND COHERENCY

<u>NUMBER</u>	<u>SHORT NAME</u>	<u>WEIGHT (gm)</u>	<u>COHERENCY</u>
67515	Breccia, polymict, anorthositic	60.8	Variable
67516	Breccia, polymict, anorthositic	14.38	Coherent
67517	Breccia, anorthositic	9.65	Friable
67518	Breccia, ? monomict, anorthositic	3.74	Moderate
67519	Breccia, polymict, anorthositic	2.04	Moderate
67525	Anorthosite, shocked	2.52	Coherent
67526	Breccia, polymict, anorthositic	2.44	Friable
67527	Breccia, polymict, anorthositic	2.40	Moderate
67528	Breccia, polymict, anorthositic	1.24	Moderate
67529	Breccia, anorthositic	1.13	Coherent
67535	Breccia, anorthositic	0.99	Moderate
67536	Breccia, anorthositic	1.20	Friable
67537	Breccia, anorthositic	1.29	Moderate
67538	Breccia, anorthositic	1.77	Friable
67539	Breccia, polymict, anorthositic	2.12	Coherent
67545	Breccia, polymict, anorthositic	1.88	Friable
67546	Breccia, polymict, anorthositic	1.50	Friable
67547	Breccia, polymict, anorthositic	0.83	Coherent
67548	Breccia, polymict, anorthositic	1.36	Coherent
67549	Breccia, polymict, "gray and white"	43.1	Friable
67555	Breccia, polymict, "gray and white"	3.54	Coherent
67556	Breccia, polymict, "gray and white"	8.21	Moderate
67557	Breccia, polymict	3.30	Coherent
67558	Breccia, polymict	2.56	Moderate
67559	Basalt, coarse, olivine	32.9	Coherent
67565	Basalt, plagioclase phyric	10.43	Coherent
67566	Basalt, coarse, plagioclase phyric	4.31	Coherent

<u>NUMBER</u>	<u>SHORT NAME</u>	<u>WEIGHT (gm)</u>	<u>COHERENCY</u>
67567	Cinder	11.51	Coherent
67568	Breccia, polymict, vesicular	11.05	Coherent
67569	Breccia, polymict, vesicular	7.27	Coherent
67575	Breccia, polymict, vesicular	4.47	Coherent
67576	Breccia, soil, partly vitrified	3.98	Moderate
67615	Basalt, porphyritic	8.77	Coherent
67616	Basalt, coarse	21.29	Coherent
67617	Breccia, polymict, mostly basalt	14.32	Coherent
67618	Basalt with glass	11.17	Coherent
67619	Breccia, polymict, mostly basalt	6.15	Coherent
67625	Breccia, polymict, metamorphosed	6.72	Coherent
67626	Cinder	19.19	Coherent
67627	Glass, vesicular	79.64	Coherent
67628	Cinder	49.71	Coherent
67629	Basalt, vesicular with attachments	32.84	Coherent
67635	Breccia monomict, anorthositic	9.12	Coherent
67636	Breccia near-monomict, anorthositic	3.23	Coherent
67637	Anorthosite, shocked, recrystallized	2.34	Coherent
67638	Breccia, polymict	7.23	Coherent
67639	Breccia, polymict	7.34	Coherent
67645	Breccia	.84	Friable
67646	Breccia, polymict	3.94	Friable
67647	Breccia, polymict	47.72	Coherent
67648	Breccia, polymict	7.88	Coherent
67649	Breccia, polymict	1.60	Friable
67655	Breccia, polymict	4.11	Coherent
67656	Breccia, polymict	1.93	Friable
67657	Breccia, polymict, anorthositic	1.70	Friable
67658	Breccia, polymict	1.35	Friable
67659	Breccia, polymict	1.62	Coherent
67665	Breccia, friable, feldspar-rich	5.88	Friable

<u>NUMBER</u>	<u>SHORT NAME</u>	<u>WEIGHT (gm)</u>	<u>COHERENCY</u>
67666	Breccia, polymict	5.47	Coherent
67667	Breccia, monomict ?, ultramafic ?	7.89	Coherent
67668	Breccia, monomict, olivine basalt	3.58	Coherent
67669	Breccia, polymict	12.54	Weak
67675	Glass, ropy	1.07	Coherent
67676	Basalt, vesicular	2.33	Coherent
67715	Basalt with white coating	9.44	Coherent
67716	Breccia, mostly basaltic	17.02	Coherent
67717	Breccia, polymict, metamorphosed	5.56	Coherent
67718	Breccia, polymict, metamorphosed	41.05	Coherent
67719	Basalt ?, otherwise breccia	2.13	Coherent
67725	Breccia, polymict	5.85	Coherent
67726	Breccia, polymict	4.53	Coherent
67727	Breccia, vesicular, polymict	1.80	Coherent
67728	Breccia, vesicular, polymict	9.25	Moderate
67729	Breccia, vesicular, polymict	73.2	Coherent
67735	Breccia, metamorphosed ?	13.3	Coherent
67736	Basalt, olivine with ultramafic inclusion	14.92	Coherent
67737	Basalt	4.56	Coherent
67738	Basalt	5.84	Coherent
67739	Breccia, metamorphosed ?	2.03	Coherent
67745	Basalt	3.53	Coherent
67746	Norite ?	3.47	Coherent
67747	Troctolite ?	6.30	Coherent
67748	Breccia, polymict, metamorphosed ?	4.74	Coherent
67749	Breccia, polymict	11.47	Moderate
67755	Breccia, polymict or monomict ?	3.53	Moderate
67756	Breccia, polymict, anorthositic	4.82	Coherent
67757	Basalt, shocked ?	4.83	Coherent
67758	Breccia, polymict, metamorphosed	4.06	Coherent

<u>NUMBER</u>	<u>SHORT NAME</u>	<u>WEIGHT (gm)</u>	<u>COHERENCY</u>
67759	Breccia, polymict	4.56	Moderate
67765	Breccia, polymict, metamorphosed	1.73	Coherent
67766	Breccia, metamorphosed ?	5.47	Coherent
67767	Breccia, anorthositic	1.67	Friable
67768	Breccia, anorthositic	.99	Friable
67769	Breccia, monomict ?, troctolite ?	3.05	Coherent
67775	Breccia ?, metamorphosed ?	6.58	Coherent
67776	Breccia, polymict ?, anorthositic ?	3.10	Friable
68515	Breccia, polymict with coating glass	236.1	Coherent
68516	Basalt, partly vitrified	34.04	Coherent
68517	Breccia, polymict, vesicular	13.13	Moderate
68518	Cinder	29.82	Coherent
68519	Basalt, partly vitrified	10.56	Coherent
68525	Basalt, vesicular	38.96	Coherent
68526	Basalt ?	7.21	Coherent
68527	Basalt, porphyritic	3.03	Coherent
68528	Breccia, vesicular, polymict	1.08	Moderate
68529	Cinder (vesicular glass)	7.03	Coherent
68535	Basalt and glass	8.04	Coherent
68536	Basalt and vesicular glass	1.85	Coherent
68537	Breccia	1.41	Coherent

CLASSIFICATION PROCEDURES

It will be no surprise to any reader that identification of lunar samples by binocular microscopy is an imprecise art. From our work on coarse fines from earlier Apollo missions, we have found about 95 percent correlation between the petrography identified on a preliminary basis by binocular microscopy and the definitive petrography from study of polished thin sections.

The following are the problems:

(1) Some samples are nearly completely covered by a powder or a coherent coating up to 1 mm thick. Identification of a specimen as (say) a basalt may be wrong because the available surface may by chance show only a single clast from a breccia.

(2) Mechanical shock causes fracturing and powdering which hinders or makes impossible identification of the minerals. The white, powdery material of some of the specimens is almost certainly plagioclase, but one cannot make out for certain that it contains some or even a lot of finely comminuted ferromagnesian mineral which would also appear white.

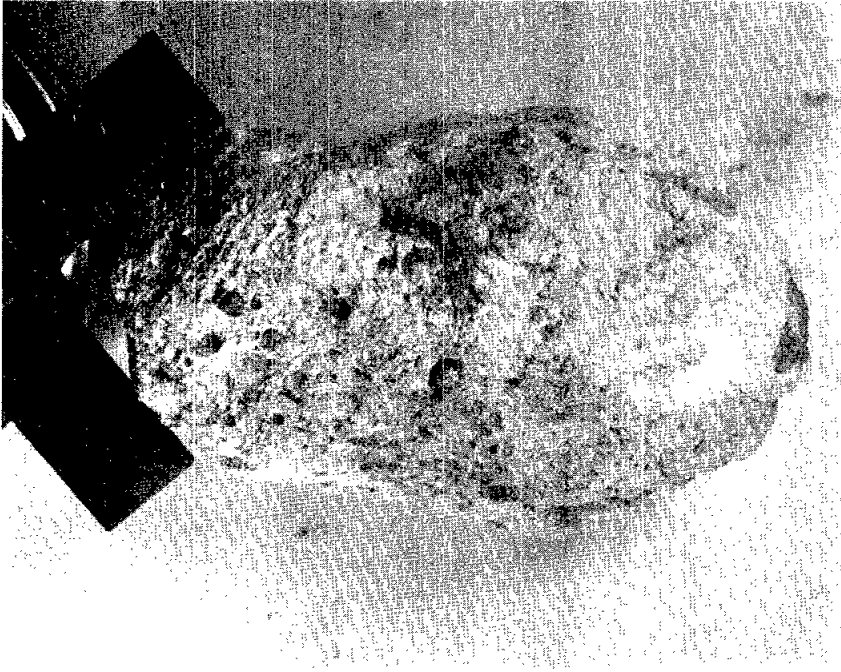
(3) Thermal metamorphism obscures the distinction between clast and matrix in breccias, culminating in development of a flinty hornfels texture for a high grade. Ultimately partial or complete melting can occur; we saw some specimens for which a distinction between a basalt and a metamorphosed breccia was not absolutely certain.

(4) Distinction between olivine and pyroxene is not fool-proof (cinnamon material is almost certainly Ti-bearing augite). Yellow and green material is probably olivine. Gray material is probably Ca-poor pyroxene.

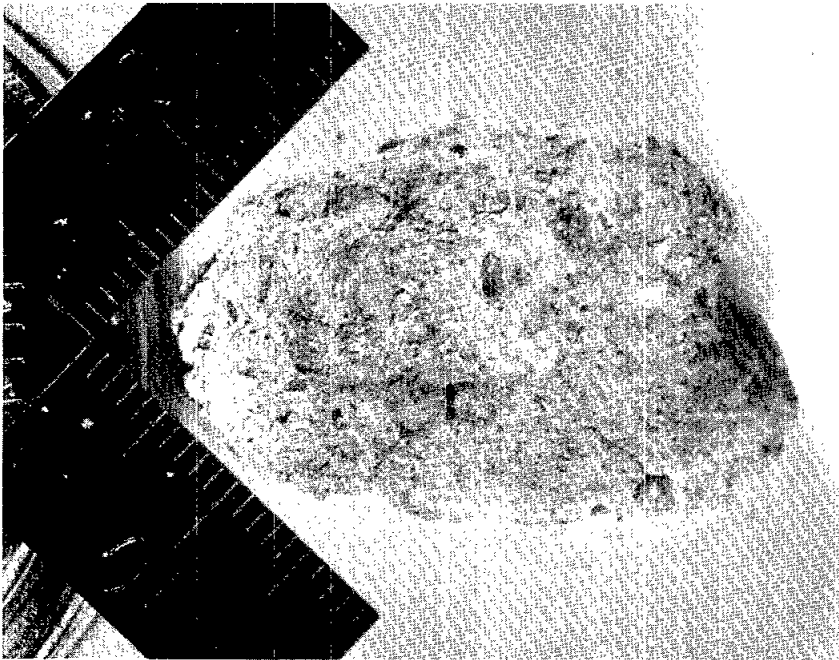
We concluded that for many breccias, the clasts were of several types and that detailed description was unwise. Thin section optical petrography followed by electron microprobe analysis of clasts is necessary for a satisfactory description.

A detailed photograph is given of each specimen plus an enlargement of the inclusion in specimen 67736. Identification was carried out without checking the preliminary identification in MSC 03210. Comparison of the data will show very satisfactory agreement for all but a few specimens which pose particularly severe problems.

67515



67516



Generic No.: 67515
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 60.8
Dimensions (cm): 5.0 x 3.0 x 3.0
Color (fresh): White to gray
Shape: Irregular
Variability: Breccia
Coherence:
intergranular - variable
fracturing - present but minor
Surface: Irregular, powdery in places
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	Whitish	90	--			
Clasts	Grayish	10	Irreg	2mm	0-5	

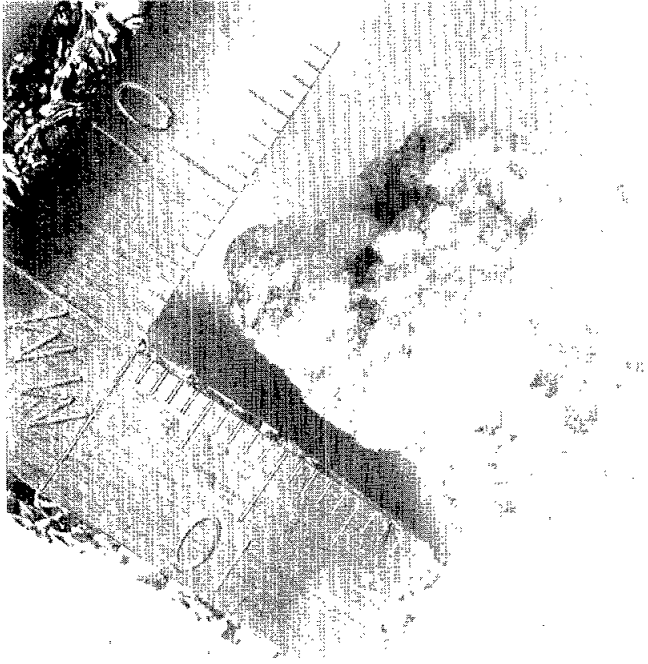
Special Features: Complex polymict breccia with at least two components. Dominant whitish matrix with some irregularity perhaps resulting from shock. Grayish clasts have some color variation and range up to 5 mm in size.

Generic No.: 67516
Rock Type: Breccia, polymict
anorthositic

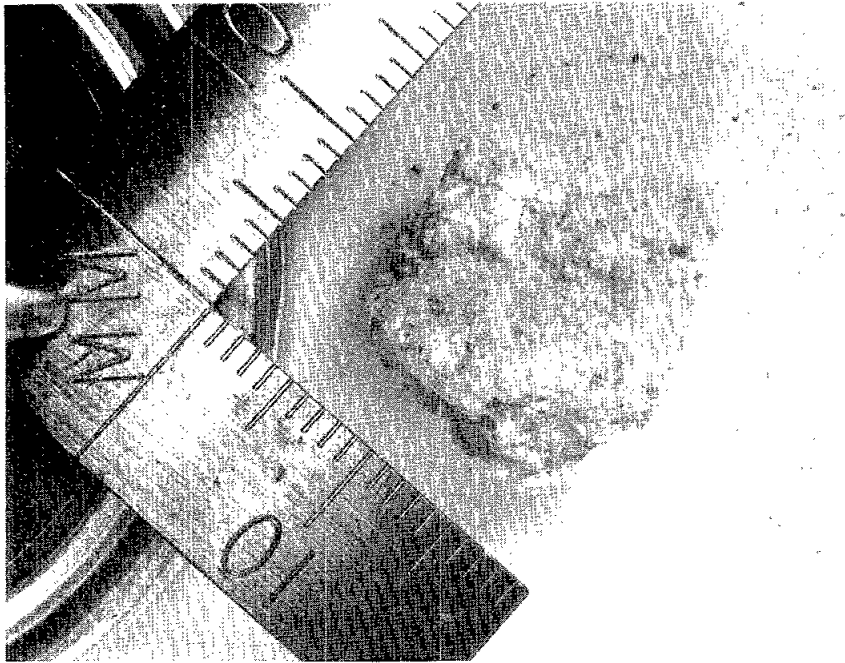
Weight (g): 14.38
Dimensions (cm): 3.2 x 2.5 x 2.5
Color (fresh): White
Shape: Subangular
Variability: Light matrix with darker clasts
Coherence:
intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Zap pits: None
Surface: Irregular, some dimples

<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	90				
Clast	Dark gray	10	Angular	0.25	0-0.5	

67517



67518



Generic No.: 67517
Rock Type: Breccia,
anorthositic

Weight (g): 9.65

Coherence: intergranular - friable

Special Features: Very friable, broken into two large pieces and twenty smaller pieces. No further examination. Appears similar to many other specimens.

Generic No.: 67518
Rock Type: Breccia, monomict,
anorthositic

Weight (g): 3.74

Dimensions (cm): 1-1/2 x 1-1/2 x 1

Color (fresh): White

Shape: Subangular

Variability: Homogeneous

Coherence:

intergranular - moderate
fracturing - none

Fabric/texture: Fine-grained, powdery

Cavities (%): None

Surface: Rough, irregular

Zap pits: None

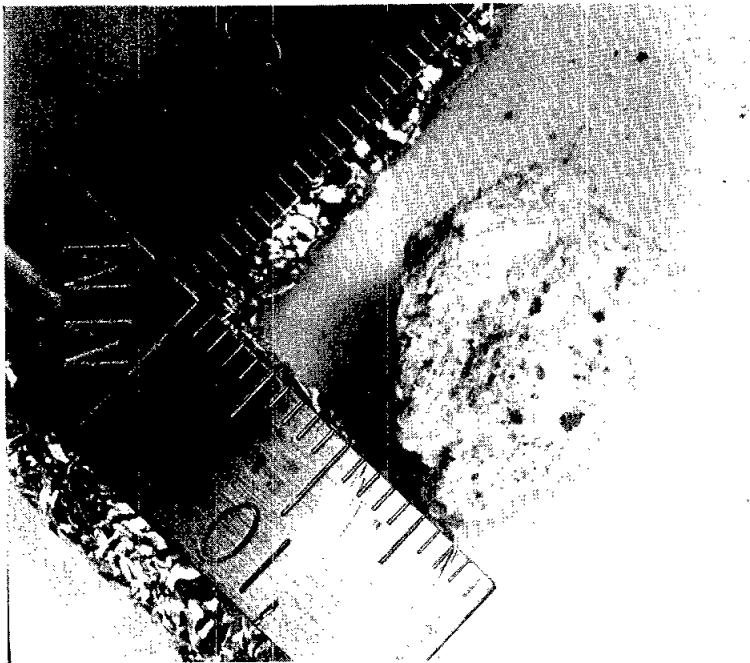
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Plagioclase	White	99				Powdery
Dark specks	Dark	1				Ferro- magnesian ?

Special Features: Shocked, granular anorthosite

67519



67525



Generic No.: 67519
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 2.04
Dimensions (cm): 1.5 x 1 x 0.75
Color (fresh): White
Shape: Irregular
Variability: Tiny clasts in dominant matrix
Coherence: intergranular - moderate coherence
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: 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	White	95				
Clasts	Whitish	5	Angular	1/4	0-1/2	

Special Features: Two pieces in container, but smaller piece will probably fracture into two pieces. Small piece is 3/4 x 1/4 x 1/4. Fine-grained anorthosite with few percent dark minerals. Clasts, a fraction of a mm across, are distributed at random. Second possibility is plagioclase-rich complex breccia with possible origin as shocked crystalline rock.

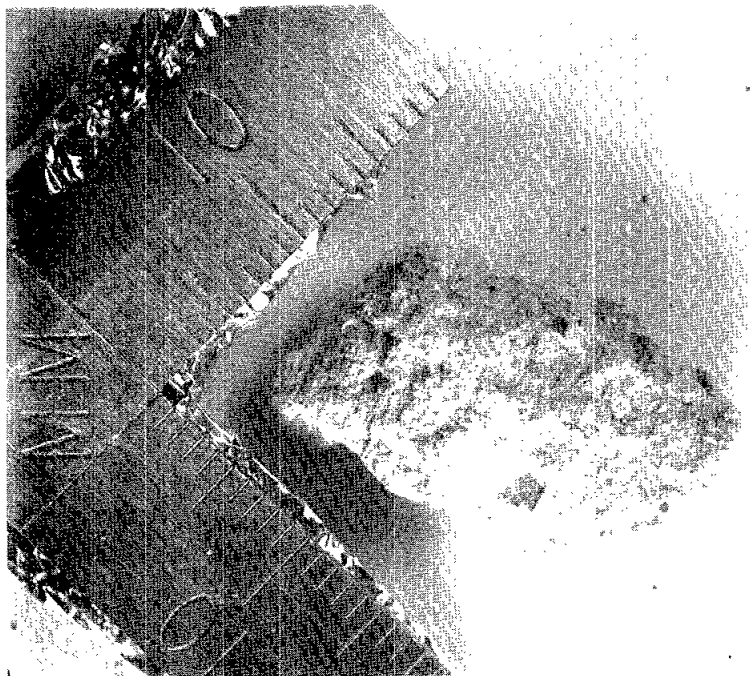
Generic No.: 67525
Rock Type: Anorthosite,
shocked

Weight (g): 2.52
Dimensions (cm): 1.75 x 1.5 x 1.0
Color (fresh): White
Shape: Irregular
Variability: Uniform
Coherence: intergranular - coherent
fracturing - fractured
Fabric/texture: Powdery, probably large shocked crystals
Cavities (%): None
Surface: Mostly irregular white but some coating glass
Zap pits: Few, one dozen

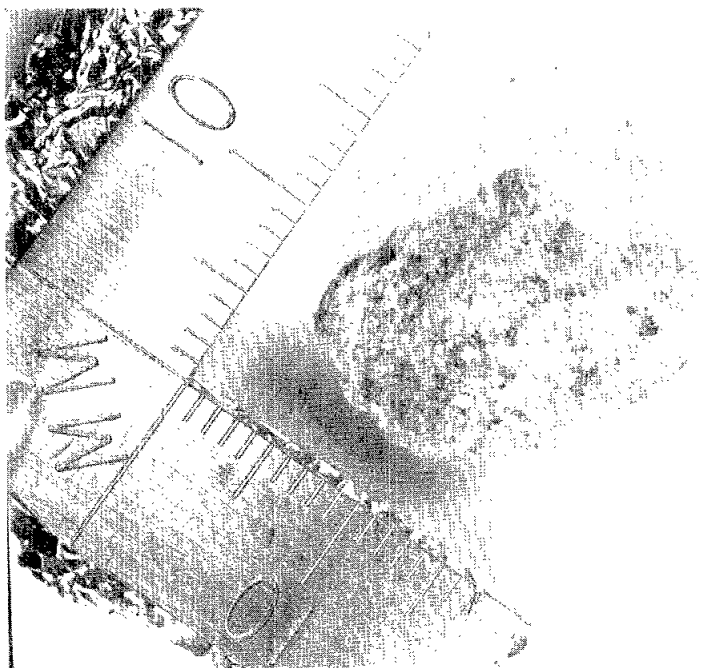
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Plagioclase	White	~100				

Special Features: Appears heavily shocked. Probably original grains up to mm in size but mostly comminuted.

67526



67527



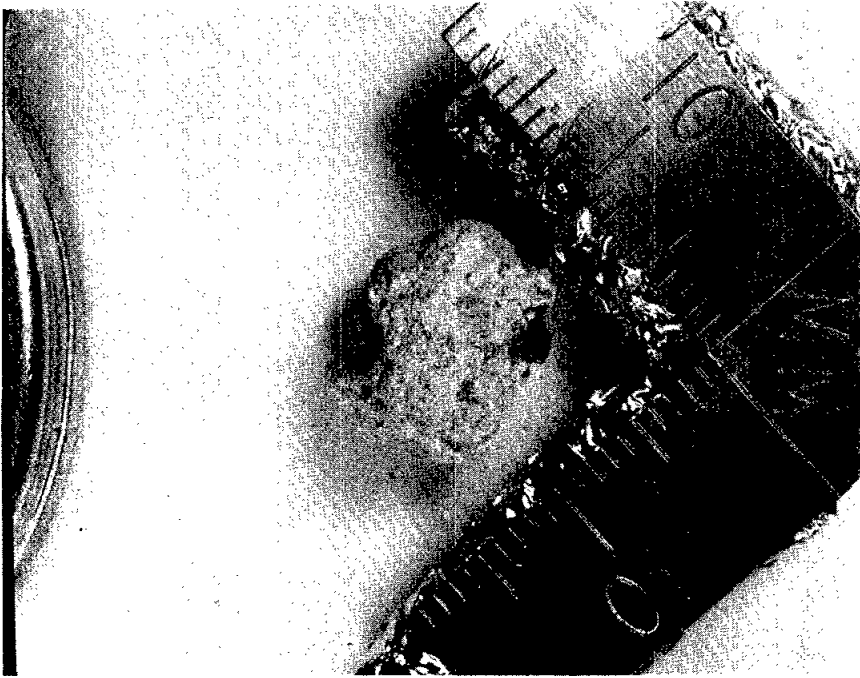
Generic No.: 67526
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 2.44
Dimensions (cm): 2.25 x 1.25 x 1.00
Color (fresh): White/gray
Shape: Irregular
Variability: Whitish matrix; some grayish inclusions
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Powdery with inclusions
Cavities (%): None
Surface (face): Powdery surface with projecting inclusions
Zap pits: None
Special Features: One small fragment, 4 mm long broken off. Like many
other specimens of anorthositic breccia.

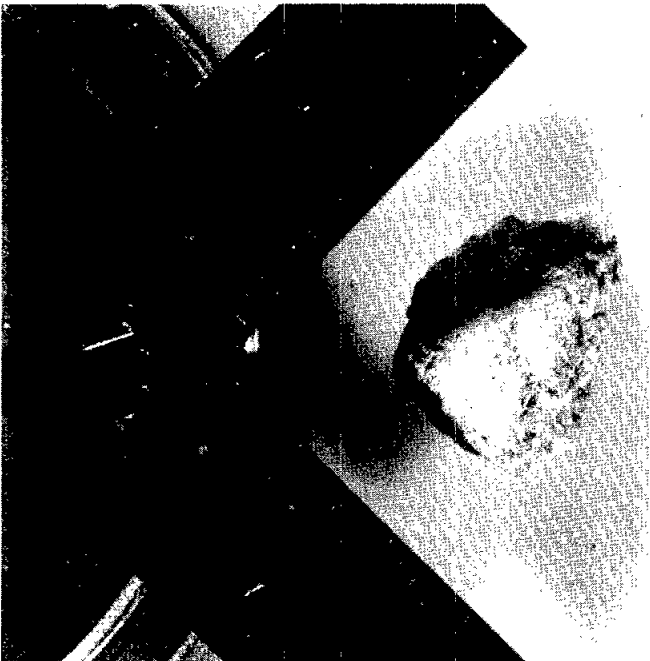
Generic No.: 67527
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 2.40
Dimensions (cm): 2 x 1 x 1
Color (fresh): Whitish
Shape: Irregular
Variability: White powdery matrix with small dark clasts
Coherence: intergranular - moderate
fracturing - none
Fabric/texture: White powdery matrix with few dark clasts
Cavities (%): None
Surface: Mostly covered with white powder
Zap pits: Few on one surface
Special Features: Probably shocked anorthosite with small clasts of dark
material whose character is unidentified.

67528



67529



Generic No.: 67528
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 1.24
Dimensions (cm): 1 x 1 x 1
Color (fresh): Light gray
Shape: Subrounded
Variability: Several dark clasts in light matrix
Coherence: intergranular - moderate
fracturing - clasts almost free
Cavities (%): None
Fabric/texture: Very fine-grained matrix
Surface: Moderately 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	White	95				Shocked plagioclase
Clast	Dark gray	Angular			0-2	Very fine-grained

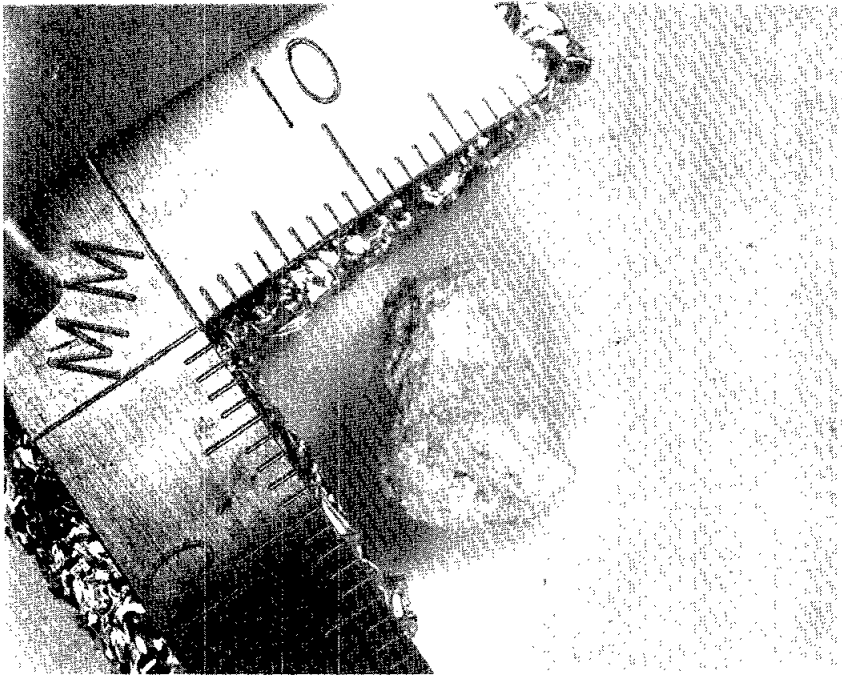
Special Features: The matrix is shocked plagioclase. Clasts are unidentified because of fine-grain size.

Generic No.: 67529
Rock Type: Breccia,
anorthositic

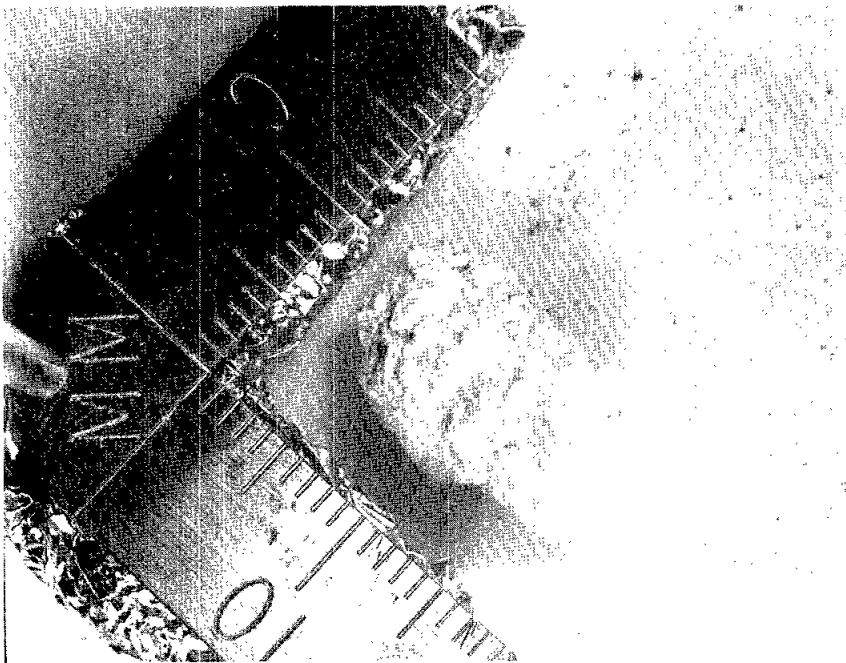
Weight (g): 1.13
Dimensions (cm): 1 x 0.5 x 0.5
Color (fresh): Almost white
Shape: Subangular
Variability: Homogeneous
Coherence: intergranular - coherent
fracturing - one large fracture
Fabric/texture: Very fine-grained
Cavities (%): None
Surface: Smooth-powdery; few dark specks
Zap pits: None

<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>	
Anorthosite		100				

67535



67536



Generic No.: 67535

Rock Type: Breccia, anorthositic

Dimensions (cm): 1 x 3/4 x 3/4

Color (fresh): Variable white to gray

Shape: Elongated

Variability: Quite variable from white to light gray

Coherence: intergranular - moderate
fracturing - none

Fabric/texture: Very fine-grained

Cavities (%): None

Surface: Moderately 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	White	98				Powdery white plagioclase
Clasts	Gray	2	Angular		0-1	Very fine-grained

Special Features: Clasts appear homogeneous crystalline, very fine-grained.

Generic No.: 67536

Rock Type: Breccia, anorthositic

Weight (g): 1.20

Dimensions (cm): 1.5 x 1 x 1/2

Color (fresh): White

Shape: Elongated

Variability: Homogeneous

Coherence: intergranular - friable
fracturing - none

Fabric/texture: Very fine-grained homogeneous

Cavities (%): None

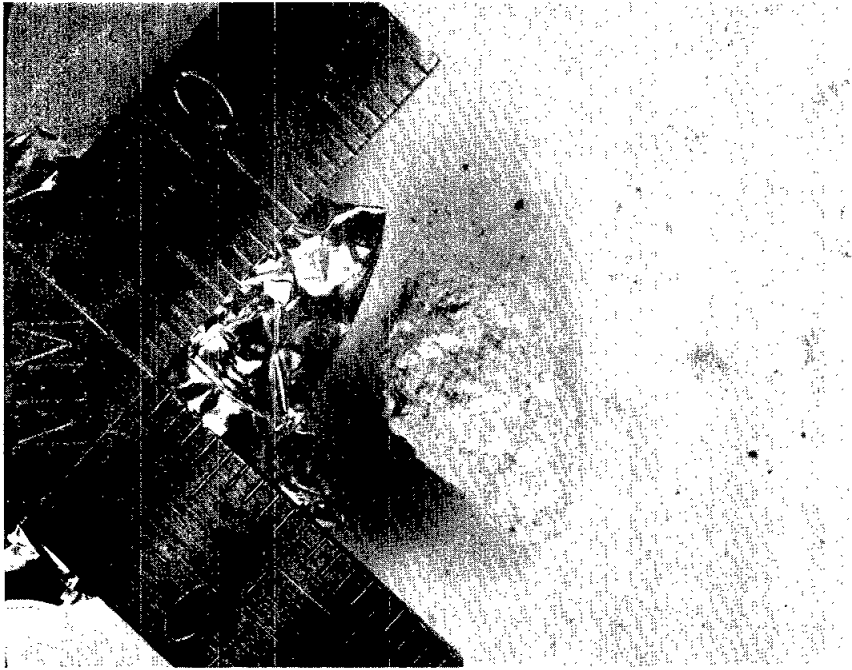
Surface: Smooth powdery

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	White	100				Very fine-grained, plagioclase

Special Features: Shocked anorthosite like other specimens.

67537



67538



Generic No.: 67537

Rock Type: Breccia, anorthositic

Weight (g): 1.29

Dimensions (cm): 1 x 3/4 x 3/4

Color (fresh): White

Shape: Ovoid

Variability: Homogeneous

Coherence: intergranular - moderate
fracturing - none

Fabric/texture: Fine-grained powdery

Cavities (%): None

Surface: Fairly smooth

Zap pits: None

Special Features: May be nearly 100% plagioclase

Generic No.: 67538

Rock Type: Breccia, anorthositic

Weight (g): 1.77

Dimensions (cm): 1 x 3/4 x 3/4

Color (fresh): White matrix and dark clasts

Shape: Angular

Variability: White matrix and dark clasts

Coherence: intergranular - friable
fracturing - fractured

Fabric/texture: Fine-grained matrix

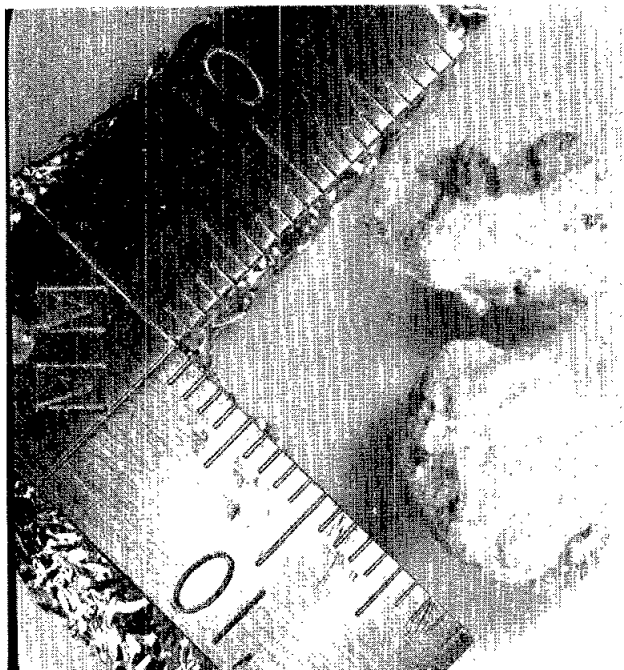
Cavities (%): None

Surface: Rough

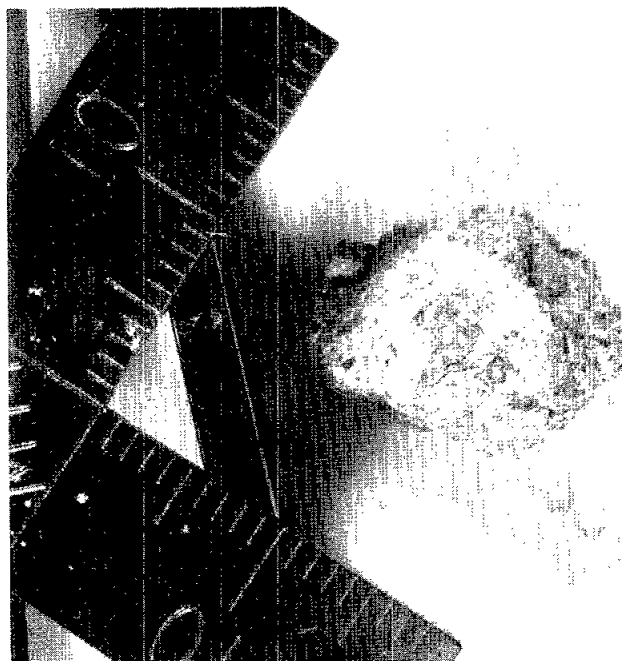
Zap pits: None

Special Features: Broken into two fragments. Small piece is half size of big piece, but further breakage is likely. Distinction between matrix and clast is not useful.

67539



67545



Generic No.: 67539
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 2.12
Color (fresh): Mostly white
Shape: Irregular
Variability: Contains small dark clasts
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Breccia
Cavities (%): None
Surface: Irregular - coated with fine white powder
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	White	95				
Clasts	Gray	5	Irreg	.5	0-2	

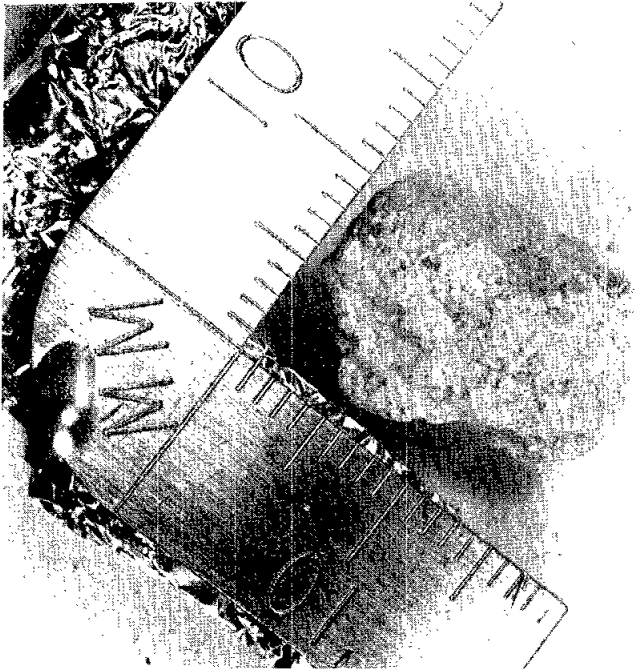
Special Features: Sample composed of three fragments. A - 1 cm ovoid - used for above description. B - 1 x .5 x .25 cm irregular. C - irregular. All polymict breccia.

Generic No.: 67545
Rock Type: Breccia, polymict,
anorthositic

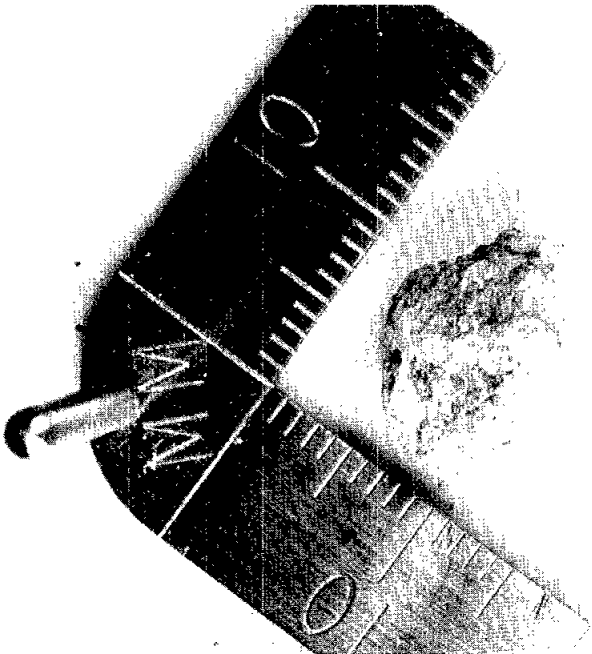
Weight (g): 1.88
Dimensions (cm): 1 x .75
Color (fresh): Light gray
Shape: Ovoid
Variability: Homogeneous (mostly) with darker clasts
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: Smooth
Zap pits: None

<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	Light gray	90				
Clasts	Medium gray	10	Sub- angular	2	0-2	

67546



67547



Generic No.: 67546
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 1.50
Dimensions (cm): 1.5 x 1 x .75
Color (fresh): White
Shape: Irregular
Variability: Polymict breccia
Coherence: intergranular - friable
fracturing - fractured
Fabric/texture: Polymict breccia mostly white powder - small dark clasts
Cavities (%): None
Surface: Irregular - mostly covered with white powder
Zap pits: None
Special Features: Polymict breccia; mostly white powder. Many small dark clasts. Impossible to identify.

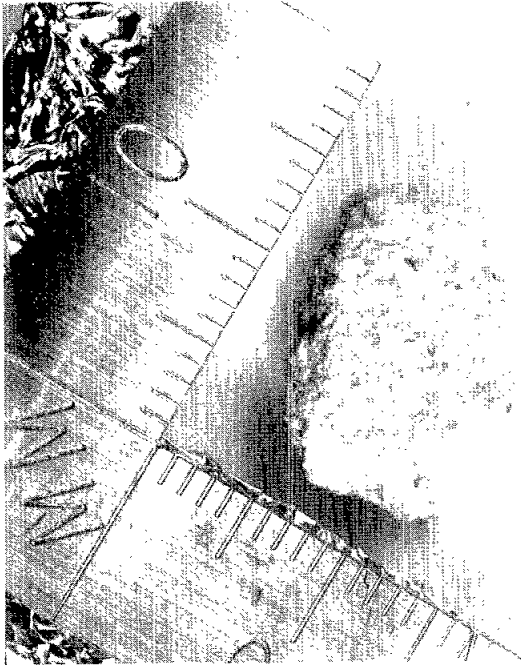
Generic No.: 67547
Rock Type: Breccia, polymict,
anorthositic

Weight (g): .83
Dimensions (cm): 1 x 1 x 3/4
Color (fresh): Whitish with darker clasts
Shape: Angular
Variability: Mainly white but some dark clasts
Coherence: intergranular - coherent
fracturing - around clasts
Fabric/texture: Fine-grained white powdery with clasts.
Cavities (%): None
Surface: Rough
Zap pits: None

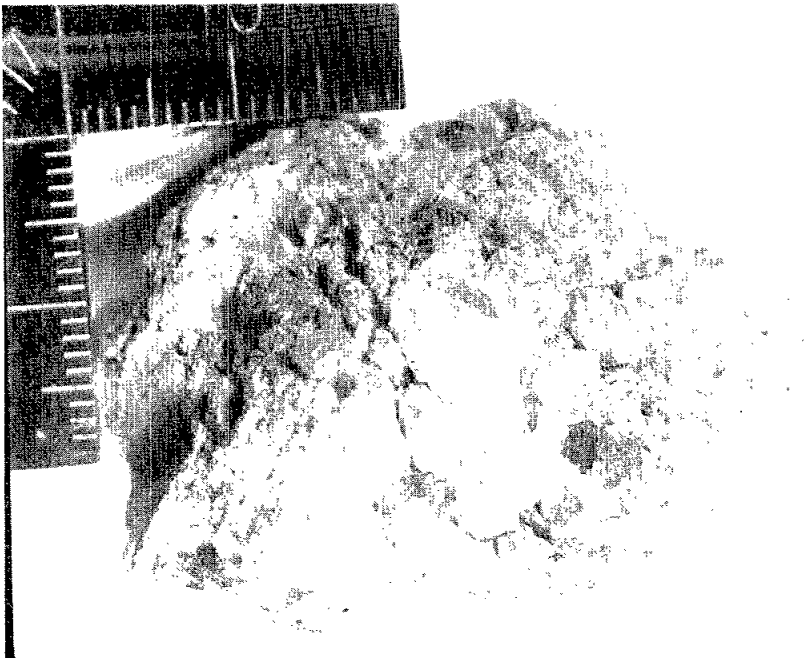
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	95	Powdery			
Clast	Gray	5				Appears basaltic

Special Features: No detailed description because similar to many others.

67548



67549



Generic No.: 67548

Rock Type: Breccia, polymict,
anorthositic

Weight (g): 1.36

Dimensions (cm): 1-1/2 x 1 x 3/4

Color (fresh): Light gray

Shape: Ovoid

Variability: Homogeneous with small gray clasts

Coherence: intergranular - moderate
fracturing - none

Fabric/texture: Homogeneous with small clasts

Cavities (%): None

Surface: Moderately smooth

Zap pits: None

Component	Color	% of Rock	Shape	Size (mm)		Comments
				Dom.	Range	
Matrix	White	95				Very fine-grained powdery
Clasts	Dark gray	5			0-2	Too small to identify

Special Features: Some clasts appear metallic.

Generic No.: 67549

Rock Type: Breccia, polymict

Weight (g): 43.1

Dimensions (cm): 4-1/2 x 3 x 3

Color (fresh): Light gray to medium gray

Shape: Irregular

Variability: Dark clasts: light gray matrix

Coherence: intergranular - friable
fracturing - none

Fabric/texture: Very fine-grained

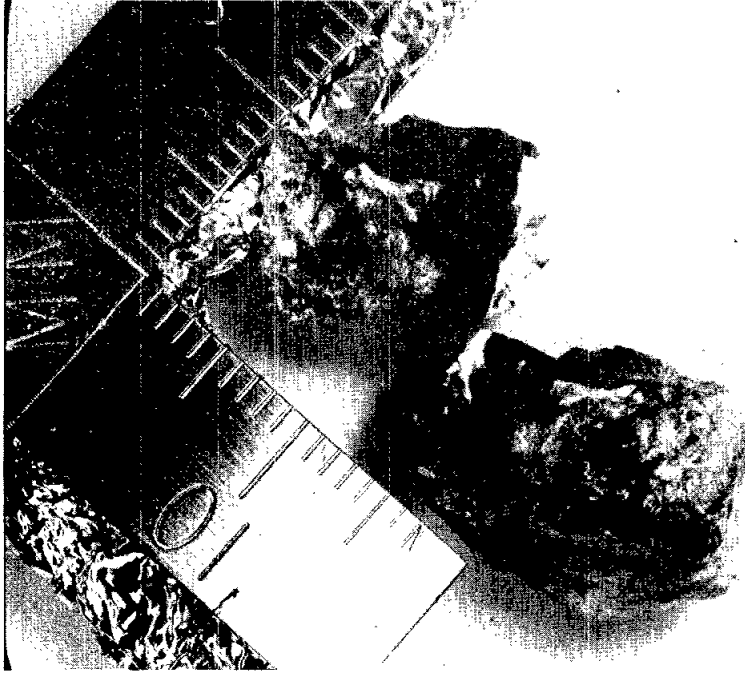
Cavities (%): None

Surface: Rough with rounded corners

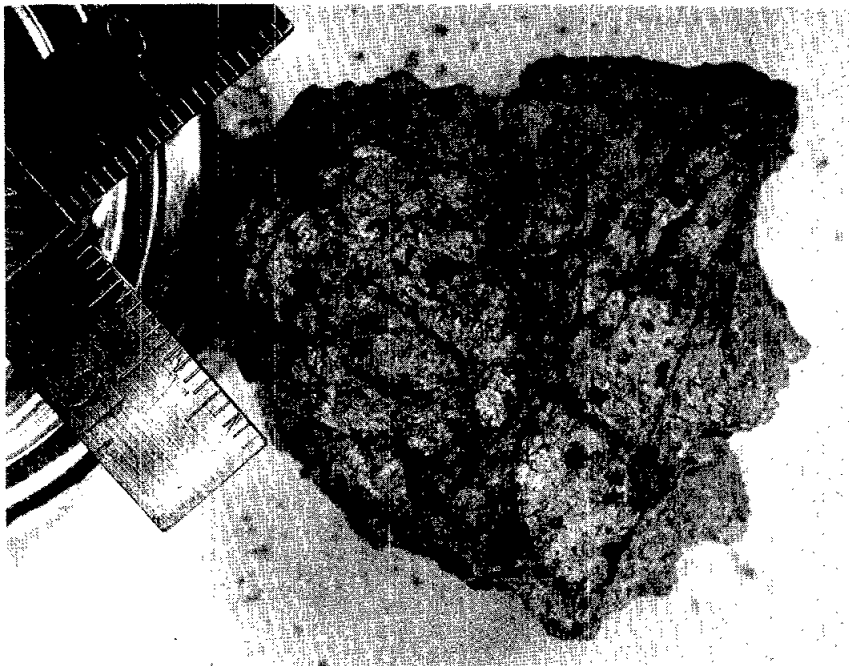
Zap pits: None

Component	Color	% of Rock	Shape	Size (mm)		Comments
				Dom.	Range	
Matrix	Light gray	95				
Clast	Medium gray	5	Angular	2	0-6	

67555



67556



Generic No.: 67555
Rock Type: Breccia, polymict,
black and white

Weight (g): 3.54
Dimensions (cm): 2 x 1 x 1/2
Color (fresh): Black matrix and white clasts
Shape: Angular
Variability: Homogeneous except for white clasts
Coherence: intergranular - tough
fracturing - conchoidal fracturing
Fabric/texture: Very fine-grained matrix
Cavities (%): None
Surface: Smooth: one surface has white powder
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	Dark	95				Very fine-grained
Clasts	White	5				Very fine-grained

Special Features: Two fragments: largest 2 x 1 x 1/2, smaller 1 x 1 x 1/2.
Description applies to larger piece. Dark matrix looks like igneous rock,
presumably result of thermal metamorphism.

Generic No.: 67556
Rock Type: Breccia, polymict,
gray and white

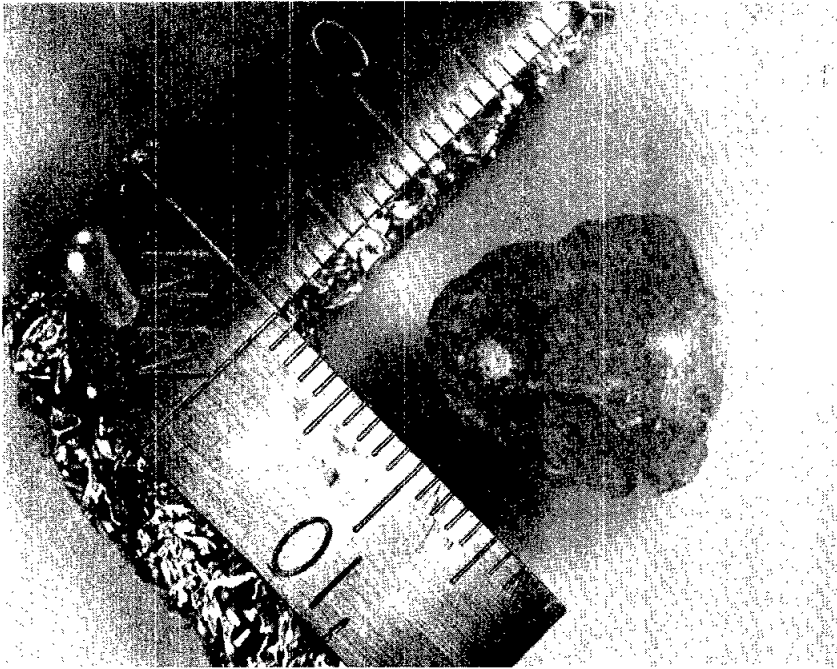
Weight (g): 8.21
Dimensions (cm): 5 x 5 x 5
Color (fresh): White matrix and dark gray clasts
Shape: Angular
Variability: Highly variable
Coherence: intergranular - moderate
fracturing - many fractures
Fabric/texture: Fine-grained variable
Cavities (%): None
Surface: Very irregular because of fracturing; glass splashes
Zap pits: Some on one face

<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 to light gray	95				Possibly plagioclase and light colored pyroxene; certainly plagi-rich.
Clasts	Dark	5			Several 1 mm	Fine-grained

67557



67558



67559



Generic No.: 67558
Rock Type: Breccia, polymict

Weight (g): 2.56
Dimensions (cm): 1-1/2 x 1-1/2 x 1-1/2
Color (fresh): Light gray
Shape: Subrounded
Variability: Very variable with light clasts
Coherence: intergranular - moderate
fracturing - in some clasts
Fabric/texture: Fine-grained variable clasts
Cavities (%): None
Surface: Fairly smooth, sharp boundaries between matrix and clasts
Zap pits: Few on all surfaces
Special Features: One interesting clast is 1 x 1/2 cm. Crystalline rock fragment with fractures, pyroxene dominant, minor plagioclase, probably basaltic. Other clasts are polymict and fine-grained. Difficult to distinguish matrix from clasts.

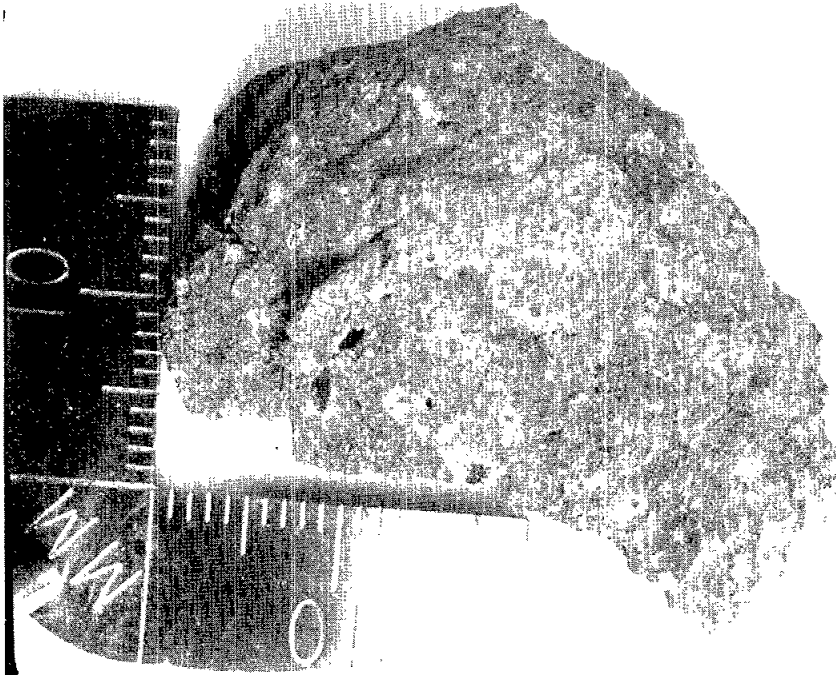
Generic No.: 67559
Rock Type: Basalt, coarse,
olivine

Weight (g): 32.9
Dimensions (cm): 2-1/2 x 2 x 4
Color (fresh): Gray
Shape: Angular
Variability: Homogeneous
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Porphyritic with homogeneous matrix
Cavities (%): Two small cavities, 1 medium with crystals
Surface: Fairly smooth fracture 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	15			3-4	Phenocrysts
Plagioclase	White	50			1/2-1	Matrix
Pyroxene	Gray	20			0-1/2	Matrix
Olivine	Yellow	10			0-1/2	Matrix

Special Features: Most coarse-grained rock so far seen in Apollo 16 walnuts.

67565



67566



Generic No.: 67565

Rock Type: Basalt, plagioclase,
phyric

Weight (g): 10.43

Dimensions (cm): 5 x 3 x 3/4

Color (fresh): Medium gray

Shape: Tabular

Variability: Homogeneous

Coherence: intergranular - coherent
fracturing - fractured

Fabric/texture: Fine-grained

Cavities (%): Open fractures; no vesicles

Surface: Moderately smooth

Zap pits: Few

Special Features: Phenocrysts of plagioclase up to 3 mm present in ground-mass. Ground-mass too fine-grained for detailed description.

Generic No.: 67566

Rock Type: Basalt, coarse,
porphyritic

Weight (g): 4.31

Dimensions (cm): 3 x 2 x 1

Color (fresh): Variable because of large grain size

Shape: Irregular

Variability: Uniform with phenocrysts

Coherence: intergranular - coherent
fracturing - healed fractures

Fabric/texture: Moderate to coarse-grained

Cavities (%): None

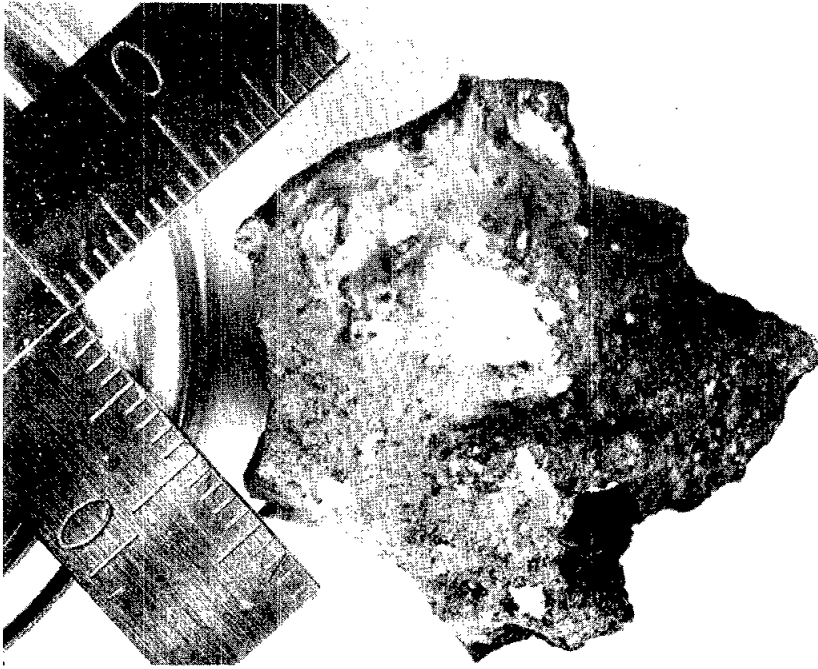
Surface: Mostly covered with powder

Zap pits: None

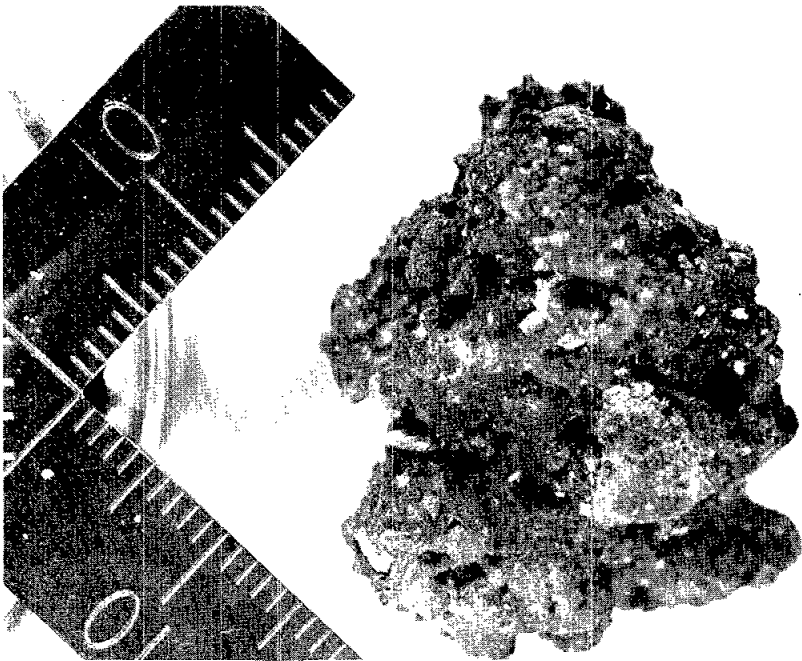
Component	Color	% of Rock	Shape	Size (mm)		Comments
				Dom.	Range	
Plagioclase phenocrysts	White	5	Sub-rounded	4		Twinned, deformed?
Light ground-mass	White	85	Irreg		0-2	Pyroxene + plagioclase
Dark ground-mass	Dark specks	5	Specks		0-2	Opaque

Special Features: Rock consists of plagioclase phenocrysts set in ground-mass of plagioclase, pyroxene and opaque. Small yellow crystals (.2 mm) scattered throughout (olivine).

67567



67568



Generic No.: 67567

Rock Type: Cinder

Weight (g): 11.51

Dimensions (cm): 2.5 x 2.5 x 2.5

Color (fresh): Dark gray to white

Shape: Very irregular

Variability: Very variable

Coherence: intergranular - coherent

fracturing - none

Fabric/texture: See "Special Features"

Cavities (%): Vesicles

Surface: See "Special Features"

Zap pits: None

Special Features: Vesicular fragments with many curved surfaces covered by powder of different colors. Detailed identification impractical. Probably mostly glass, perhaps devitrified.

Generic No.: 67568

Rock Type: Breccia, polymict,
vesicular

Weight (g): 11.05

Dimensions (cm): 3 x 2

Color (fresh): Dark gray

Shape: Irregular

Variability: Clast and matrix

Coherence: intergranular - coherent

fracturing - none

Fabric/texture: Glassy, vesicular

Cavities (%): Vesicular 20%

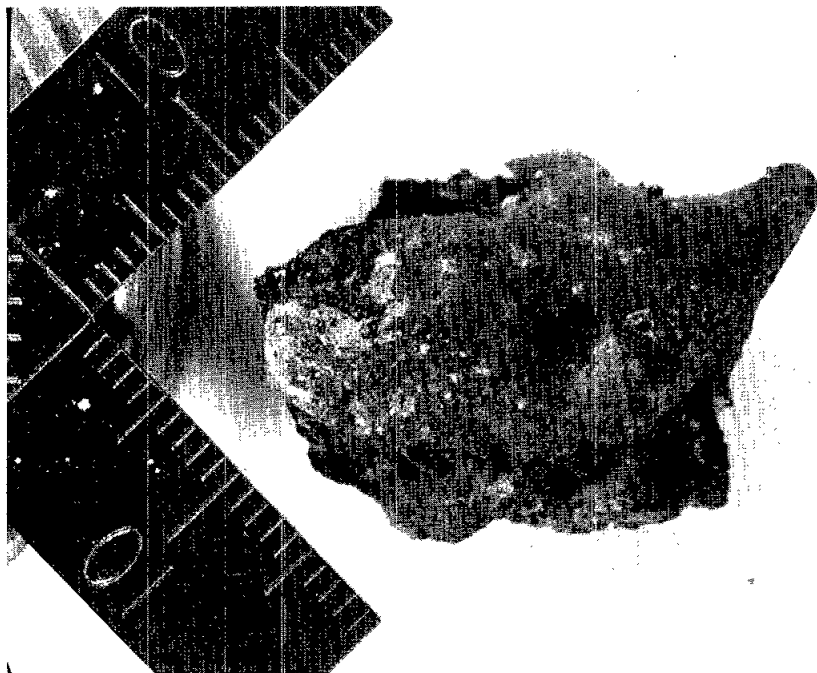
Surface: Glassy

Zap pits: Present but hard to detect because of irregular surface

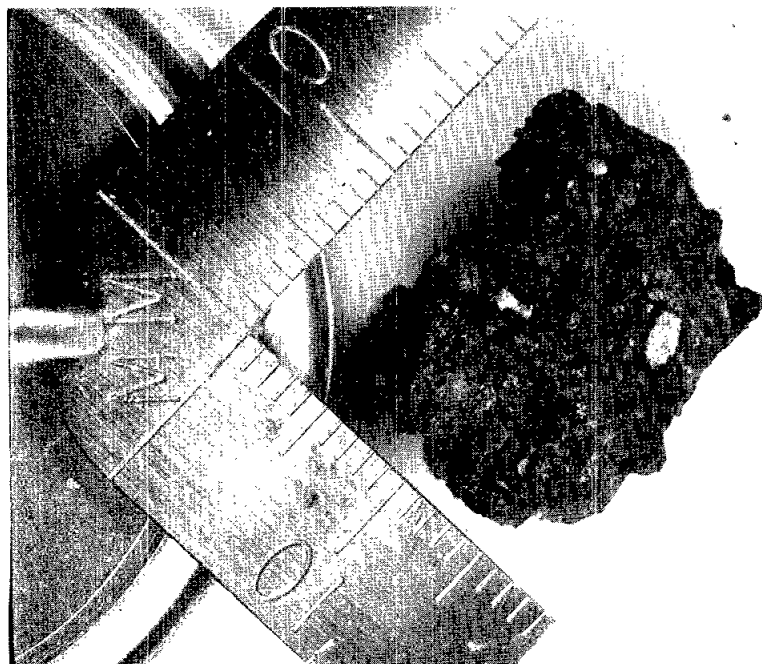
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark gray	90				Glassy material
Clasts	Light gray	10	Angular	1/2	0-5	Clasts belong to several populations

Special Features: Largest clast is homogeneous crystalline rock with sugary texture and small zap pits.

67569



67575



Generic No.: 67569
Rock Type: Breccia, polymict,
vesicular

Weight (g): 7.27
Dimensions (cm): 2-1/2 x 2 x 1
Color (fresh): Dark gray
Shape: Angular
Variability: Variable, some clasts
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Glassy
Cavities (%): Numerous vesicles
Surface: Smooth and rough
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	Dark gray	95				
Clast	Light	5	Angular	1	0-2	

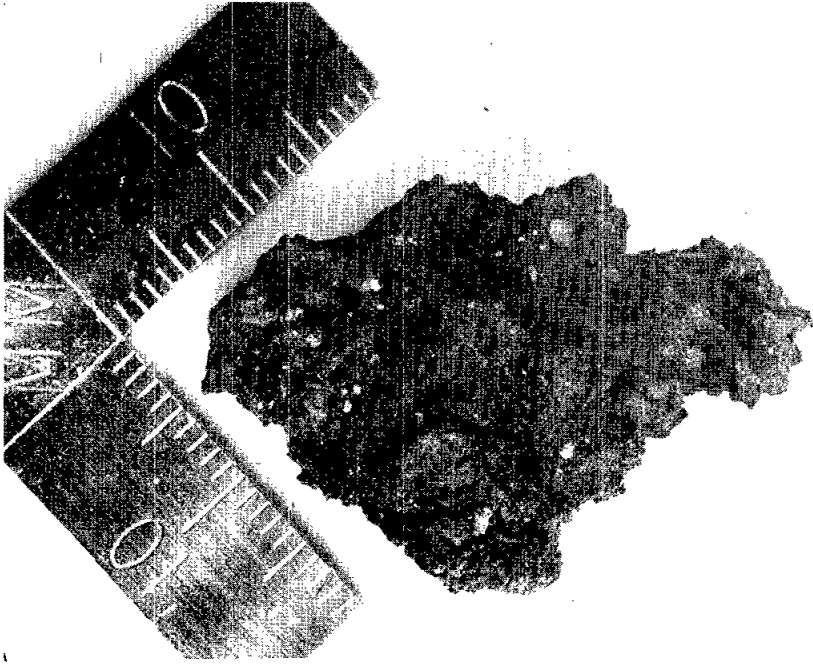
Generic No.: 67575
Rock Type: Breccia, polymict,
vesicular

Weight (g): 4.47
Dimensions (cm): 2 x 1.5 x 1.5
Color (fresh): Gray/white
Shape: Very irregular
Variability: Very variable
Coherence: intergranular - coherent
fracturing - fractured
Fabric/texture: Complex breccia mostly vesicular
Cavities (%): Present
Surface: Very irregular; partly vesicular
Zap pits: None

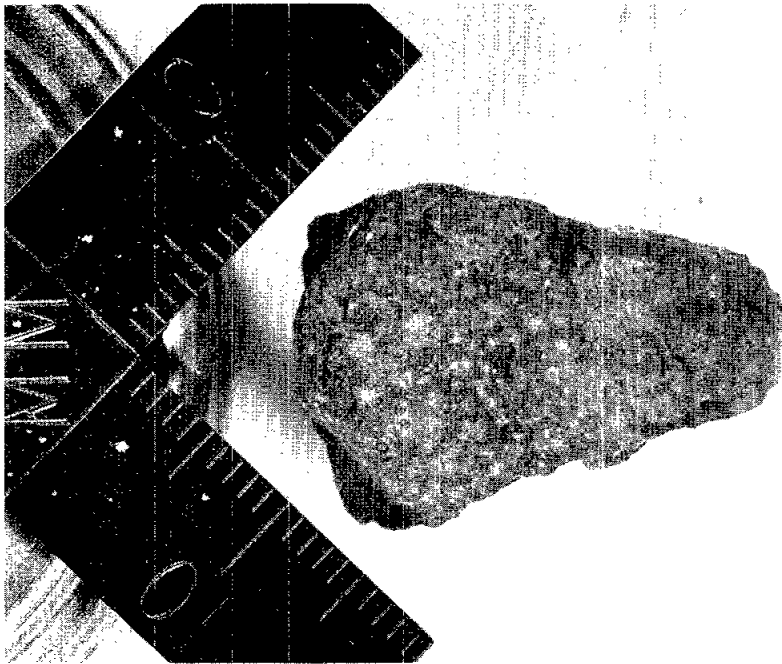
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark gray	90				Fine-grained; partly vesicular
Clasts	White	10	Irreg		0-5	White clasts of several types, at least one appearing to be breccia.

Special Features: Probably more than one generation of breccia. Both matrix and clasts are complete. Matrix has flinty appearance suggesting metamorphism.

67576



67615



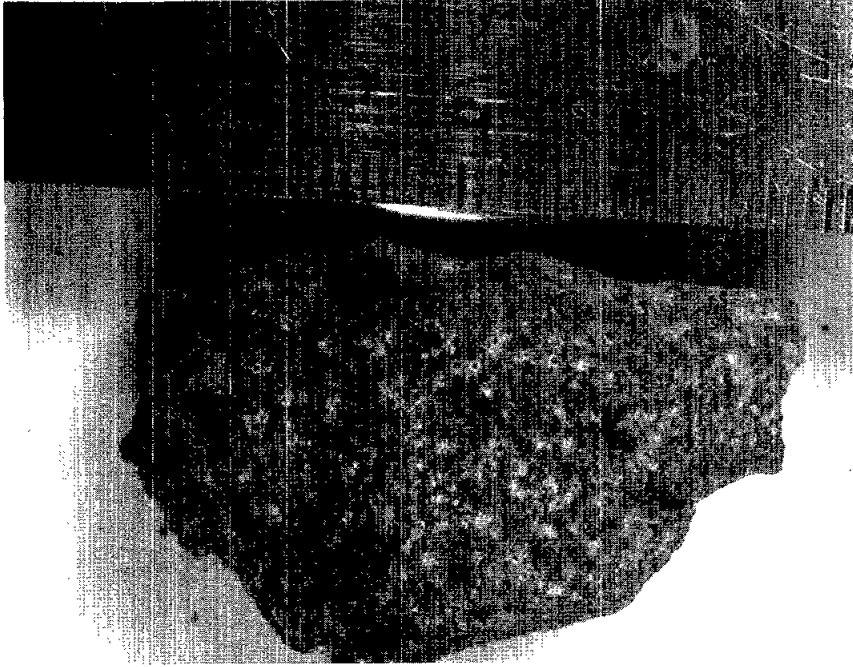
Generic No.: 67576
Rock Type: Breccia, soil,
partly vitrified

Weight (g): 3.98
Dimensions (cm): 3 x 2 x 1/2
Color (fresh): Dark gray to black
Shape: Very angular
Variability: Very variable; glassy to powdery
Coherence: intergranular - moderate
fracturing - none
Fabric/texture: Partly vitrified; mostly soil
Cavities (%): None
Surface: Very rough and partly melted
Zap pits: Too rough to detect
Special Features: Soil breccia, partly vitrified. Some small white
clasts visible, probably anorthosite.

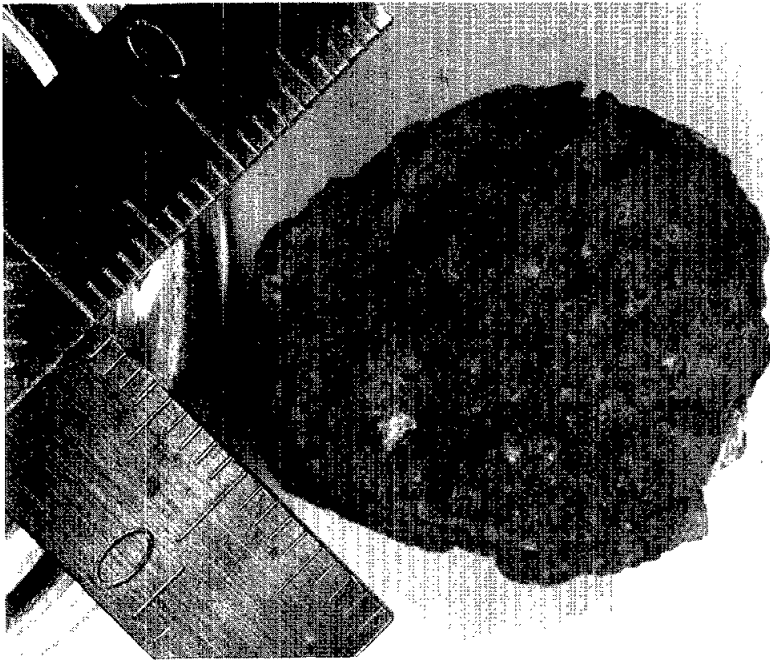
Generic No.: 67615
Rock Type: Basalt, porphyritic

Weight (g): 8.77
Dimensions (cm): 2-1/2 x 2 x 1-1/2
Color (fresh): Gray
Shape: Angular
Variability: None
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: One surface was fractured; others show zap pits
Zap pits: 40
Special Features: Fractured surfaces confusing but probably plagioclase
phenocrysts 0.2 mm set in plagioclase - pyroxene ground-mass.

67616



67617



Generic No.: 67616

Rock Type: Basalt, coarse

Weight (g): 21.29

Dimensions (cm): 3.5 x 2 x 2

Color (fresh): Gray

Shape: Irregular

Variability: Uniform

Coherence: intergranular - coherent
fracturing - fractured

Fabric/texture: Equigranular

Cavities (%): None

Surface: Mostly fracture surfaces

Zap pits: Many 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>	
Plagioclase	White	30	Irreg	.2		None
Pyroxene	Gray	70	Irreg	.2		Color variable, two types?

Generic No.: 67617

Rock Type: Breccia, polymict,
mostly basalt

Weight (g): 14.32

Dimensions (cm): 2-1/2 x 2-1/2 x 2-1/2

Color (fresh): Mostly gray (white clasts)

Shape: Irregular

Variability: See "Special Features"

Coherence: intergranular - coherent
fracturing - numerous fractures

Fabric/texture: Mostly equigranular fine-grained

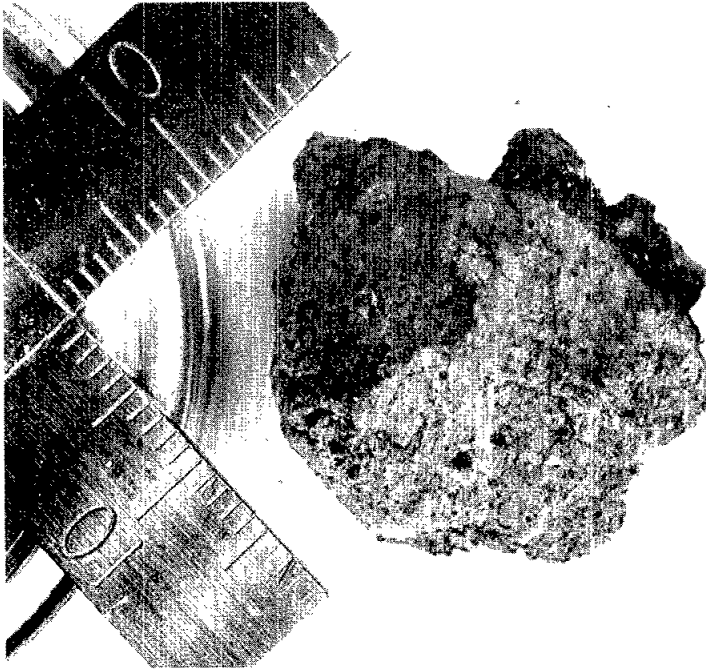
Cavities (%): None

Surface: Irregular

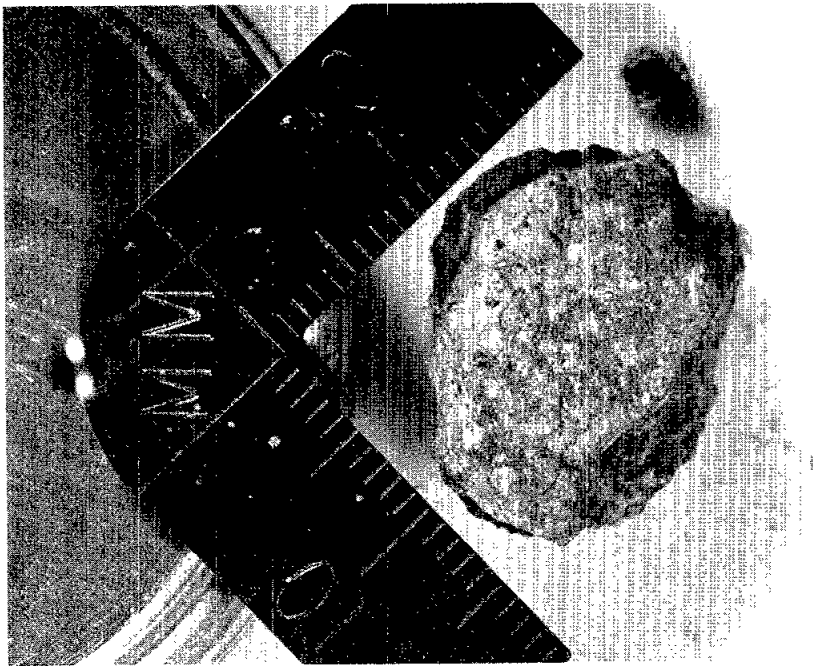
Zap pits: Many on one surface

Special Features: Although this is polymict breccia, much appears to be basaltic rock with uniform texture. However, presence of different types of clasts implies polymict breccia (probably strongly metamorphosed).

67618



67619



Generic No.: 67618
Rock Type: Basalt with glass

Weight (g): 11.17
Dimensions (cm): 2-1/2 x 2-1/4 x 1-1/2
Color (fresh): Dark gray
Shape: Irregular
Variability: Glassy to crystalline
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Glassy to fine-grained, parts granular
Cavities (%): None
Surface (face): Rough with glass coating
Zap pits: Numerous on exposed 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>	
Basalt		80				
Glass	Slightly greenish	20				

Special Features: Identification unclear. May be shocked crystalline glass as given, but texture is strange.

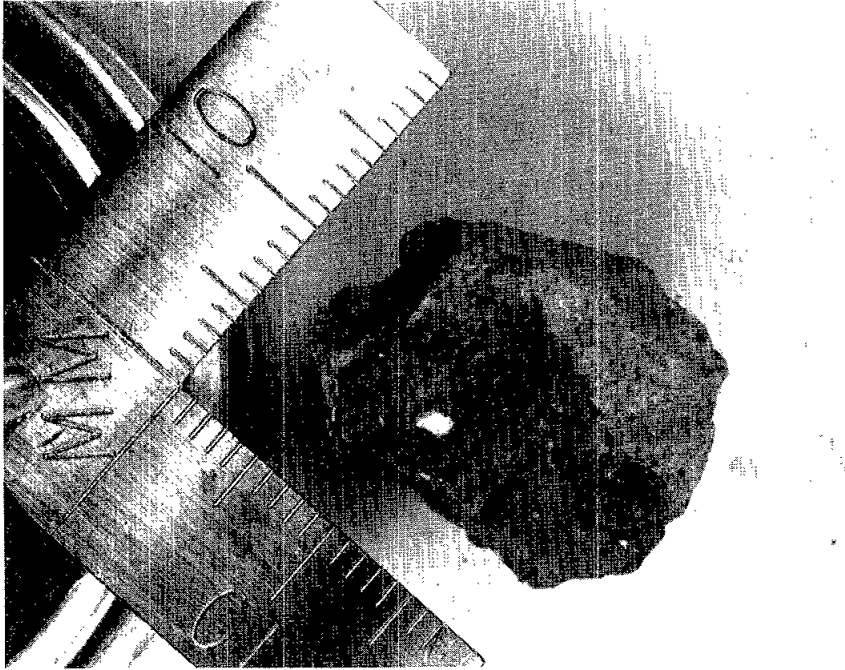
Generic No.: 67619
Rock Type: Breccia, polymict,
mostly basalt

Weight (g): 6.15
Dimensions (cm): 2 x 1.5 x 1
Color (fresh): Medium gray
Shape: Subangular
Variability: Few small clasts but essentially homogeneous
Coherence: intergranular - coherent
fracturing - one large
Fabric/texture: Very fine-grained
Cavities (%): None
Surface (face): Smooth; mostly coated with white powder which obscures most of sample.
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	98				
Clasts	Several colors	2	Angular	0.25	0-1	

Special Features: Mostly homogeneous but with patchy color change from light to dark gray. One small fragment cracked off. Homogeneous part is probably basalt.

67625



67626



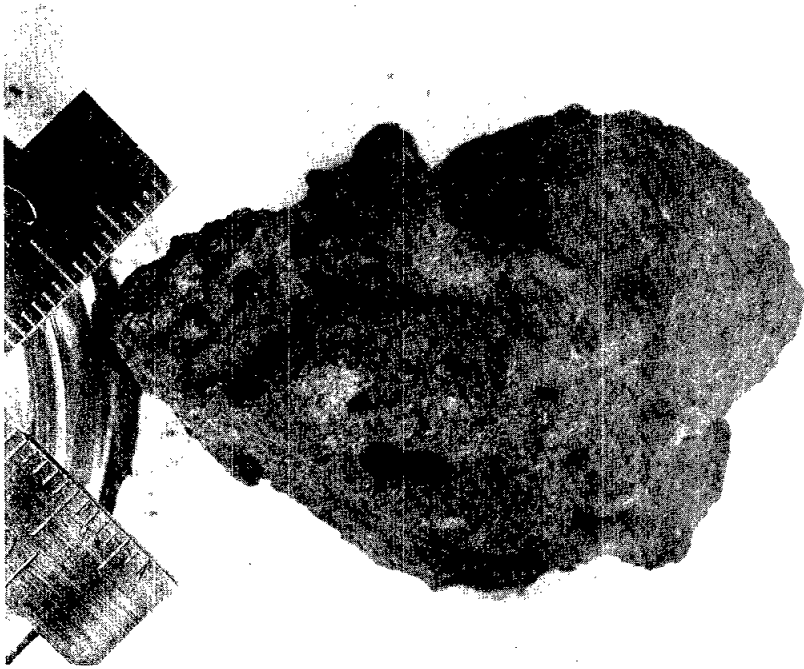
Generic No.: 67625
Rock Type: Breccia, polymict,
metamorphosed

Weight (g): 6.72
Dimensions (cm): 1-3/4 x 2 x 1-3/4
Color (fresh): Medium gray
Shape: Subrounded
Variability: Variable
Coherence: intergranular - coherent
fracturing - not present
Fabric/texture: Complex
Cavities (%): None
Surface: Light-gray coating over one-third; otherwise fracture surface
Zap pits: None
Special Features: Appears crystalline, but definitely is not homogeneous. Both dark and light crystalline material is present with indistinct boundaries. Not a good crystalline rock. Probably metamorphosed polymict breccia.

Generic No.: 67626
Rock Type: Cinder

Weight (g): 19.19
Dimensions (cm): 4 x 3 x 3
Coherence: Intergranular - coherent
Special Features: Obviously similar to 67628. Half of specimen is either basalt or high grade metamorphic. No detailed description is made.

67627



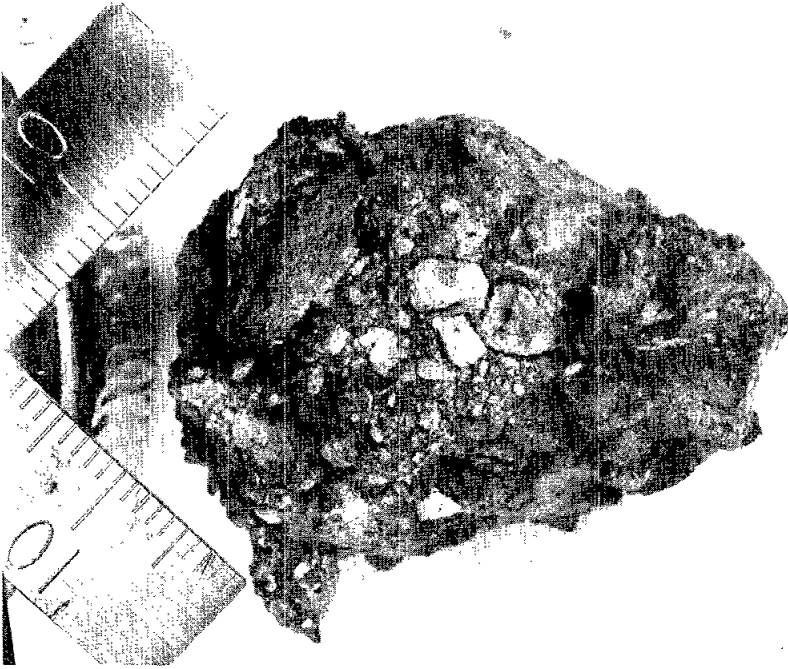
Generic No.: 67627
Rock Type: Glass, vesicular

Weight (g): 79.64
Dimensions (cm): 5-1/2 x 4 x 4
Color (fresh): Dark gray
Shape: Angular
Variability: Constant except for one clast
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Very fine-grained. Uniform - glassy patches
Cavities (%): Abundant vesicles
Surface: Irregular
Zap pits: None

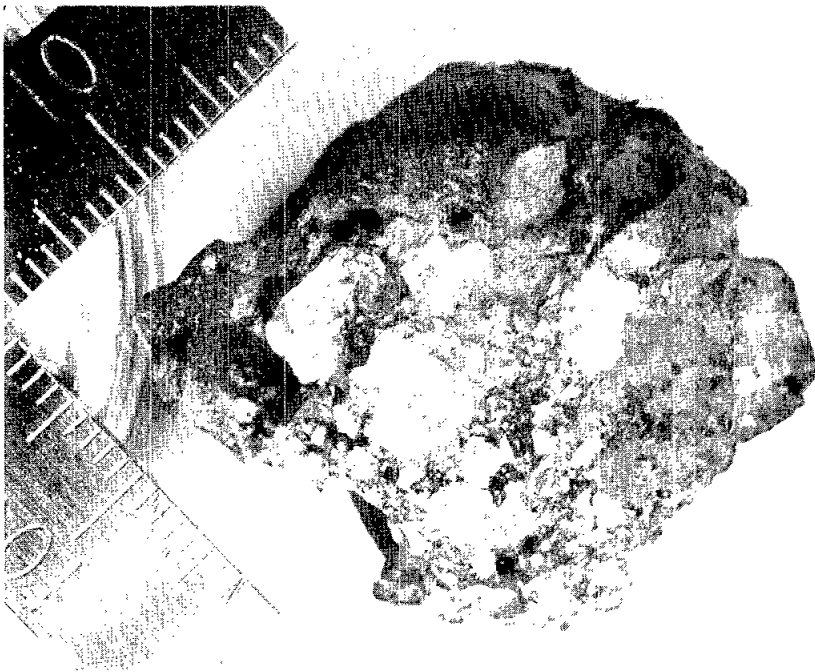
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Glass	Dark gray	95				
Clast	Light gray	5	Angular		0-10	Contains small dark clasts breccia-in-breccia

Special Features: One small fragment also in dish.
Puzzling - possibly composed of vitrified basalt or metamorphosed soil.

67628



67629



Generic No.: 67628

Rock Type: Cinder

Weight (g): 49.71

Dimensions (cm): See below

Color (fresh): Variable dark gray to white

Shape: Very irregular

Variability: Very variable contains white clasts

Coherence: intergranular - coherent
fracturing - fractured

Fabric/texture: Cindery

Cavities (%): Vesicles

Surface: Cindery

Zap pits: None

Special Features: Four fragments. Largest 4 x 3 x 3 cm. Next 2 x 2 x 2. Next 2 x 2 x 1.5. Smallest 1 x 1.5 x 1.5. All from same population. All cindery - unsuitable for precise description. Many white clasts up to 1 cm, each being a breccia.

Generic No.: 67629

Rock Type: Basalt, vesicular
with attachments

Weight (g): 32.84

Dimensions (cm): 3 x 3 x 2

Color (fresh): Dark gray

Shape: Very irregular

Variability: Basaltic part is uniform

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Very fine-grained in basalt

Cavities (%): Large vesicles (50%)

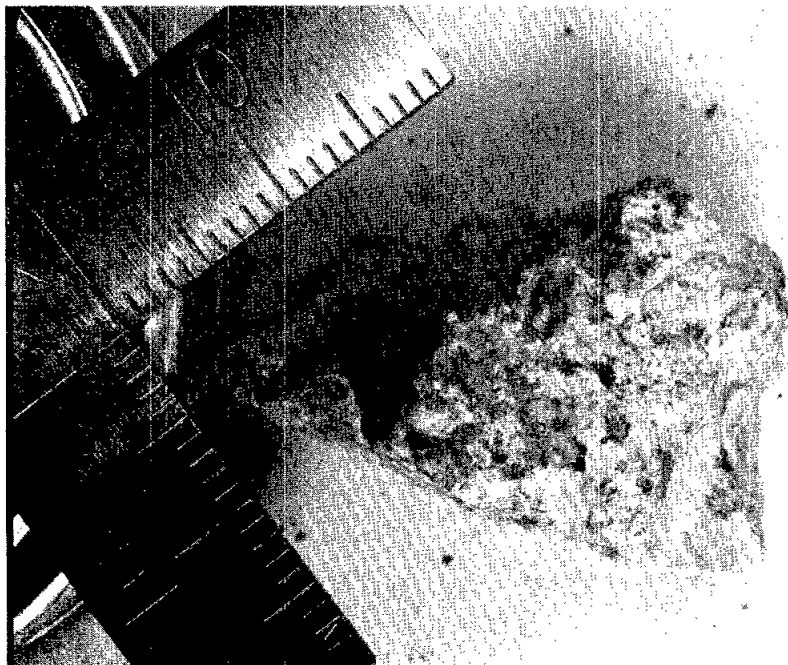
Surface: Rough, angular

Zap pits: Not seen

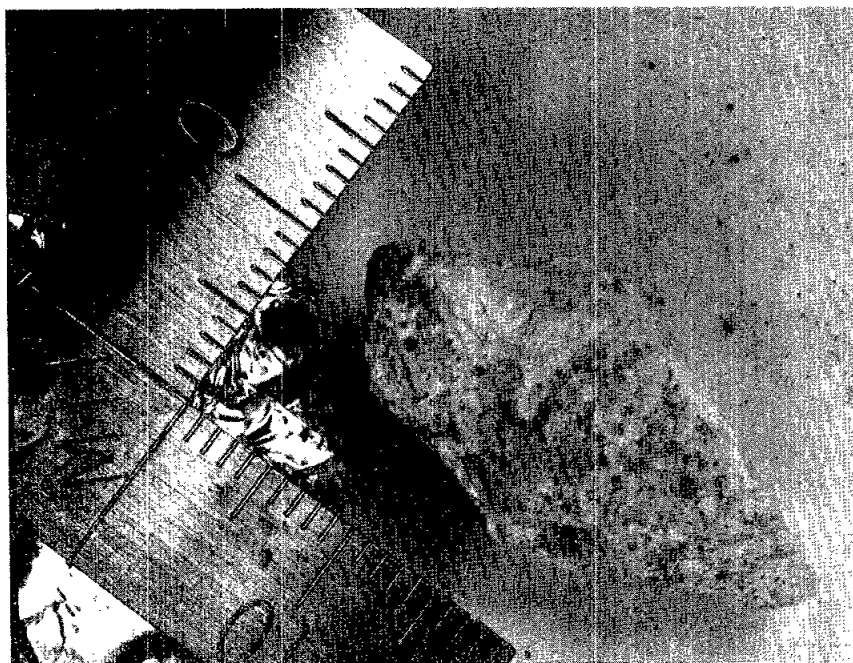
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Basalt	Dark gray	89				
Attachments	Whitish	15				

Special Features: Four large pieces, all same size. Complex variation. Much of specimen seems to be vesicular basalt. White material appears to be attached to outer surfaces. Description applies to largest piece.

67635



67636



Generic No.: 67635
Rock Type: Breccia, monomict,
anorthositic

Weight (g): 9.12
Dimensions (cm): 3 x 2 x 1-1/2
Color (fresh): White
Shape: Angular
Variability: Homogeneous
Coherence: intergranular - tough
fracturing - present, numerous
Fabric/texture: Very fine-grained
Cavities (%): None
Surface: Fairly smooth
Zap pits: Present on two 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>	
Plagioclase	White	100				Fine-grained but faces seen

Special Features: Probably monomict. Recrystallized shocked anorthosite is probably the origin. It is the most compact white rock in the suite.

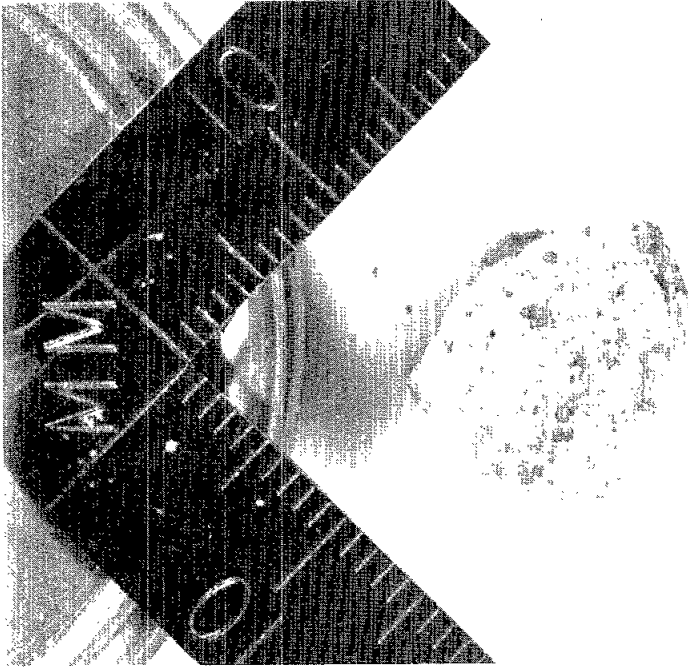
Generic No.: 67636
Rock Type: Breccia, near
monomict, anorthositic

Weight (g): 3.23
Dimensions (cm): 2.5 x 1.25 x 1.0
Color (fresh): White
Shape: Irregular
Variability: Uniform matrix with rare dark clast
Coherence: intergranular - coherent
fracturing - present
Surface: One side has patchy-glassy coating with powder and many zap pits
Zap pits: Many present. 50 on one side.

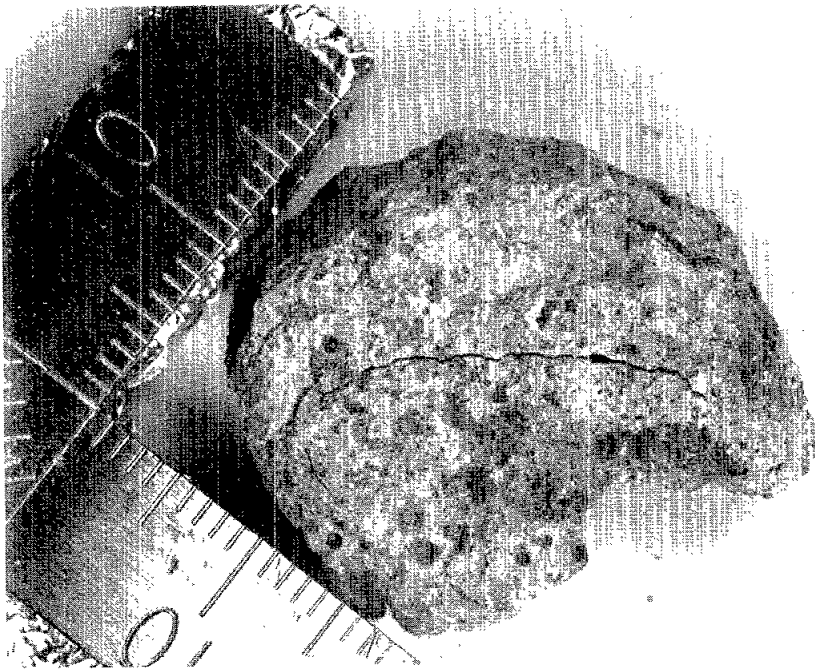
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	98				Plagioclase rich
Clast	Light gray yellow- green tinge	1	Irreg	2		Only one clast
Coating	Irreg	1				

Special Features: Essentially anorthosite, but very fine-grained.

67637



67638



Generic No.: 67637

Rock Type: Anorthosite, shocked
recrystallized

Weight (g): 2.34

Dimensions (cm): 1.3 x 1 x 1

Color (fresh): White

Shape: Angular

Variability: Variable

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Very fine-grained, some lineation

Cavities (%): None

Surface: Rough

Zap pits: Zap pits and coating glass on exposed surfaces

Special Features: Consists of angular crystals up to 1/2 mm across, mostly transparent or white. An occasional yellow crystal occurs set in white powdery matrix. A few black specks are visible. Probably crushed anorthosite containing rare olivine and perhaps opaque mineral; latter, however, is probably a surface coating.

Generic No.: 67638

Rock Type: Breccia, polymict

Weight (g): 7.23

Dimensions (cm): 2-1/2 x 2-1/2 x 1

Color (fresh): Light gray

Shape: Irregular

Variability: Numerous medium-gray clasts - complex.

Coherence: intergranular - coherent
fracturing - several fractures

Fabric/texture: Fine-grained

Cavities (%): None

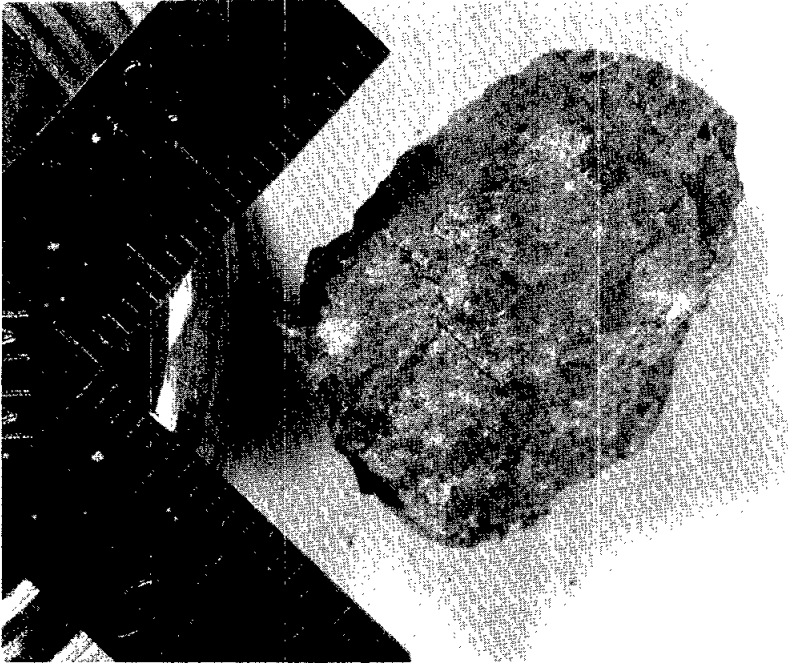
Surface (face): Irregular

Zap pits: Several dozen - often appear like clasts

<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	50				
Clasts A	Medium gray	20	Sub-angular	2	0-3	
Clasts B	Greenish yellow	10		0.5	0-1	
Other clasts		20				

Special Features: The A and B clasts occupy separate areas. Many clast types several mm and smaller. Complex polymict breccia. Need thin section for any reasonable description.

67639



67645

TOO FRIABLE TO PHOTOGRAPH

Generic No.: 67639
Rock Type: Breccia, polymict

Weight (g): 7.34
Dimensions (cm): 2-1/2 x 2 x 1
Color (fresh): Light gray with brownish coating
Shape: Ovoid
Variability: Some dark clasts in homogeneous matrix
Coherence: intergranular - coherent
fracturing - several large fractures
Cavities (%): None
Fabric/texture: Fine-grained
Surface: Fairly smooth, brown coating on about 3/4 of surface
Zap pits: Several dozen

<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	98				95% white; 5% tiny dark
Clast	Dark gray	2	Angular	2	2-2	White & gray crystals in clast
Coating						Fine crystalline

Special Features: Dull brownish coating.

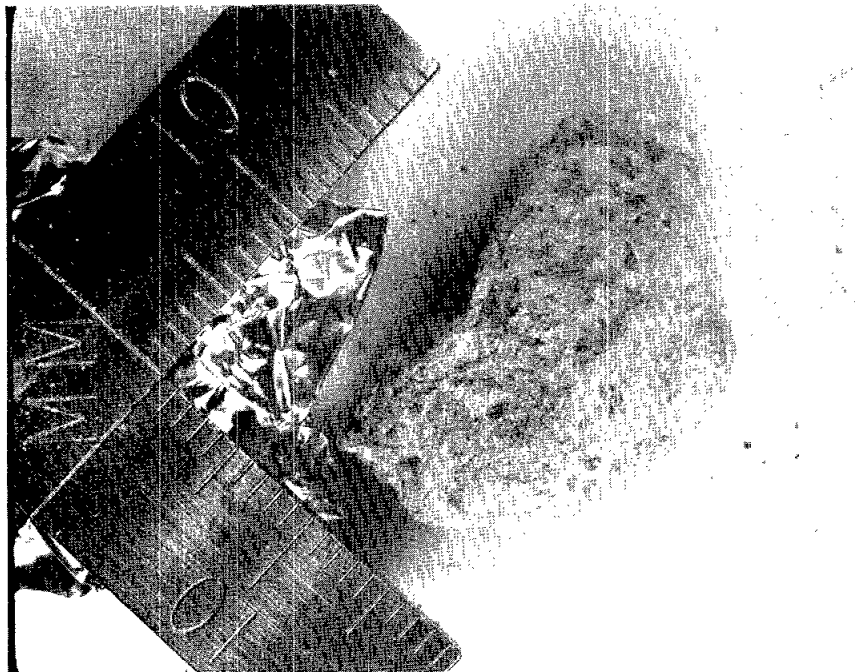
Generic No.: 67645
Rock Type: Breccia

Weight (g): .84
Dimensions (cm): .75 x .5 x .25
Color (fresh): Whitish
Shape: Irregular
Variability: Matrix with clasts
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Powdery surface
Cavities (%): None
Surface: Powdery
Zap pits: None

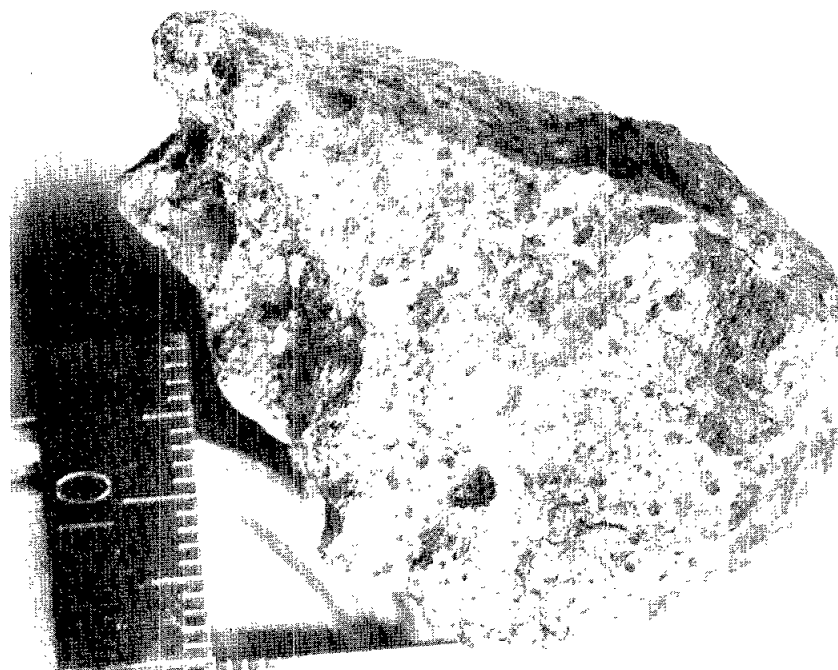
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	95				
Clast	Dark gray	5	Irreg	.25	0-1	

Special Features: Broken into four fragments and fine powder - all essentially identical. Description given for largest. Further crumbling will occur. Impossible to describe due to white powder. No photograph because too friable.

67646



67647



Generic No.: 67646
Rock Type: Breccia, polymict

Weight (g): 3.94
Dimensions (cm): 2.5 x 1.5 x 1
Color (fresh): White with gray clasts
Shape: Subrounded
Variability: White powdery matrix with grayish clasts
Coherence: intergranular - friable
 fracturing - none
Fabric/texture: White powdery matrix with darker clasts
Cavities (%): None
Surface: Mostly white powder with darker clasts protruding
Zap pits: None
Special Features: White powder prevails. Thus, detailed identification unwise. Crystals may be seen in both matrix and clasts. Possibly heavily shocked anorthosite.

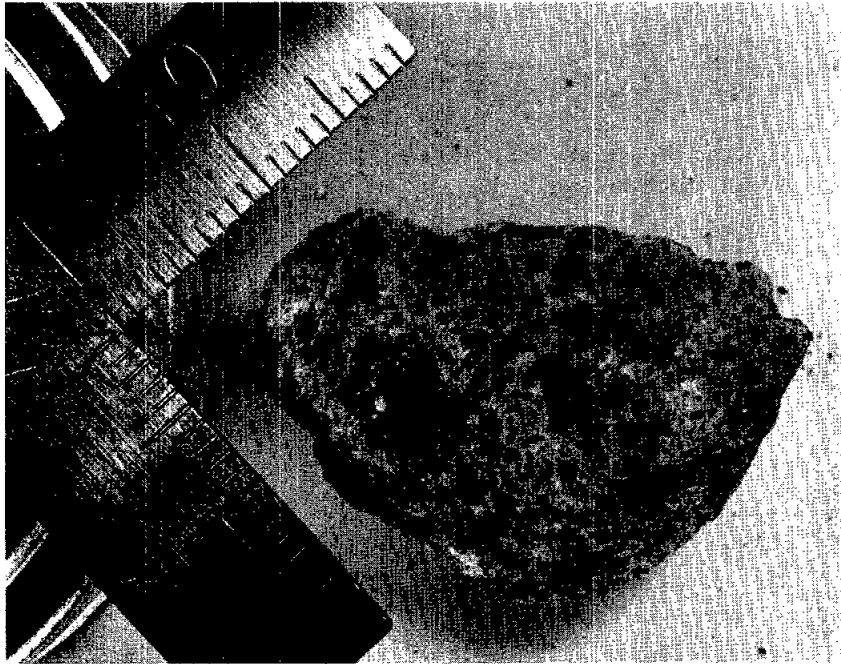
Generic No.: 67647
Rock Type: Breccia, polymict

Weight (g): 47.72
Dimensions (cm): 5 x 3 x 3-1/2
Color (fresh): Light gray
Shape: Irregular
Variability: Several dark clasts dominant matrix
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: Rough on exposed surface
Zap pits: Numerous on exposed surfaces

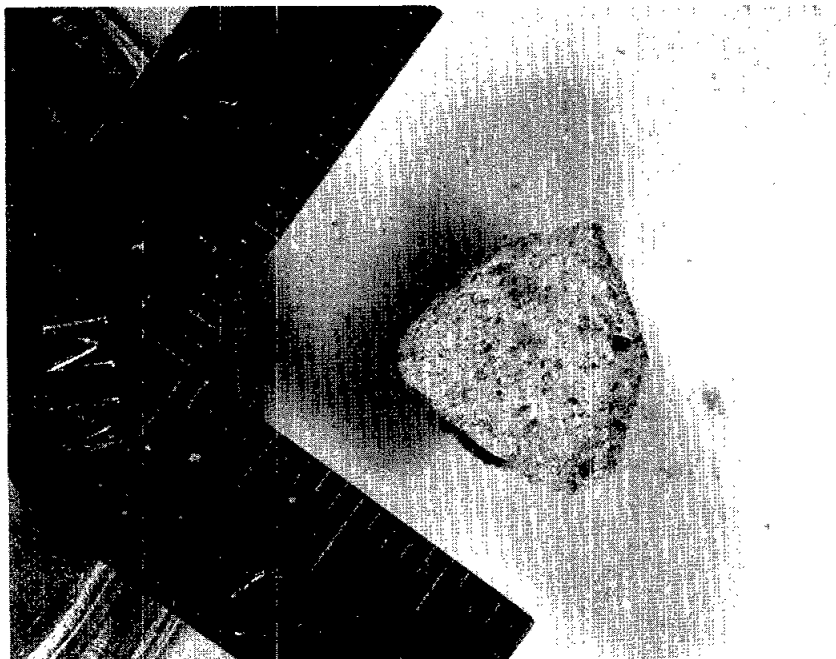
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light gray	95				Too fine for mineral identification
Dark clasts	Dark gray	5	Angular	2	0-5	Two types: A=fine-grained; B=crystalline plagioclase

Special Features: Matrix is highly variable with individual grains. Polymict breccia too complex to decipher without thin section.

67648



67649



Generic No.: 67648
Rock Type: Breccia, polymict

Weight (g): 7.88
Dimensions (cm): 2 x 2-1/2 x 1-1/2
Color (fresh): Light gray with light and dark clasts
Shape: Irregular
Variability: Light matrix with both dark and light clasts
Coherence: intergranular - coherent
 fracturing - none
Cavities (%): None
Fabric/texture: Fine-grained matrix
Surface: Reasonably smooth
Zap pits: Present on half of surface, high density

<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	60				Fine-grained white
Dark clasts	Dark gray	30	Angular		0-5	Crystalline rocks
Light clasts	White	10	Sub-rounded		0-2	Fine powdery white

Special Features: White clasts difficult to resolve from matrix and may consist of same materials; both should be feldspar-rich. Dark clasts appear to be fine-grained basalt, have different shades of color suggesting different types; might be metamorphosed breccia rather than basalt.

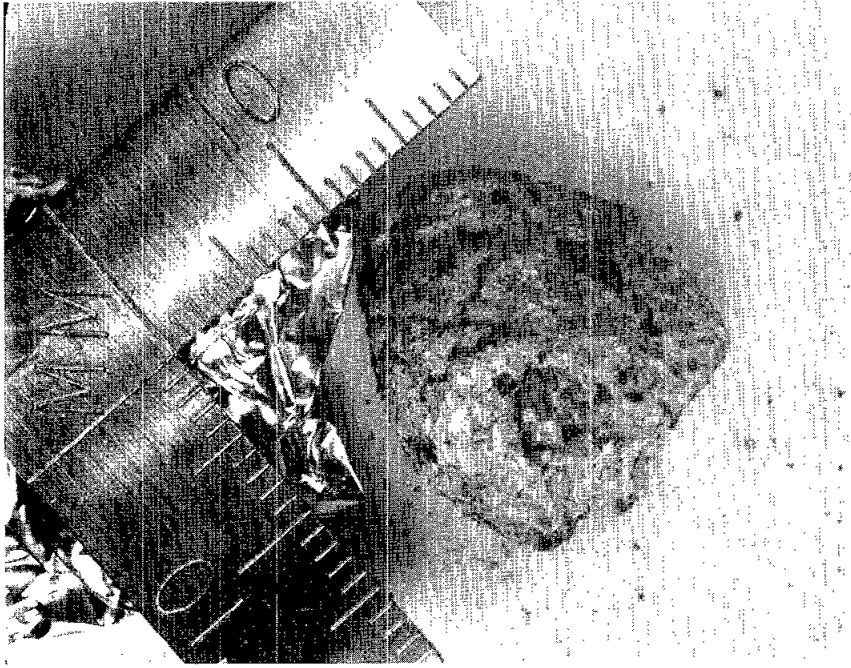
Generic No.: 67649
Rock Type: Breccia, polymict

Weight (g): 1.60
Dimensions (cm): 1 x 3/4 x 1
Color (fresh): White with dark gray
Shape: Subrounded
Variability: White with dark clasts
Coherence: intergranular - friable
 fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: Smooth
Zap pits: None

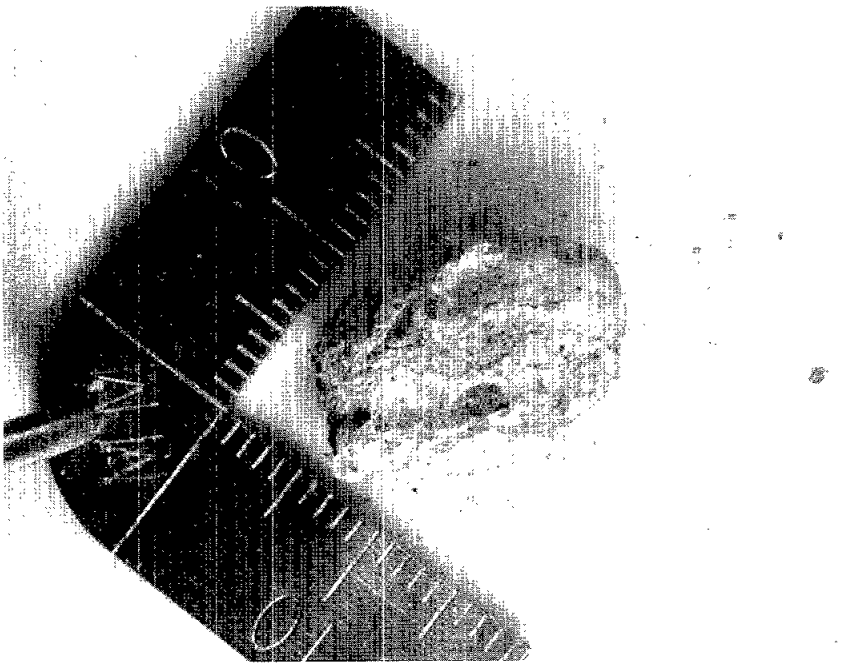
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	90				
Clast	Dark gray	10	Angular	0.25	0-3	

Special Features: Crystals visible in fine powder. Nature of clasts obscured by fine powder.

67655



67656



Generic No.: 67655
Rock Type: Breccia, polymict

Weight (g): 4.11
Dimensions (cm): 2 x 1-1/2 x 1
Color (fresh): Mottled gray to white
Shape: Ovoid
Variability: Homogeneous except for clast
Coherence: intergranular - very coherent
fracturing - none
Fabric/texture: Very fine-grained
Cavities (%): None
Surface (face): Very rough
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	White	80				
Clast	Dark	20				

Special Features: Looks like piece of concrete. Dark clasts evenly distributed in white rough matrix. Clasts appear to be basalt. White material cannot be identified.

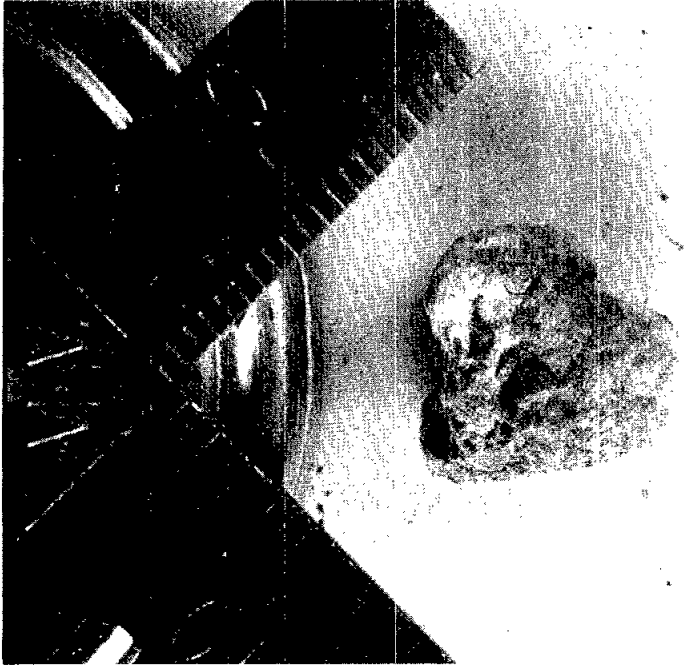
Generic No.: 67656
Rock Type: Breccia, polymict

Weight (g): 1.93
Dimensions (cm): 1-1/2 x 1 x 1
Color (fresh): Dark clasts in light matrix
Shape: Angular
Variability: Dark clasts in light matrix
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Very fine-grained powdery
Cavities (%): None
Surface: Rough
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	White	95				
Clasts	Dark	5	Irreg		0-1	

Special Features: Dark clasts in light, powdery matrix. Detailed description not worthwhile. One rust spot seen in matrix; piece of metal surrounded by stain.

67657



67658



Generic No.: 67657
Rock Type: Breccia, polymict,
anorthositic

Weight (g): 1.70
Dimensions (cm): 1 x 1 x 1
Color (fresh): Whitish gray inclusions
Shape: Irregular
Variability: Whitish matrix, gray inclusions
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Whitish, powdery matrix with inclusions
Cavities (%): None
Surface: Whitish powder with projections
Zap pits: None
Special Features: No detailed description since like many others.

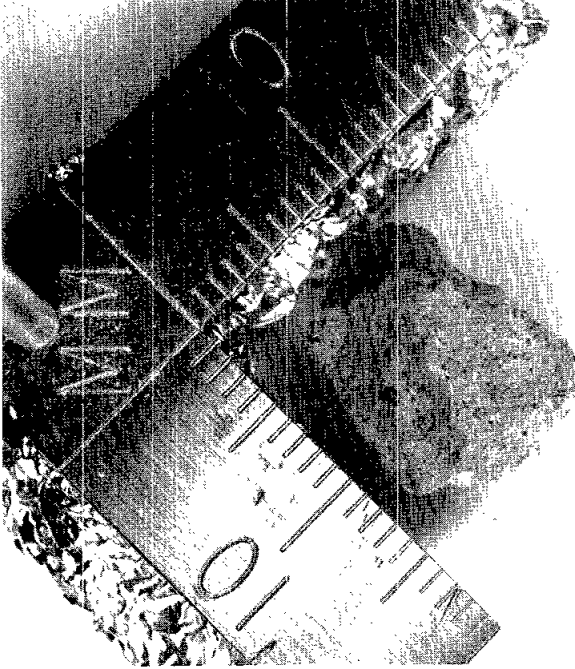
Generic No.: 67658
Rock Type: Breccia, polymict

Weight (g): 1.35
Dimensions (cm): 1-1/4 x 1/2 x 1/2
Color (fresh): White
Shape: Subangular
Variability: Few small darker clasts
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Very fine-grained
Surface: Smooth
Zap pits: None
Cavities (%): Large cavities, perhaps where clasts fell out

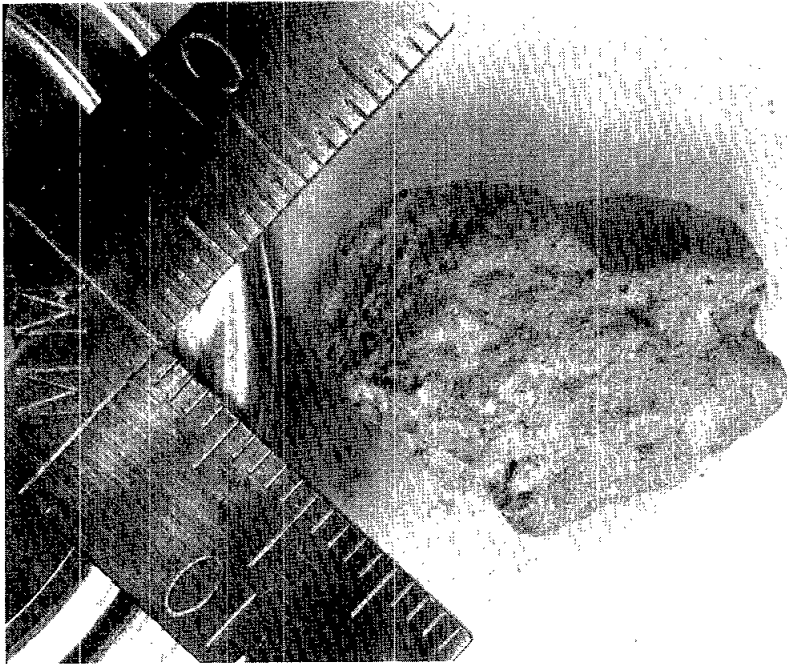
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	95				
Clasts	Gray	5	Too small	0.25	0-0.5	Very fine-grained

Special Features: Considerable powder in dish.

67659



67665



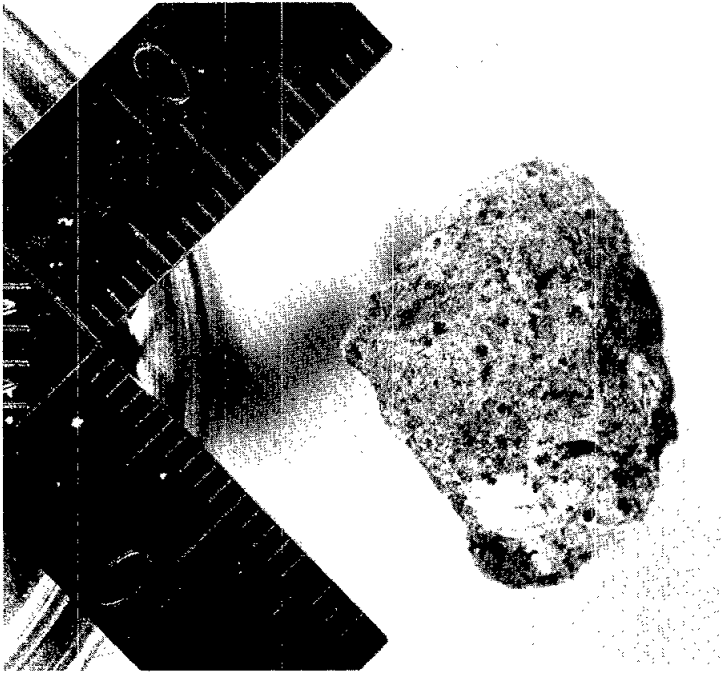
Generic No.: 67659
Rock Type: Breccia, polymict

Weight (g): 1.62
Dimensions (cm): 1.5 x 1.25 x 1
Color (fresh): White/gray
Shape: Irregular
Variability: Polymict breccia
Coherence: intergranular - coherent
 fracturing - partly fractured
Fabric/texture: Small clasts in fine-grained breccia
Cavities (%): None
Surface: Irregular
Zap pits: None
Special Features: Breccia consisting of single mineral grains down to very small sizes (maximum .2mm). Some small rock clasts. Detailed classification impossible.

Generic No.: 67665
Rock Type: Breccia, friable,
 plagioclase-rich

Weight (g): 5.88
Dimensions (cm): 2 x 1-1/2 x 1
Color (fresh): Light gray
Coherence: Intergranular - very friable
Special Features: One large piece and 50 small ones in powder. Will probably disintegrate further. Fine-grained, rich in plagioclase grains. Detailed description not worthwhile.

67666



Generic No.: 67666

Rock Type: Breccia, polymict

Weight (g): 5.47

Dimensions (cm): 2 x 1.5 x 1.5

Color (fresh): Gray

Shape: Ovoid

Variability: Matrix + 2 types of clasts

Coherence: intergranular - coherent

fracturing - none

Fabric/texture: Medium grained

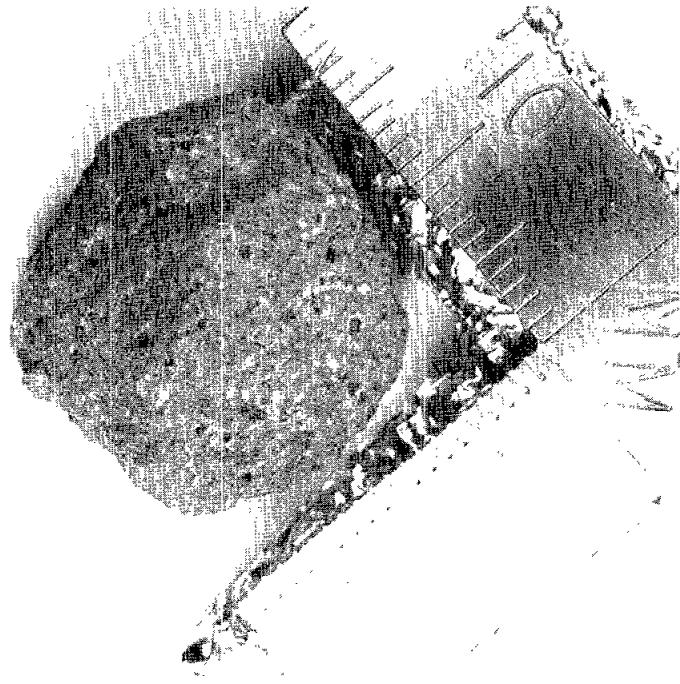
Cavities (%): None

Surface: Irregular knobbling

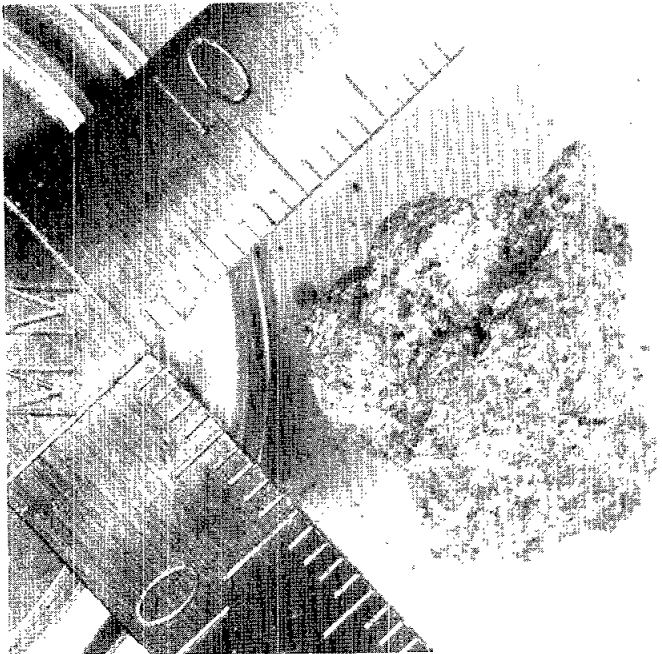
Zap pits: Many, all surfaces

Special Features: Very inhomogeneous. Perhaps breccia-in-breccia. Very variable texture where distinction between clasts and matrix is not possible. Many different types of components occur and thin section study is necessary.

67667



67668



Generic No.: 67667
Rock Type: Breccia, monomict ?,
ultramafic ?

Weight (g): 7.89
Dimensions (cm): 2 x 1.5 x 1.75
Color (fresh): Irregular gray with yellow tinge
Shape: Subangular
Variability: Variable
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained, white clots in fine matrix
Cavities (%): None
Surface: Irregular
Zap pits: Several dozen
Special Features: Probably near monomict breccia dominated by fine-grained material rich in yellowish crystals. White clots of irregular shape occur up to 1 mm. Probably rich in pyroxene and/or olivine but identification not clear until thin section study.

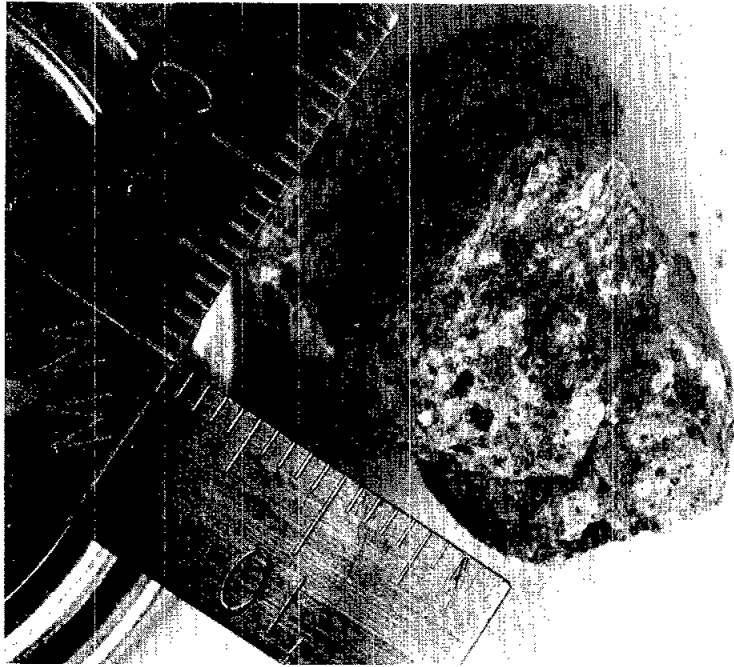
Generic No.: 67668
Rock Type: Breccia, monomict,
olivine basalt

Weight (g): 3.58
Dimensions (cm): 2 x 1-1/2 x 1
Shape: Angular
Color (fresh): Light gray
Variability: Homogeneous to eye, heterogeneous in microscope
Coherence: intergranular - coherent
fracturing - present
Fabric/texture: Fine-grained equigranular
Cavities (%): None
Surface: Rough
Zap pits: None

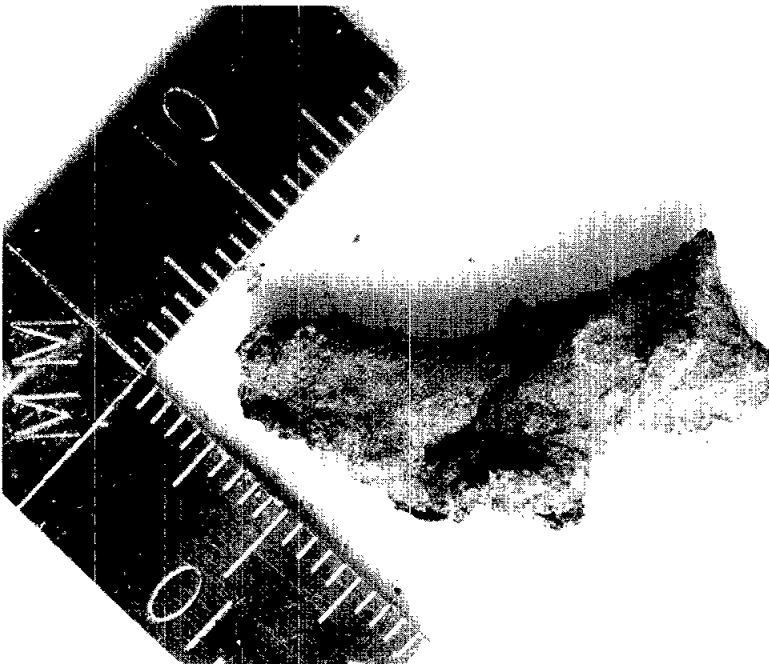
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light gray	50				Very fine-grained
Clast	Medium gray	50	Inreg		.2-.5	
<u>Clast Composition</u>						
Plagioclase	White	60	Inreg		.2-.5	
Pyroxene	Gray	35	Inreg		.2-.5	
Olivine	Yellow	4	Inreg		.2-.5	
Opaque	Dark	1	Inreg		Specks	

Special Features: Consists of matrix and clasts with indistinct boundaries. Matrix almost certainly results from comminution of material represented by clasts. Presumably recrystallized shocked basalt containing olivine.

67669



67675



Generic No.: 67669
Rock Type: Breccia, polymict

Weight (g): 12.54
Dimensions (cm): 2.5 x 2.5 x 2.25
Color (fresh): White to light gray
Shape: Irregular
Variability: Very variable
Coherence: intergranular - weak
 fracturing - many fractures
Fabric/texture: Irregular polymict breccia
Cavities (%): None
Surface: Irregular
Zap pits: ~40 on one end.
Special Features: Complex polymict breccia probably at least two generations. Probably a fine grained whitish matrix with many sizes of clasts (1 cm down). The clasts do not consist of one type.

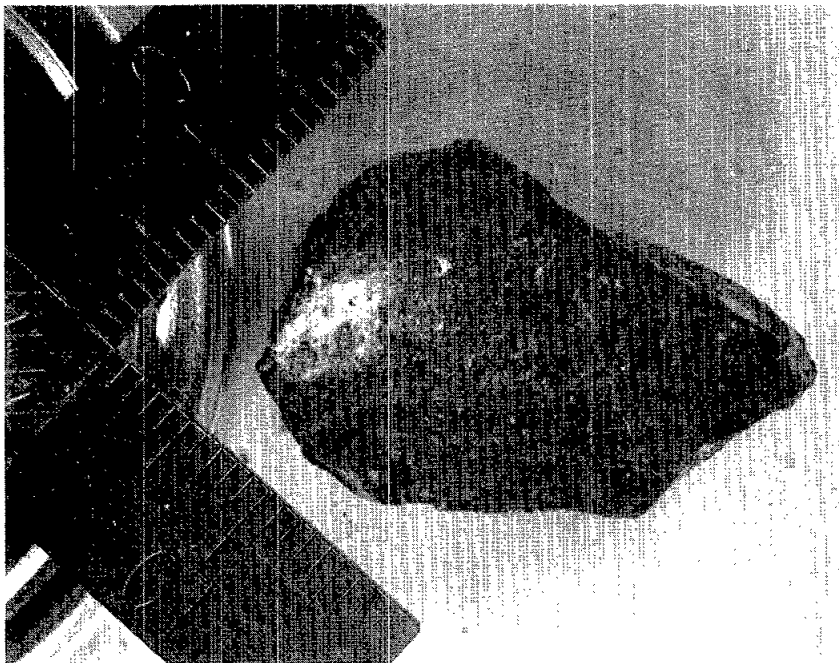
Generic No.: 67675
Rock Type: Glass, ropy

Weight (g): 1.07
Dimensions (cm): 3 x 1 x 1
Color (fresh): Dark gray
Shape: Very irregular
Variability: Homogeneous
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Ropy glass
Cavities (%): None
Surface: Covered by fine powder
Zap pits: None
Special Features: No crystalline material in glass.

67676



67715



Generic No.: 67676
Rock Type: Basalt (vesicular)

Weight (g): 2.33
Dimensions (cm): 1.5 x 1 x 1
Color (fresh): Dark gray
Shape: Irregular
Variability: Exposed area too small to tell
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Basaltic
Cavities (%): Vesicles
Surface: Coated with brown powder
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						Fine-grained
Pyroxene						

Special Features: 99% of surface covered by brown coating. 1% appears to be vesicular basalt. Detailed description would be silly because so little showing.

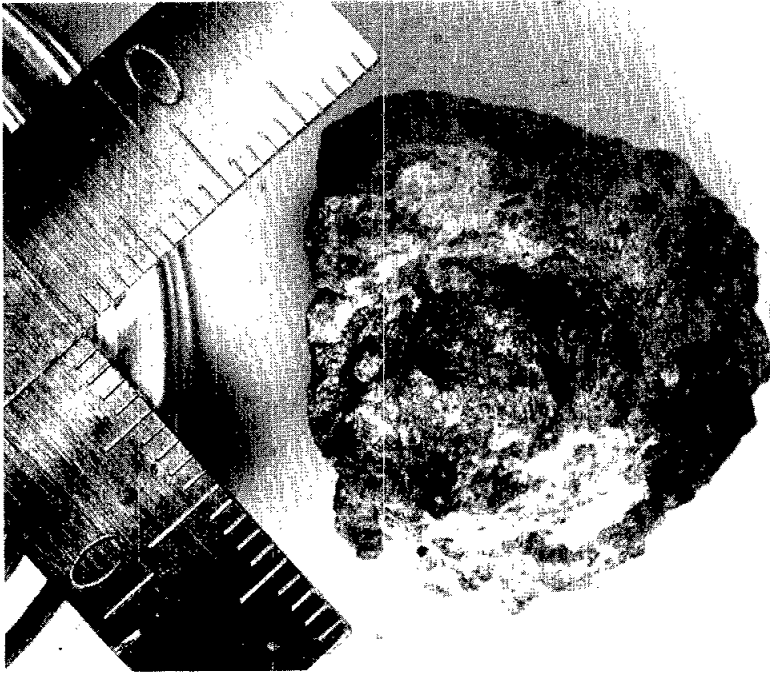
Generic No.: 67715
Rock Type: Basalt with white coating

Weight (g): 9.44
Dimensions (cm): 3 x 2 x 1-1/2
Color (fresh): Dark gray with white coating
Shape: Angular
Variability: Homogeneous except for white coating
Coherence: intergranular - rough
 fracturing - none
Fabric/texture: Fine-grained basaltic
Cavities (%): None
Surface: White coating on one side; other side is fresh fracture
Zap pits: None

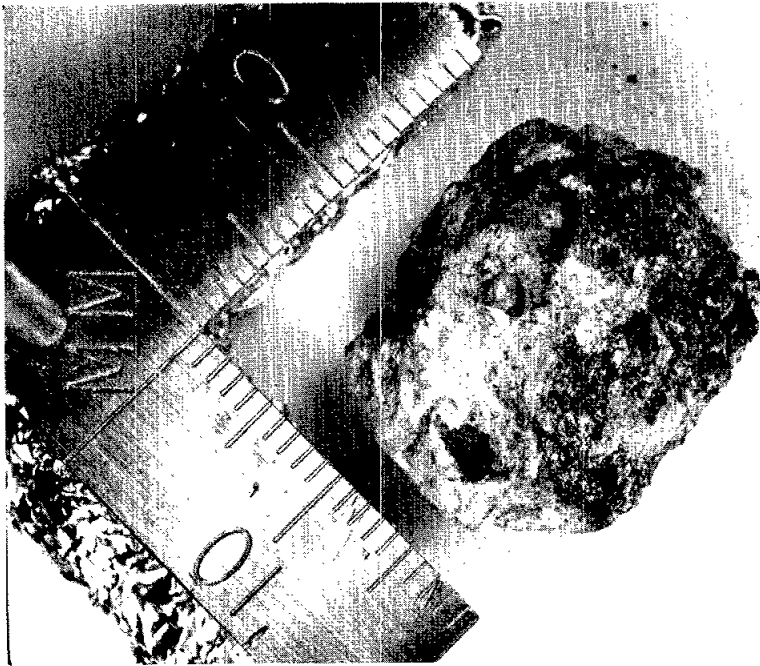
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Plagioclase	White	50				Very fine-grained
Pyroxene	Gray	50				Very fine-grained

Special Features: Mostly basalt with irregular white coating giving impression of breccia clasts at casual glance. Description applies to basalt; typical texture without phenocrysts.

67716



67717



Generic No.: 67716
Rock Type: Breccia, mostly
basaltic

Weight (g): 17.02
Dimensions (cm): 2.5 x 2.5 x 2.5
Color (fresh): Medium gray
Shape: Irregular
Variability: Basaltic part homogeneous
Coherence: intergranular - coherent
fracturing - fractures present
Fabric/texture: Fine-grained basaltic
Cavities (%): None
Surface: Surface coated by white material - otherwise rough
Zap pits: Several on one corner.

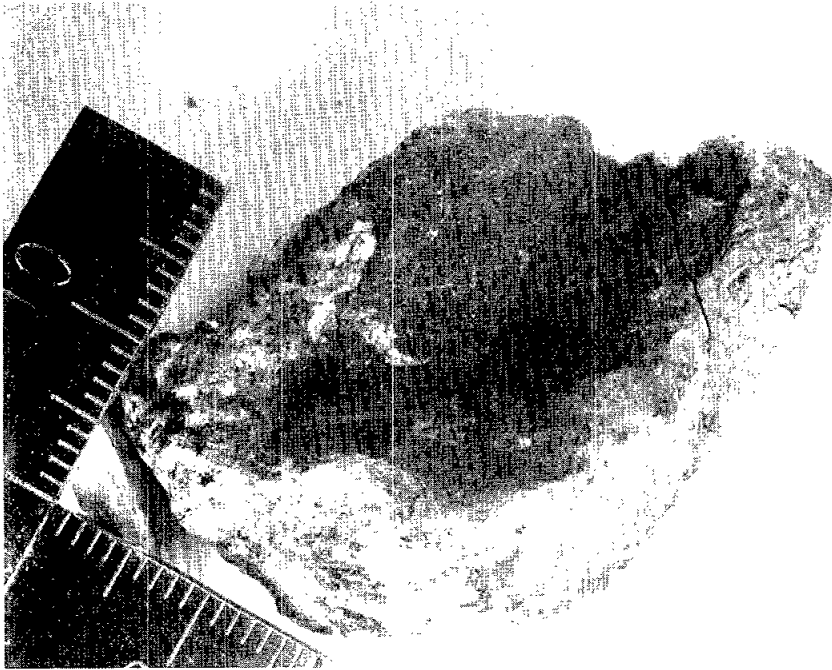
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u> <u>Dom.</u>	<u>Range</u>	<u>Comments</u>
Plagioclase						} Fine-grained
Pyroxene						

Special Features: Most of specimen appears basaltic or high-grade metamorphic. Patches of whitish material including granulated anorthosite suggest that this is polymict breccia. Surface coating covers much of specimen. Description applies to basaltic portion whenever relevant.

Generic No.: 67717
Rock Type: Breccia, polymict,
metamorphosed

Weight (g): 5.56
Dimensions (cm): 2 x 1.5 x 1.5
Color (fresh): Medium gray
Shape: Subrounded
Variability: Light clasts and dark matrix
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: White coating on three-quarters of surface, up to 1/2 mm thick
Zap pits: None
Special Features: Probably metamorphosed polymict breccia. Texture appears basaltic, but presence of clasts indicates breccia. Impossible to characterize properly because of thick coating over most of surface.

67718



67719



Generic No.: 67718
Rock Type: Breccia, polymict,
metamorphosed

Weight (g): 41.05
Dimensions (cm): 4.0 x 3.0 x 2.5
Color (fresh): Gray/white
Shape: Irregular
Variability: Breccia
Coherence: intergranular - coherent
fracturing - fractured
Fabric/texture: Fine-grained matrix and complex clasts
Cavities (%): None
Surface: Irregular
Zap pits: Few on one surface

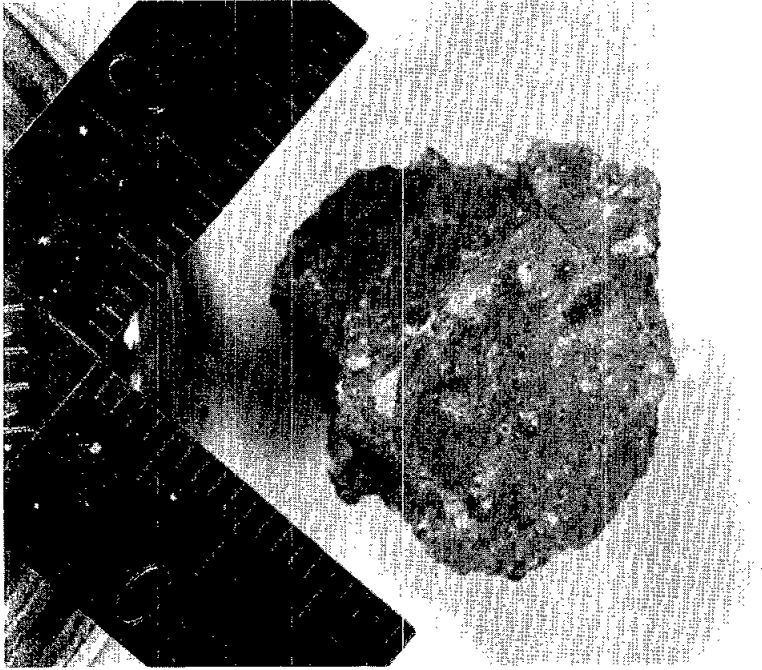
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Dark	90				
Clasts	White	10	Irreg		0-10	Very complex

Special Features: Broken into two pieces which match together. Description for larger piece which is twice volume of smaller. Puzzling specimen because more white material on surface than in interior. About 1/2 of surface is white material. White material is not uniform and is a breccia. Fine grained texture of interior suggests thermal metamorphism. The dark matrix varies in intensity of gray suggesting several components now largely obscured by thermal metamorphism.

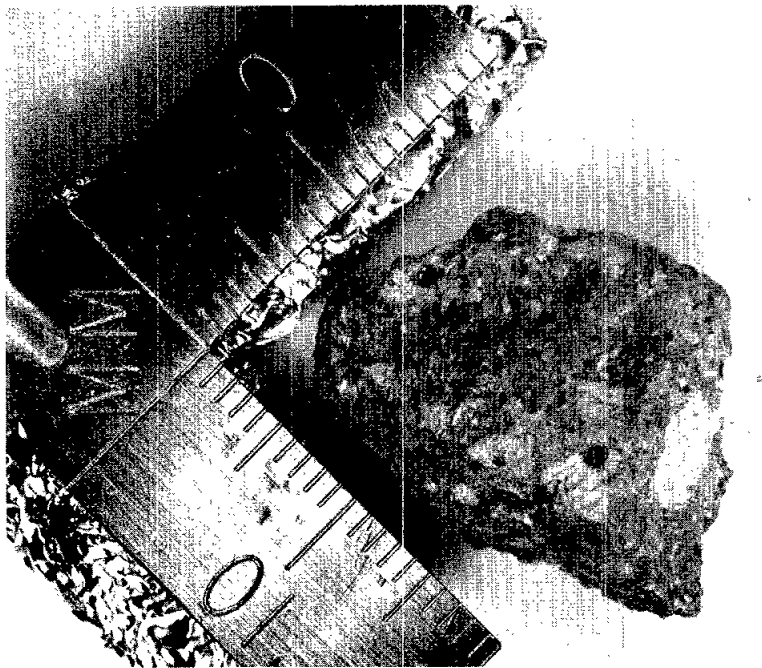
Generic No.: 67719
Rock Type: Basalt ?,
otherwise breccia

Weight (g): 2.13
Dimensions (cm): 1.5 x 1 x 1
Color (fresh): Light gray
Shape: Subrounded
Variability: Homogeneous ?
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Basaltic
Cavities (%): None
Surface: Mostly coated with powder
Zap pits: None
Special Features: Most of the surface obscured by coating. Very difficult to decide whether crystalline rock or breccia. Decided to call it basalt: if so there is one large plagioclase phenocryst 3 mm across.

67725



67726



Generic No.: 67725
Rock Type: Breccia, polymict

Weight (g): 5.85
Dimensions (cm): 2 x 2 x 1
Color (fresh): Light gray with white clasts
Shape: Angular
Variability: White clasts
Coherence: intergranular - coherent
 fracturing - several fractures
Fabric/texture: Fine-grained
Cavities (%): No cavities
Surface: See "Special Features"
Zap pits: See "Special Features" many zap 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	85				
Clast	White	15	Angular	0.5	0-2	
Clast	Dark	.2	Angular	.2		Unidentified

Special Features: One surface is a fracture; other surfaces are primary, coated with glass and zap pits.

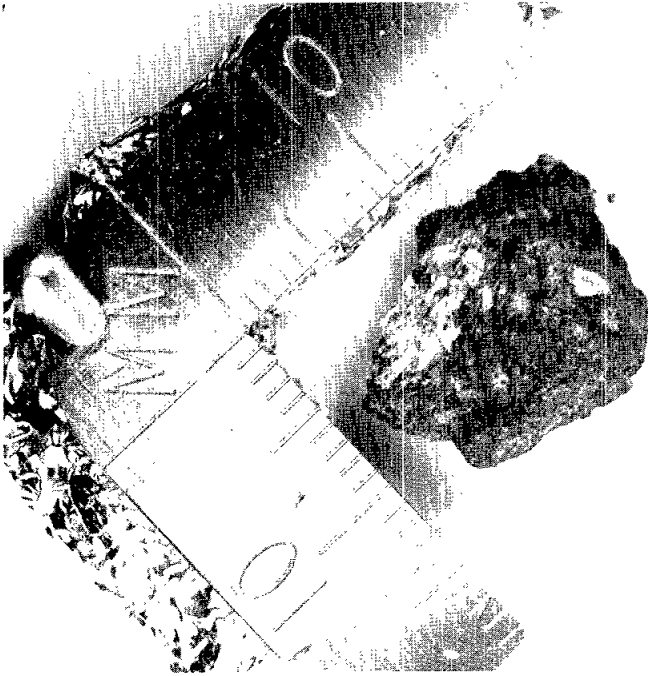
Generic No.: 67726
Rock Type: Breccia, polymict

Weight (g): 4.53
Dimensions (cm): 2 x 2 x 1
Color (fresh): Light gray with white clasts
Shape: Angular
Variability: Homogeneous matrix with white clasts
Coherence: intergranular - coherent
 fracturing - several fractures
Fabric/texture: Very fine-grained
Cavities (%): None
Surface: Mostly fractured surface; small exposed surface
Zap pits: Many zap pits on exposed surface

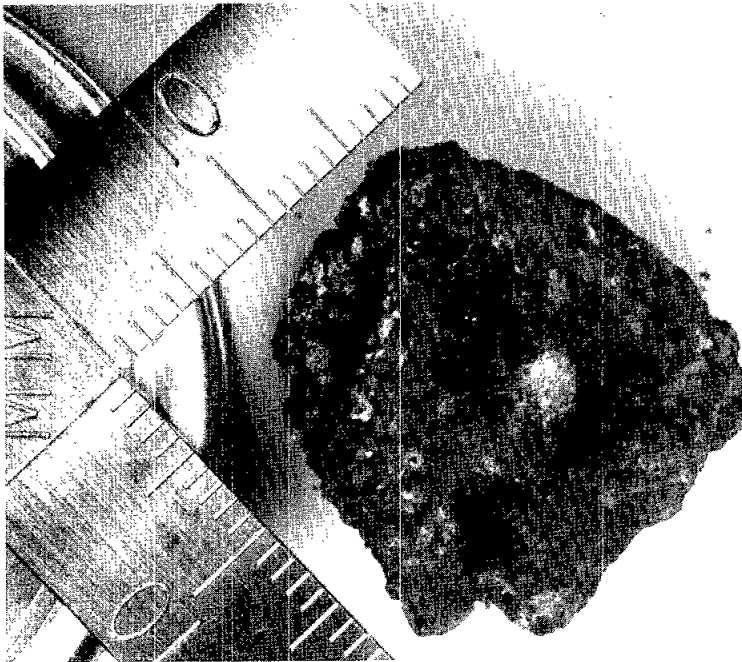
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	Light gray	80				Very fine-grained
Clast	White	20	Angular		0-2	Very fine-grained

Special Features: Can be described as matrix with one group of clasts. Fractures at matrix-clast boundaries. Clasts may be anorthosite.

67727



67728



Generic No.: 67727
Rock Type: Breccia, vesicular,
polymict

Weight (g): 1.80
Dimensions (cm): 1 x 1 x .75
Color (fresh): Dark gray - white
Shape: Irregular
Variability: Dark with white clasts
Coherence: intergranular - coherent
fracturing - fractured
Fabric/texture: Breccia plagioclase clasts
Cavities (%): Vesicles
Surface: Irregular
Zap pits: Present about 10

<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	80				Partly glassy & vesicular
Clasts	White	20	Irreg		0-.6	Polymict

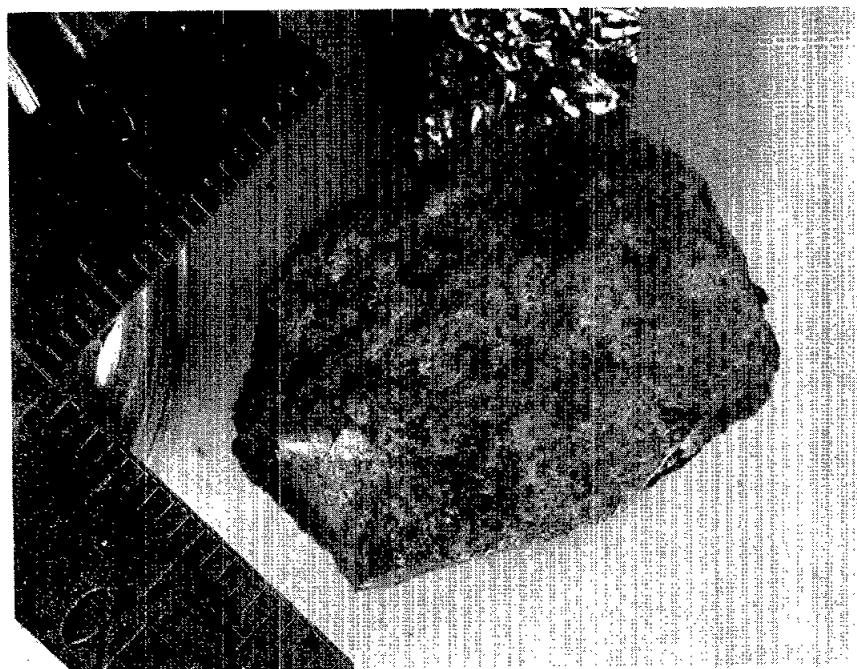
Generic No.: 67728
Rock Type: Breccia, vesicular,
polymict

Weight (g): 9.25
Dimensions (cm): 2 x 2 x 1.5
Color (fresh): Gray/white
Shape: Irregular
Variability: Very variable
Coherence: intergranular - moderate
fracturing - present
Fabric/texture: Polymict breccia partly glass-vesicular
Cavities (%): Very irregular
Surface: Very irregular
Zap pits: Present
Special Features: Complex polymict breccia - partly fused. Probably several types of clasts. Detailed classification impossible.

67729



67735



Generic No.: 67729
Rock Type: Breccia, vesicular,
polymict

Weight (g): 73.2
Dimensions (cm): 5 x 3.5 x 3.5
Color (fresh): Dark gray with white inclusions
Shape: Irregular
Variability: White inclusions in dark matrix, partly glass surface
Coherence: intergranular - coherent
fracturing - highly fractured with pieces falling off.
Fabric/texture: Complex
Cavities (%): Many vesicles
Surface: Very irregular
Zap pits: Many 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	Dark gray	90				
Clast	Whitish	10	Irreg	10	1-25	Assumed to be one population

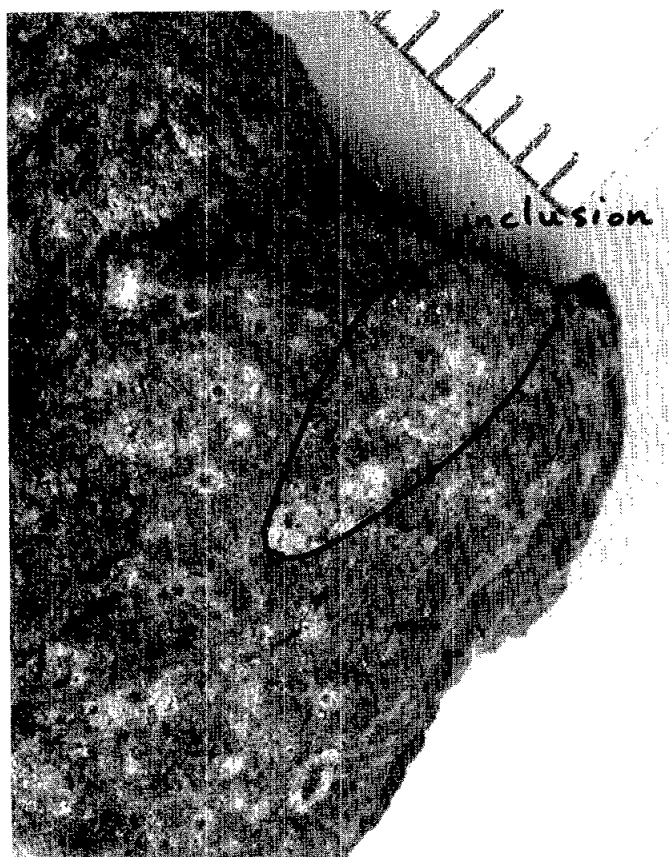
Special Features: Several clasts greater than one cm and whitish in color should be considered separately. Largest clast has yellowish-green crystals in fine whitish matrix. Most probably this is a porphyritic basalt. Possibly other clasts are same material but are not sure. Matrix is fine grained and complex.

NOTE: Thin section should cross matrix-clast boundary

Generic No.: 67735
Rock Type: Breccia, metamorphosed

Weight (g): 13.3
Dimensions (cm): 2.5 x 2 x 1.75
Color (fresh): Variable gray
Shape: Subangular
Variability: Variable coating
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained crystalline
Cavities (%): None
Surface: Almost all surface coated with material of white to dark gray reflectance. Coating glass on one corner. One corner broken away by fracturing.
Zap pits: None
Special Features: Casual study might identify as basalt, but distribution of texture on fracture surface including two rounded areas of reflection suggests strongly annealed breccia approaching basaltic texture. Needs thin section. Fractured surface shows white powdery clast.

67736
ENLARGEMENT



67736



Generic No.: 67736

Rock Type: Basalt, olivine
with ultrabasic inclusion

Weight (g): 14.92

Dimensions (cm): 3 x 2 x 1

Color (fresh): Dark gray

Shape: Irregular

Variability: Homogeneous

Coherence: intergranular - very tough
fracturing - absent

Fabric/texture: Fine-grained

Cavities (%): Vesicles with euhedral iron crystals projecting
into them; 1 mm or smaller; 2% by volume

Surface: Smooth except for zap pits on all surfaces

Zap pits: Common 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>	
<u>AREA 1 - 15 square mm across</u>						
Olivine	Yellow	49	Equant		0-0.5	
Plagioclase	White	49	Equant		0-0.5	
Spinel	Burgundy	2	Irreg		0-0.5	
<u>REMAINDER</u>						
Olivine	Yellow	5	Irreg		0-0.2	
Plagioclase	White	50	Irreg		0-0.2	
Pyroxene	Gray	45	Irreg		0-0.2	

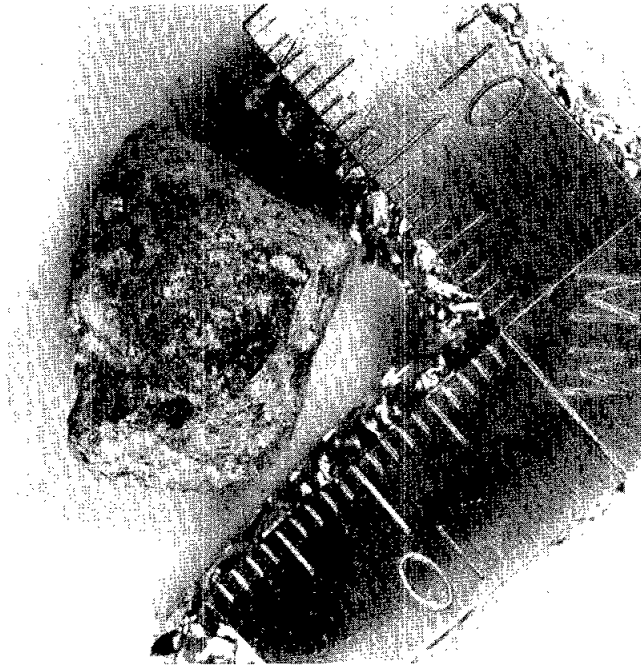
Special Features: The individual crystals, especially of red mineral, should be examined by x-rays. Concentration of minerals varies across specimen. Burgundy mineral occurs with yellow mineral. Metal grains projecting into cavities have cubo-octahedral shape and luster, consistent with iron. The crystals are shiny with no evidence of rust.

Area 1 - Appears to be olivine-plagioclase spinel, and seems to be a xenolith of ultrabasic character. Hence it is extremely important and must be studied in detail. Some mineral grains must be removed before making thin section. About 5% of fragment.

Remainder - About 95% of rock is olivine basalt.

See special photographs for detail of inclusion.

67737



67738



Generic No.: 67737

Rock Type: Basalt

Weight (g): 4.56

Dimensions (cm): 1-1/2 x 1-1/4 x 1-1/2

Color (fresh): Gray

Shape: Angular

Variability: None

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Fine-grained

Cavities (%): None

Surface: Fractured surfaces, white coating on most 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>	
Basalt		100				Too fine grained to identify minerals
Coating	White					Contains mineral fragments, greenish & reddish crystals

Generic No.: 67738

Rock Type: Basalt

Weight (g): 5.84

Dimensions (cm): 2 x 1.75 x 1.5

Color (fresh): Dark gray

Shape: Subangular

Variability: Uniform

Coherence: intergranular - coherent
fracturing - present

Fabric/texture: Very fine-grained basaltic

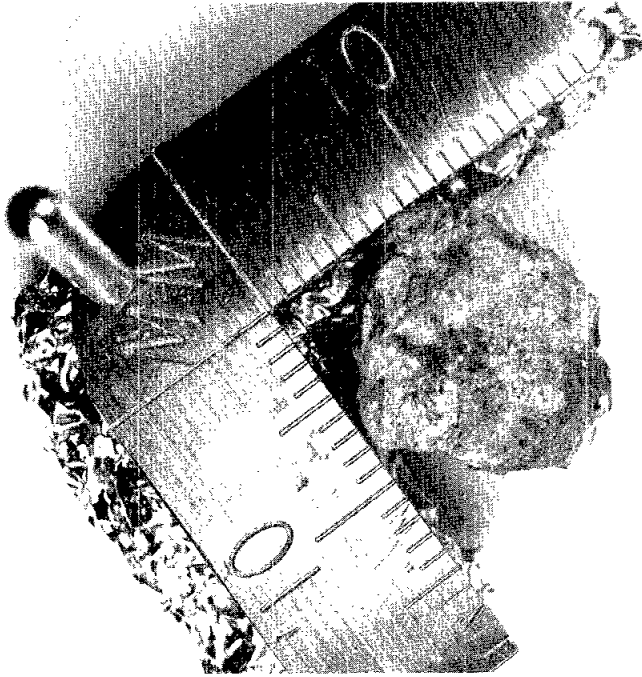
Cavities (%): None

Surface: Fracture surface shows basaltic texture. Remaining surface coated with powders of different colors.

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	60		.2		Phenocrysts?
Pyroxene	Gray	40	Irreg			
Ilmenite	Black	2	Irreg			

67739



67745



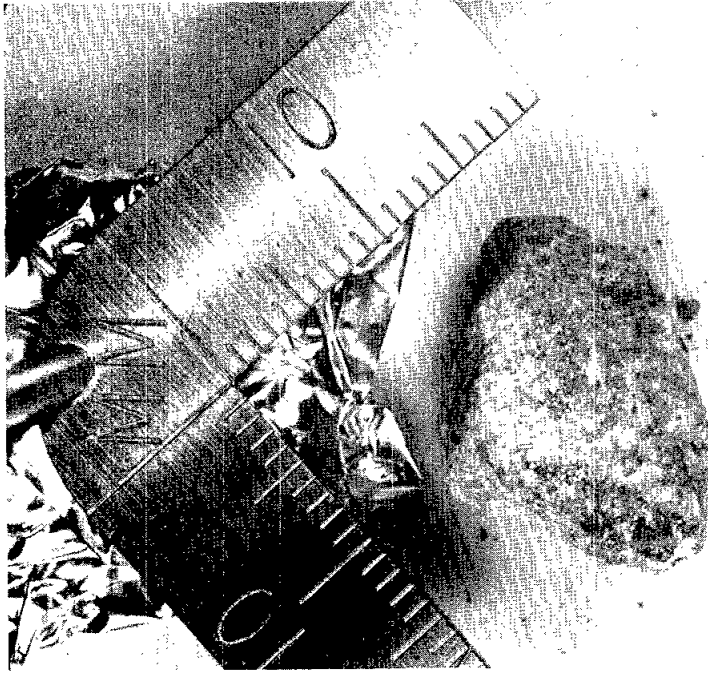
Generic No.: 67739
Rock Type: Breccia, annealed?

Weight (g): 2.03
Dimensions (cm): 1 x 1 x 1
Color (fresh): Light gray
Shape: Subrounded
Variability: Mostly homogeneous
Coherence: intergranular - tough
fracturing - several fractures
Fabric/texture: Fine-grained
Cavities (%): None
Surface: Fairly smooth
Zap pits: None
Special Features: The larger fragments are clear with good cleavages and angular shape; presumably plagioclase grains from breccia. Rather puzzling because at casual glance it might be taken to be basalt.

Generic No.: 67745
Rock Type: Basalt

Weight (g): 3.53
Dimensions (cm): 2 x 1.5 x 1
Color (fresh): White/gray variable
Shape: Irregular
Variability: See "Special Features"
Coherence: intergranular - tough
fracturing - none
Fabric/texture: Equigranular on fresh surfaces
Cavities (%): None
Surface: See "Special Features"
Zap pits: None
Special Features: ~98% of surface covered with powders. Tiny area (3 mm across) appears to be basalt coarser than others in suite (about 0.2 mm). However, color contrast is so poor that identification of individual minerals is uncertain.

67746



67747



Generic No.: 67746

Rock Type: Norite?

Weight (g): 3.47

Dimensions (cm): 2 x 1 x .75

Color (fresh): Light gray (mottled)

Shape: Irregular

Variability: Uniform

Coherence: intergranular - coherent
fracturing - one fractured surface

Fabric/texture: Sugary

Cavities (%): None

Surface: Irregular - white powder on all surfaces except one fracture surface.

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>	
White grains	White	30	Irreg	.2		Plagioclase
Yellow grains	Yellow	70	Irreg	.5	.2-.5	Olivine + orthopyroxene
Dark specks	Black			.05		Spinel?

Generic No.: 67747

Rock Type: Troctolite?

Weight (g): 6.30

Color (fresh): Medium gray

Shape: Subrounded

Variability: Homogeneous, crystalline

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Coarse, crystalline

Cavities (%): Two small cavities, may be vesicles

Surface: Smooth

Zap pits: Present on one side, 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>	
Olivine?	Yellow green	45	Inter-granular Irreg		0-.2	Matrix
Plagioclase	White	45	Lath-shaped		0-2	Phenocrysts & matrix
Pyroxene?	Gray	10	Irreg Inter-granular		0-.2	Matrix

67748



67749



Special Features: Two pieces: 1-3/4 x 1-1/2 x 1-1/2, 3/4 x 3/4 x 1/2. Same material, description applies to larger. Yellow mineral is identified tentatively as olivine. No opaque mineral seen. Plagioclase phenocrysts are stubby laths 2 mm across. Ground-mass crystals tend to be laths up to 2 mm.

Generic No.: 67748

Rock Type: Breccia, polymict,
metamorphosed

Weight (g): 4.74

Dimensions (cm): 2.5 x 2 x .5

Color (fresh): Gray with brownish tinge

Shape: Irregular

Variability: Variable

Coherence: intergranular - coherent
fracturing - present

Fabric/texture: Fine-grained, veins may be present

Cavities (%): None

Surface: Varies - white powdery film on surface.

Zap pits: None

Special Features: Not possible to divide into components. Polymict breccia with veining suggesting shock. Fine-grained brownish tinge is possibly indicative of thermal metamorphic effects.

Generic No.: 67749

Rock Type: Breccia, polymict

Weight (g): 11.47

Dimensions (cm): 2.5 x 2.5 x 1.5

Color (fresh): White to light gray

Shape: Irregular

Variability: See "Special Features"

Coherence: intergranular - moderate
fracturing - many closely spaced features

Fabric/texture: Complex

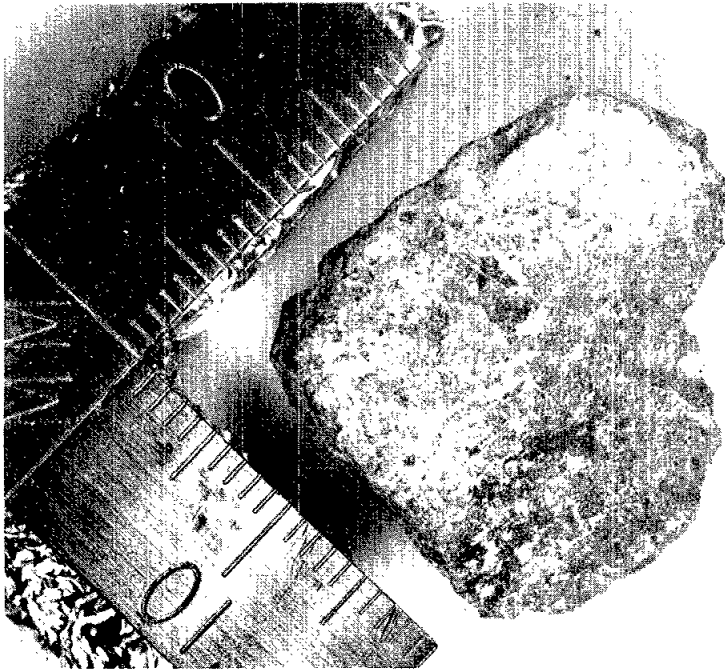
Cavities (%): None

Surface: Irregular

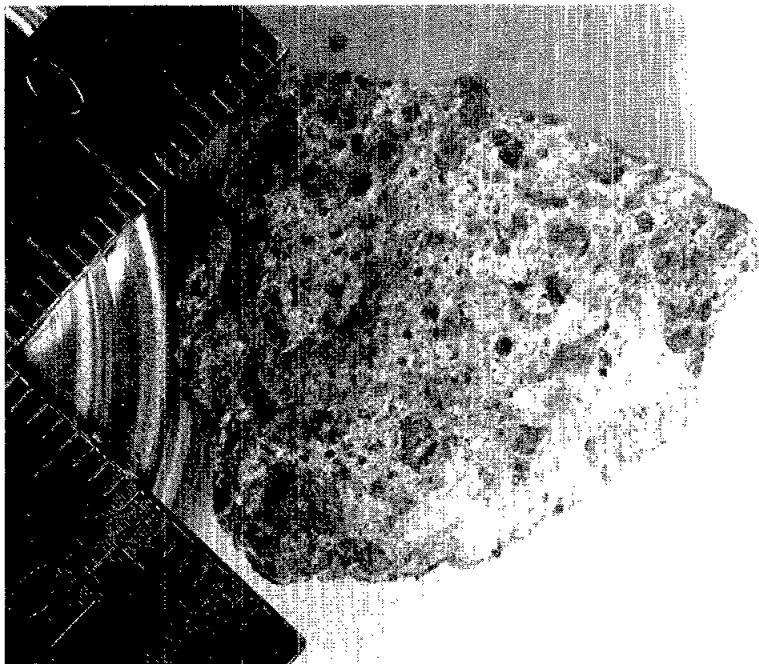
Zap pits: Many on all surfaces but one

Special Features: Color varies from white to light gray over most of specimen. Possibly resulting from variable shock of one rock type. Near one corner there are several clasts with definite different mineralogy including cinnamon colored mineral, presumably pyroxene. Several fragments of one rock type composed of plagioclase-cinnamon colored mineral (probably pyroxene) - opaque (ilmenite). Most likely more basalt. Suggest cutting serial sections.

67755



67756



Generic No.: 67755

Rock Type: Breccia, polymict ?

Weight (g): 3.53

Dimensions (cm): 1.25 x 1 x 1

Color (fresh): White to gray

Shape: Irregular

Variability: Very variable

Coherence: intergranular - moderate
fracturing - yes

Fabric/texture: Polymict breccia

Cavities (%): None

Surface: Irregular - texture varies with composition

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>	
Crystalline	Light gray	50	Irreg			Plagioclase- pyroxene
Breccia	Variable	50	Irreg			Several components

Special Features: Complex polymict breccia with one component dominant.
This may represent a former crystalline rock.

Generic No.: 67756

Rock Type: Breccia, polymict,
anorthositic

Weight (g): 4.82

Dimensions (cm): 1.5 x 1.5 x 1.5

Color (fresh): Whitish with gray inclusions

Shape: Subangular

Variability: Whitish matrix with dark inclusions

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Granular to powdery matrix with dark inclusions

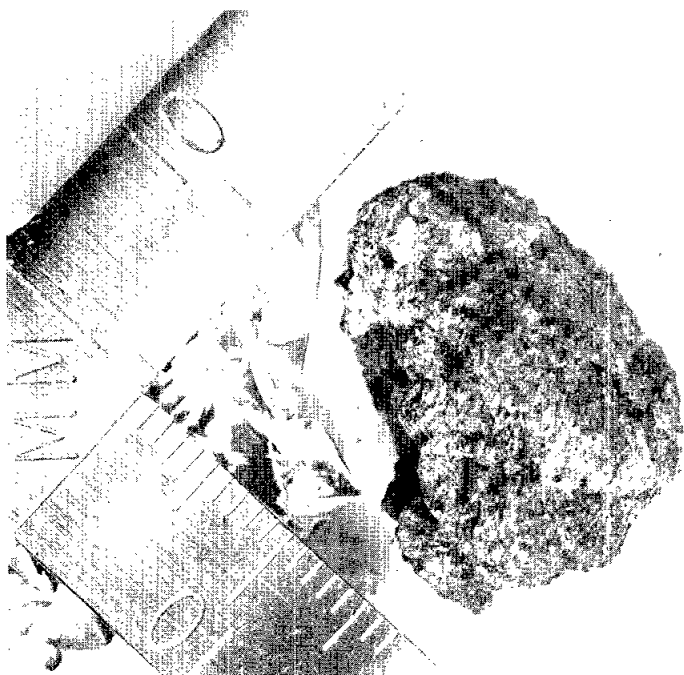
Cavities (%): None

Surface: See "Special Features"

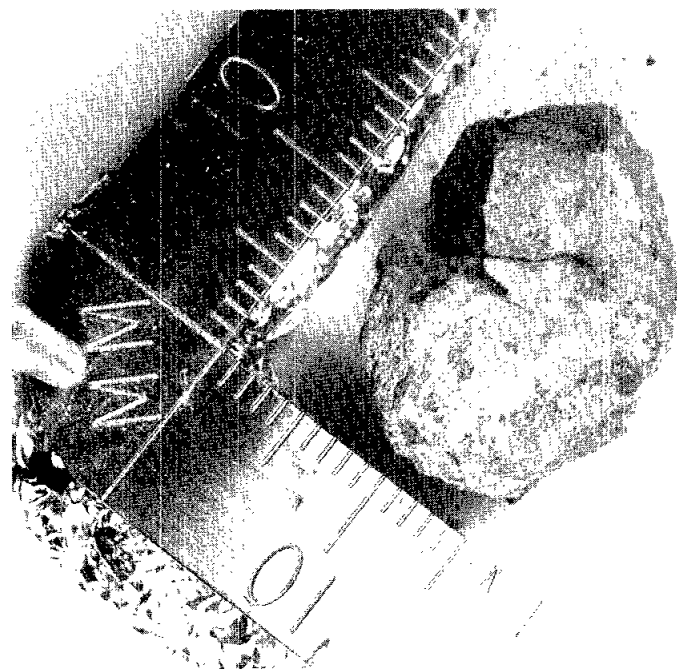
Zap pits: None

Special Features: Probably like the friable breccias of polymict anor-
thositic type except that this one is coherent. Clear crystals of
plagioclase can be easily seen in the white powder together with
dark clasts 0.2 mm across. Occasional grains of other minerals
(yellow or brown) are visible.

67757



67758



Generic No.: 67757

Rock Type: Basalt, shocked ?

Weight (g): 4.83

Dimensions (cm): 2 x 1 x 2

Color (fresh): Dark gray

Shape: Irregular

Variability: Homogeneous

Coherence: intergranular - tough
fracturing - healed fractures

Fabric/texture: Granular, deformed

Cavities (%): None

Surface: Rough, granulated

Zap pits: Few occur on one side

Special Features: Appears to be basalt shocked and veined. Might be polymict breccia. A vein cuts across center of specimen 1 to 1/2 mm wide, planar.

Generic No.: 67758

Rock Type: Breccia, polymict,
recrystallized

Weight (g): 4.06

Dimensions (cm): 2 x 1.5 x .5

Color (fresh): Variable white to gray

Shape: Irregular

Variability: See "Special Features"

Coherence: intergranular - coherent
fracturing - fractured

Fabric/texture: See "Special Features"

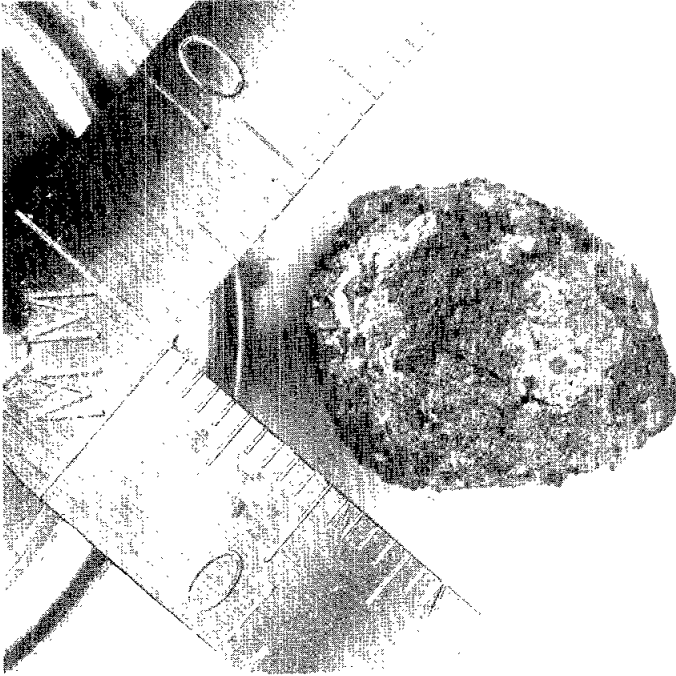
Cavities (%): None

Surface: See "Special Features"

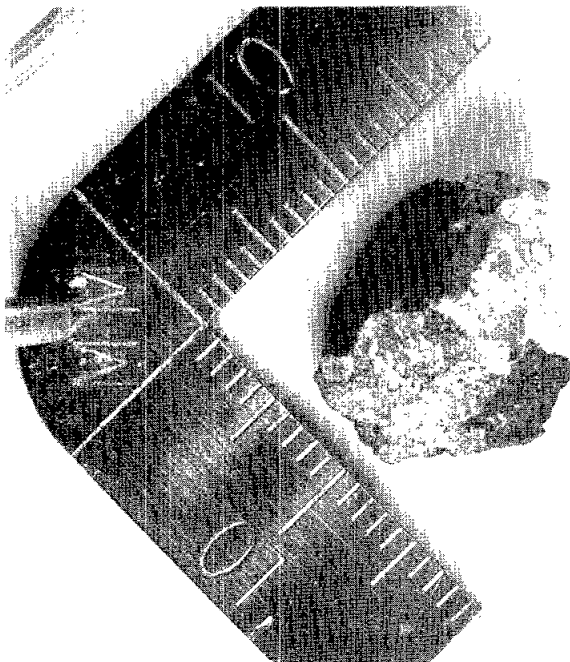
Zap pits: None

Special Features: Mostly covered by powders of different colors. Small fracture surface shows fine-grained texture suggesting recrystallized polymict breccia, but majority of specimen not available for description. Components of breccia probably obscured by recrystallization.

67759



67765



Generic No.: 67759

Rock Type: Breccia, polymict

Weight (g): 4.56

Dimensions (cm): 2 x 1-1/2 x 1-1/2

Color (fresh): Mottled gray

Shape: Subrounded

Variability: Homogeneous to naked eye, but heterogeneous in microscope

Coherence: intergranular - moderate
fracturing - present

Cavities (%): Inter-granular cavities

Fabric/texture: See "Special Features"

Surface: Moderately rough

Zap pits: Present over two-thirds: common

<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	25				Very fine- grained
Dark	Dark gray	75	Sub- rounded		0-3	Mainly plagioclase

Special Features: Not compact, granular grains cemented by whitish matrix. Grains mostly plagioclase. Numerous metal cubes on surfaces. One metal grain is a wire 1 mm long: looks like a whisker.

Generic No.: 67765

Rock Type: Breccia, polymict,
metamorphosed

Weight (g): 1.73

Dimensions (cm): 1-1/4 x 1-1/4 x 1

Color (fresh): Dark gray

Shape: Angular

Variability: Homogeneous to naked eye

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: Fine-grained

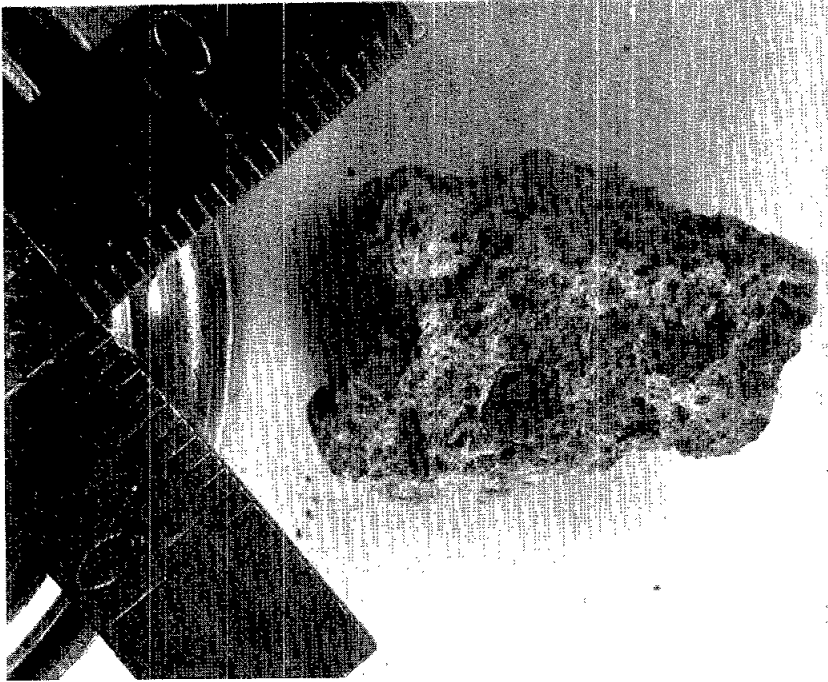
Cavities (%): None

Surface: White coating on one-third of surface

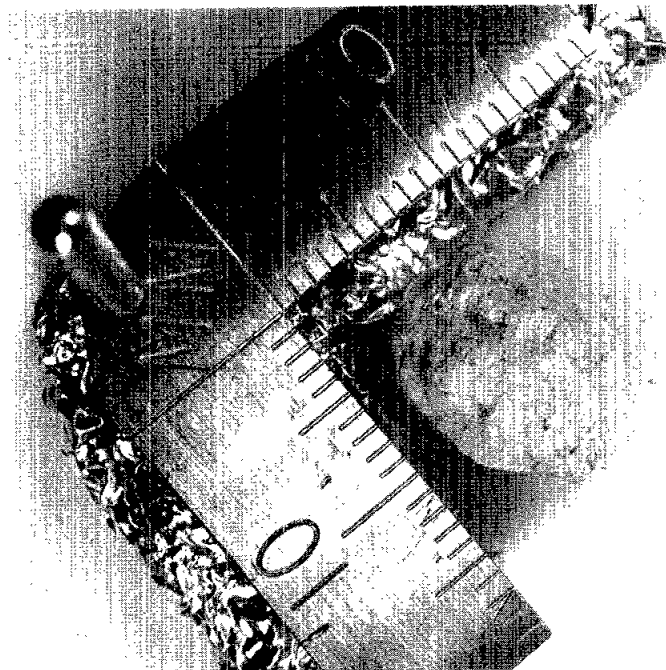
Zap pits: None

Special Features: Tough, dark breccia with white coating about 1 mm thick. Breccia has color variation but it is not possible to distinguish matrix and clasts. Large plagioclase grains up to 1 mm are present. Perhaps derived mostly from a single crystalline rock.

67766



67767



Generic No.: 67766

Rock Type: Breccia, metamorphosed?

Weight (g): 5.47

Dimensions (cm): 3 x 2 x 1-1/2

Color (fresh): Mottled gray to white

Shape: Angular

Variability: Somewhat variable matrix plus clasts

Coherence: intergranular - coherent

fracturing - some fractures in clasts

Fabric/texture: Matrix is fine-grained; some clasts are single grains

Cavities (%): None

Surface: No fresh surfaces except for one tiny area.

Zap pits: Many on all faces

Special Features: Because of surface coating, not feasible to distinguish components accurately. Probably an annealed breccia.

Generic No.: 67767

Rock Type: Breccia, anorthositic

Weight (g): 1.67

Dimensions (cm): 1 x 1 x 1

Color (fresh): White

Shape: Subrounded

Variability: Homogeneous

Coherence: intergranular - friable

fracturing - none

Fabric/texture: Very fine-grained, homogeneous

Cavities (%): None

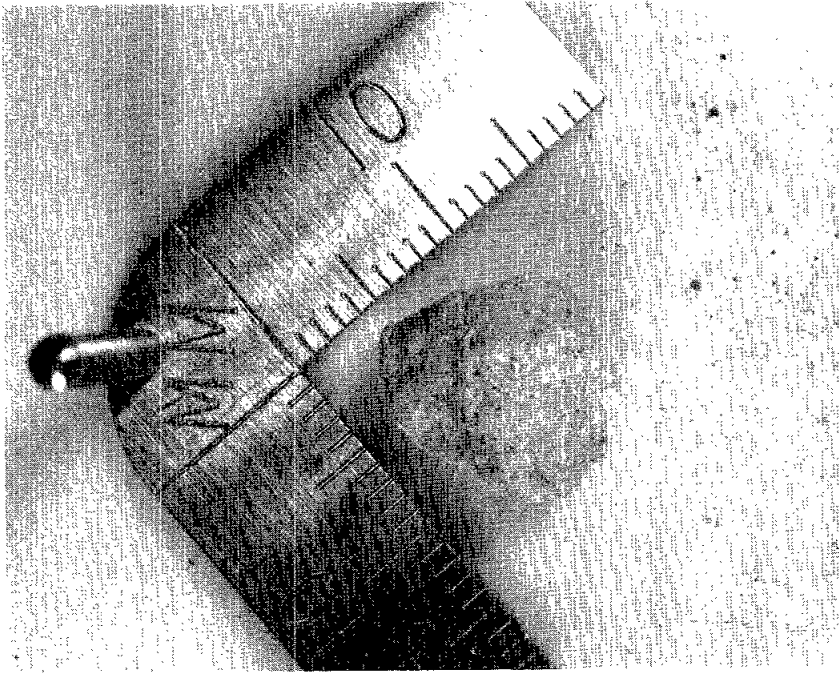
Surface: Smooth powdery

Zap pits: None

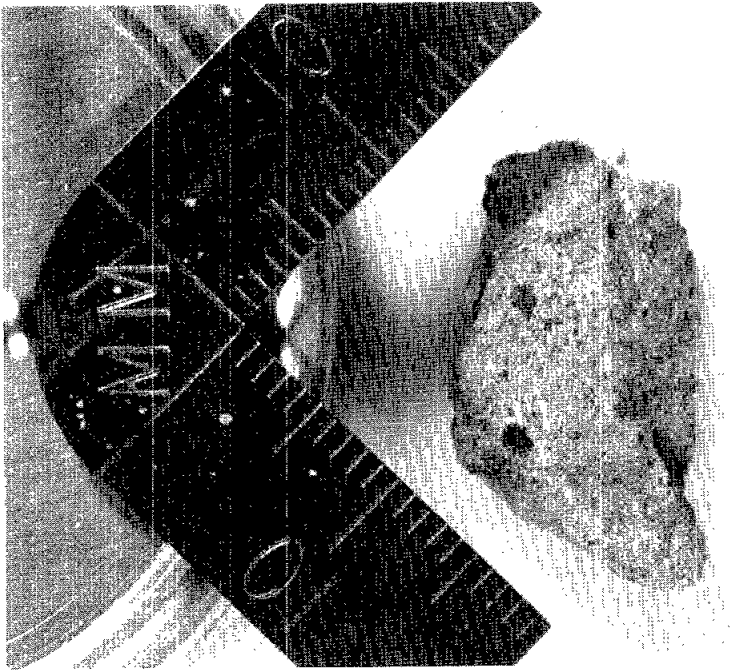
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Matrix	White	98				Very fine-grained: plagioclase
Mineral grains	Yellow to gray	2				Miscellaneous mineral grains

Special Features: Shocked anorthosite similar to many other specimens.

67768



67769



Generic No.: 67768
Rock Type: Breccia, anorthositic

Weight (g): .99
Dimensions (cm): 1 x 1 x 1
Color (fresh): White powdery; gray inclusions
Shape: Subrounded
Variability: Mostly white powder
Coherence: intergranular - friable
 fracturing - none
Fabric/texture: White powder + darker protrusions
Cavities (%): None
Surface: White powdery surface with crystals and dark pieces
Zap pits: None
Special Features: Probably heavily shocked anorthosite.

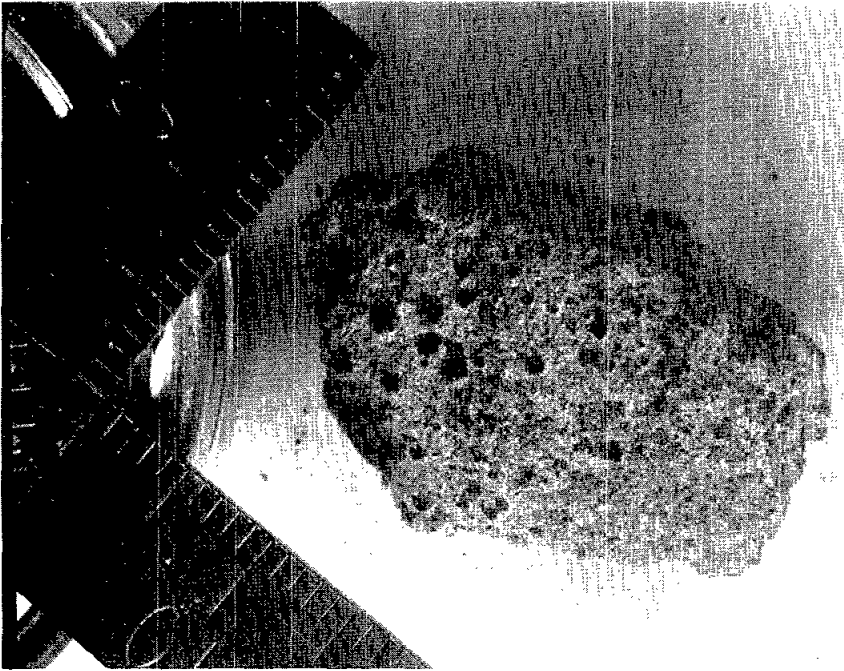
Generic No.: 67769
Rock Type: Breccia, monomict,
 troctolite?

Weight (g): 3.05
Dimensions (cm): 2 x 1 x 3/4
Color (fresh): Light gray
Shape: Angular
Variability: Homogeneous
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Planar features very fine-grained
Cavities (%): None
Surface: Smooth
Zap pits: 40

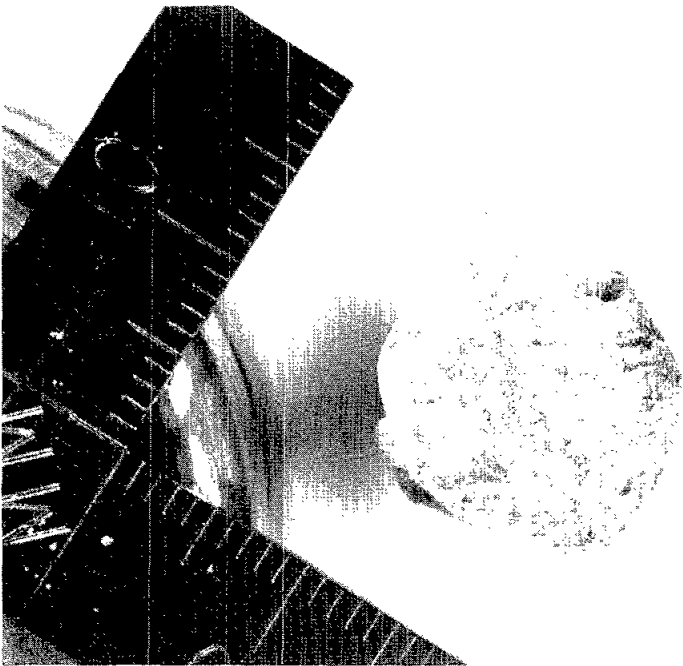
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Rock	Light gray	~100				

Special Features: Appears to be monomict breccia. Identification of minerals confused by shock features. Probably large plagioclase crystals broken down to white powdery material. Probably pyroxene appears as gray mineral but no definite identification. About 2% of rock consists of black flakes possibly ilmenite. Two yellow grains (1/2 mm) were seen and are probably olivine. Red, brown spots are probably rust but might be spinel.

67775



67776



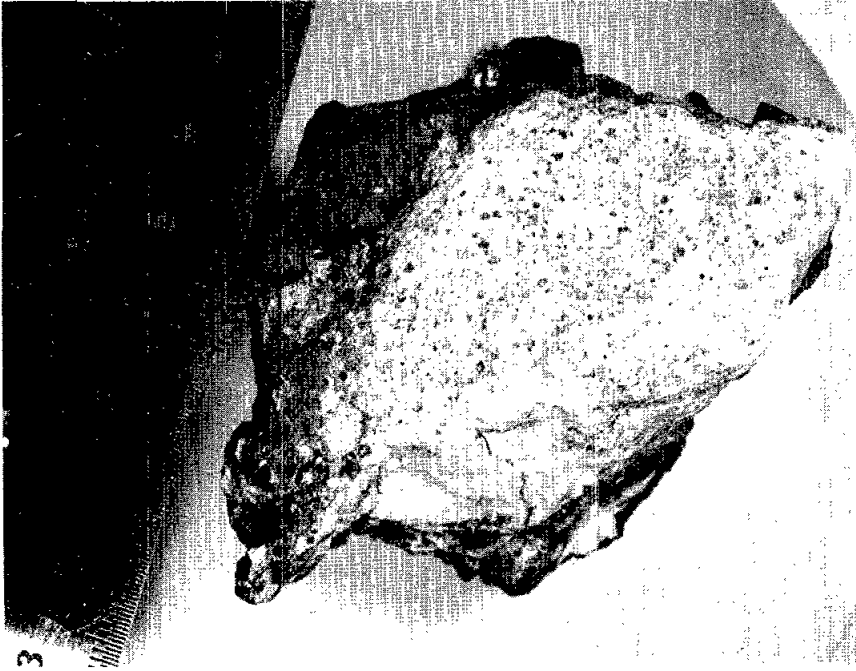
Generic No.: 67775
Rock Type: Breccia ?,
metamorphosed

Weight (g): 6.58
Dimensions (cm): 3 x 1-1/2 x 1
Color (fresh): Brownish gray
Shape: Angular
Variability: Homogeneous except for clast
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained
Cavities (%): None
Surface: Rough
Zap pits: Many on all faces
Special Features: Difficult to identify because no fresh surfaces:
probably complex annealed breccia. Unwise to make distinction
between matrix and clast; requires thin section.

Generic No.: 67776
Rock Type: Breccia, polymict ?,
anorthositic ?

Weight (g): 3.10
Dimensions (cm): 1 x 1 x 1
Color (fresh): White
Shape: Rounded
Variability: Homogeneous
Coherence: intergranular - friable
fracturing - none
Fabric/texture: Fine-grained, dusty
Cavities (%): None
Surface: Smooth
Zap pits: None
Special Features: Almost 1% of dark clasts ranging up to 1 mm. One
rust spot on surface. Probably mostly anorthosite with occasional
basaltic or breccia clasts.

68515



68516



Generic No.: 68515
Rock Type: Breccia, polymict
with coating glass

Weight (g): 236.1
Color (fresh): Dark gray
Shape: Very irregular
Variability: Breccia is fairly homogeneous
Coherence: intergranular - tough
fracturing - none
Fabric/texture: Fine-grained, no clasts
Cavities (%): None in breccia
Surface: White coating on breccia. Thick coating of vesicular glass on breccia
Zap pits: Present, few on most surfaces
Special Features: 5 pieces: one very large 9 x 9 x 10; others 3 x 4 x 2, 1/2 x 3/4 x 3, 1 x 1 x 1/2, 1/4 x 1/4 x 1/4. Description for largest piece. Appears to be polymict breccia with extensive black vesicular glass as thick coating. Detailed description applies to breccia. Breccia is very fine-grained without clasts; probably annealed soils, plus sharp boundaries to glass. Breccia rather shiny and may be slightly vitrified.

Generic No.: 68516
Rock Type: Basalt, partly
vitrified

Weight (g): 34.04
Dimensions (cm): 4-1/2 x 3-1/2 x 2
Color (fresh): Dark gray to black
Shape: Irregular
Variability: Glassy to basaltic
Coherence: intergranular - coherent
fracturing - several fractures
Fabric/texture: Fine-grained glassy, basalt-glass has sharp boundaries.
Cavities (%): None
Surface: Very rough; some parts glassy with white clasts
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>	
Basalt	Black	50	Irreg	20		Too fine-grained for identification. Megacrysts of plagioclase
Glass	Dark gray	40	Irreg			
Clasts	White	10	Irreg	0.5	0-2	

68517



68518



Special Features: Probably partly-vitrified basalt; could be classed as breccia. Boundaries between basalt and glass are sharp but irregular. One white patch in glass consists of equal mixture of whitish and yellowish crystals (1/10 mm). These were not derived from basalt. Rock is probably complex breccia with large piece of basalt and smaller fragments of basalt associated with other assemblages.

NOTE: Thin sections should be cut to include both assemblages.

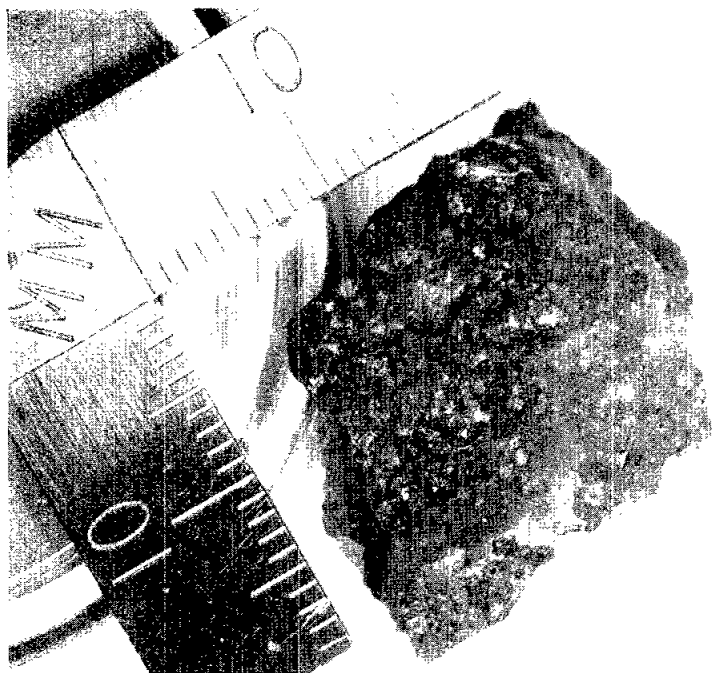
Generic No.: 68517
Rock Type: Breccia, polymict,
vesicular

Weight (g): 13.13
Dimensions (cm): 3 x 2 x 1.5
Color (fresh): Dark gray to white
Shape: Irregular
Variability: Very variable
Coherence: intergranular - moderate
fracturing - many fractures
Fabric/texture: Complex
Cavities (%): Many vesicles on surface
Surface: 3/4 covered by greenish vesicular glass. Rest shows polymict breccia.
Zap pits: None
Special Features: Polymict breccia containing white to gray components mostly covered by greenish vesicular glass, presumably derived from surface melting of breccia. The glass is complex presumably because of different degrees of melting of polymict breccia.

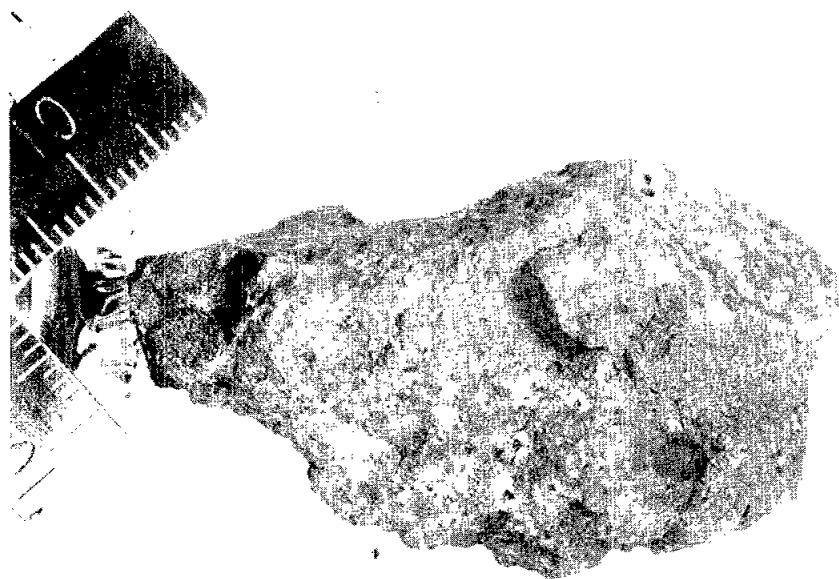
Generic No.: 68518
Rock Type: Cinder

Weight (g): 29.82
Dimensions (cm): 4 x 3.5 x 2.5
Special Features: See 67628 (similar). Probably same population with different percent of clasts. No detailed description given.

68519



68525



Generic No.: 68519
Rock Type: Basalt, partly
vitrified

Weight (g): 10.56
Dimensions (cm): 3 x 2 x 1-1/2
Color (fresh): Medium gray to black
Shape: Subangular
Variability: Glassy to basaltic
Coherence: intergranular - coherent
fracturing - no
Fabric/texture: Fine-grained to glassy
Cavities (%): Greenish glass in basaltic part
Surface: Greenish glass on one face: fracture surfaces on basaltic
surfaces.
Zap pits: Many - not 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>	
Basalt	Dark gray	70				Too fine- grained for mineral iden- tification
Glass	Black	30				

Special Features: Plagioclase phenocrysts in basalt or these may be
result of thermal metamorphism giving appearances of porphyritic
basalt.

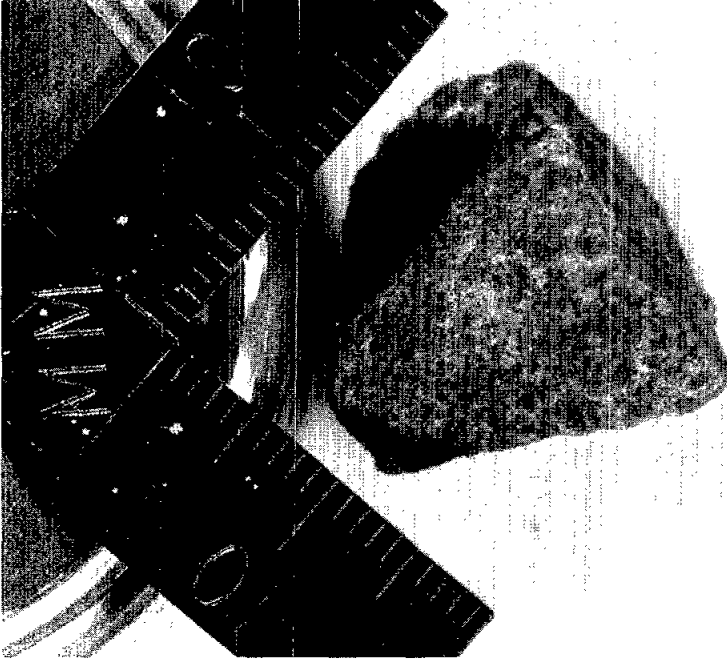
Generic No.: 68525
Rock Type: Basalt, vesicular

Weight (g): 38.96
Dimensions (cm): 7 x 4 x 2
Color (fresh): Dark gray
Shape: Angular
Variability: Homogeneous
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Fine-grained uniform
Cavities (%): Small vesicles about 2%
Surface: One fracture surface and one exposed surface
Zap pits: Many on exposed 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	40	Inreg		0-0.5	
Pyroxene	Gray	55	Inreg		0-0.5	
Olivine	Yellow	5	Rounded		0-0.5	

Special Features: Basalt with uniform texture. No opaque mineral seen.

68526



68527



Generic No.: 68526
Rock Type: Basalt ?

Weight (g): 7.21
Dimensions (cm): 2 x 1-1/2 x 1-1/2
Color (fresh): Gray with brownish tinge
Shape: Angular
Variability: None
Coherence: intergranular - coherent
 fracturing - two fractures
Fabric/texture: Very fine-grained
Cavities (%): One cavity 1 mm across - probably vesicular
Surface: Smooth
Zap pits: Present on one corner
Special Features: Similar to 67615. Probably crystalline rock but texture is puzzling; possibly modified by shock giving brownish tinge. Possibly shocked basalt.

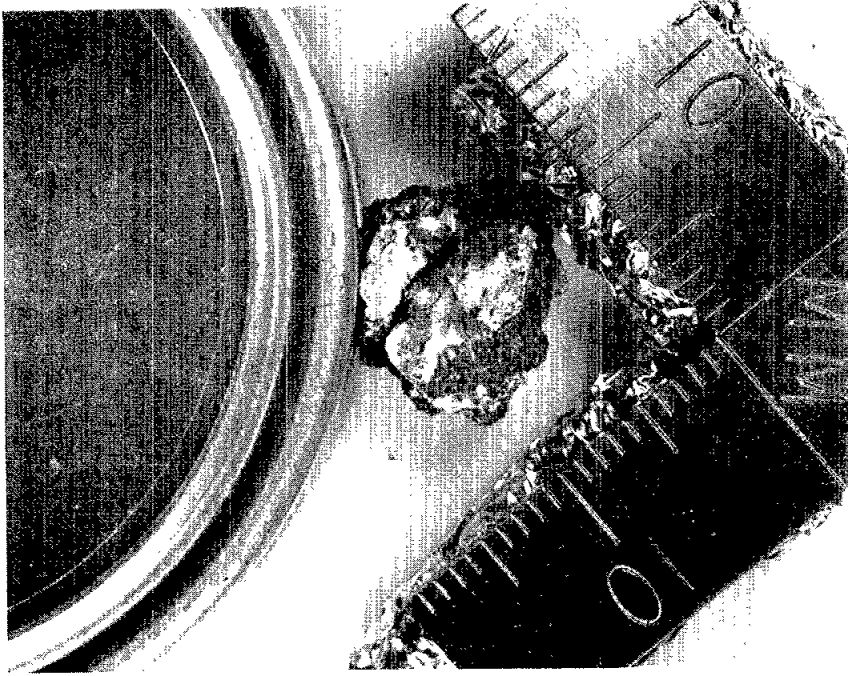
Generic No.: 68527
Rock Type: Basalt, porphyritic

Weight (g): 3.03
Dimensions (cm): 1.75 x 1.25 x 1.25
Color (fresh): Light gray
Shape: Irregular
Variability: None
Coherence: intergranular - coherent
 fracturing - none
Fabric/texture: Porphyritic
Cavities (%): None
Surface: Mostly fracture surfaces. One surface with powder.
Zap pits: Present - but few

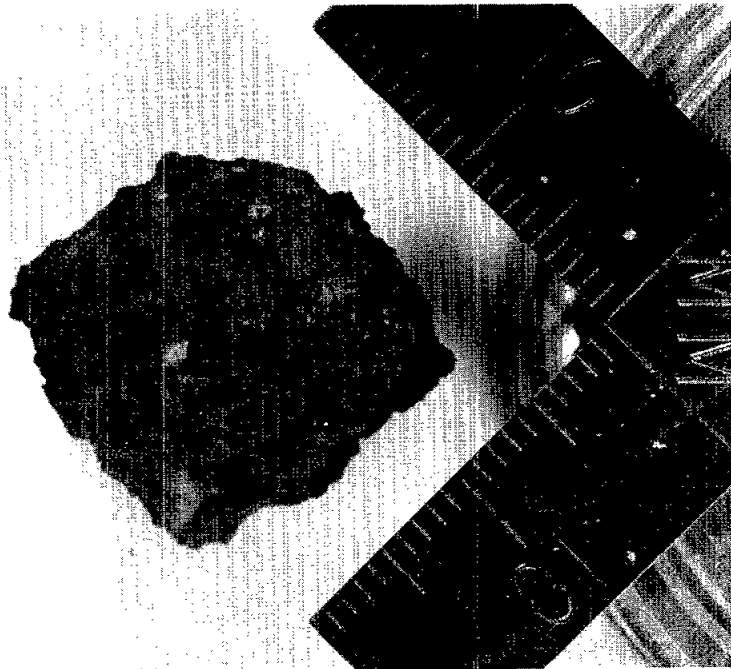
<u>Component</u>	<u>Color</u>	<u>% of Rock</u>	<u>Shape</u>	<u>Size (mm)</u>		<u>Comments</u>
				<u>Dom.</u>	<u>Range</u>	
Plagioclase	White	50				Phenocrysts + ground-mass
Pyroxene	Gray	50	Irreg			Ground-mass

Special Features: Plagioclase prisms - .2 mm. Ground-mass size unknown.

68528



68529



Generic No.: 68528
Rock Type: Breccia, vesicular,
polymict

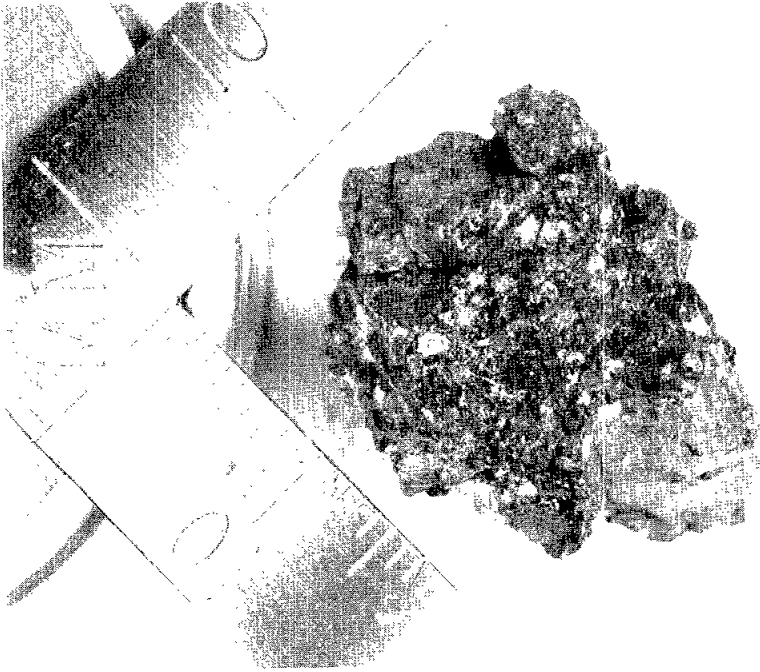
Weight (g): 1.08
Dimensions (cm): 1 x 1 x 1
Color (fresh): Dark gray to white
Shape: Irregular
Variability: Very variable
Coherence: intergranular - moderate
fracturing - fracture
Fabric/texture: Complex
Cavities (%): Vesicles in dark component
Surface: Irregular
Zap pits: None
Special Features: Polymict breccia with dark vesicular component and white/light gray component. Second component is itself breccia. Rust spots in second component.

Generic No.: 68529
Rock Type: Cinder (vesicular
glass)

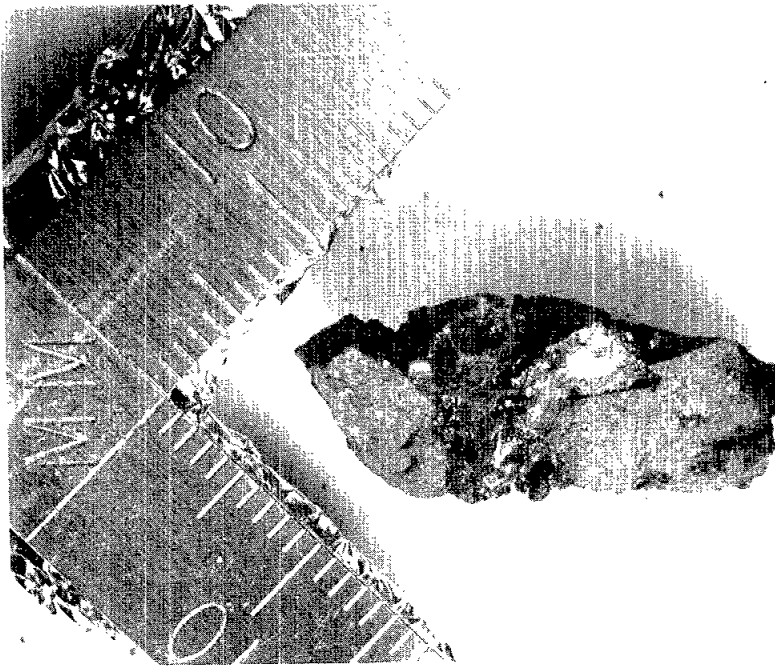
Weight (g): 7.03
Dimensions (cm): 2 x 2 x 1.5
Color (fresh): Dark
Shape: Irregular
Variability: Some clasts
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Irregular
Cavities (%): Vesicles
Surface: Partly glassy - glassy and vesicular powdery coating in places,
also coating glass.
Zap pits: Few on one corner.
Special Features: Very complex; probably breccia partly fused.

<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>	
Clasts	White	5	Irreg	0.5	0-3	Largest clast appears to be crystal with conchoidal fracture. Other clasts appear to be similar.

68535



68536



Generic No.: 68535
Rock Type: Basalt and
glass

Weight (g): 8.04
Dimensions (cm): 2-1/2 x 1-1/2 x 1-1/2
Color (fresh): Dark gray to black
Shape: Subrounded
Variability: Glassy and crystalline
Coherence: intergranular - coherent
fracturing - none
Fabric/texture: Glassy and fine-grained crystals
Cavities (%): Small vesicles in glass
Surface: Very irregular and rough
Zap pits: None
Special Features: Several pieces composing half of rock are fine-grained basalt. These are penetrated and cemented by glass containing smaller fragments of basalt and larger plagioclase crystals (up to 1 mm). Plagioclase not derived from basalt. Basalt appears fused at boundary with glass. Basalt is fine-grained.

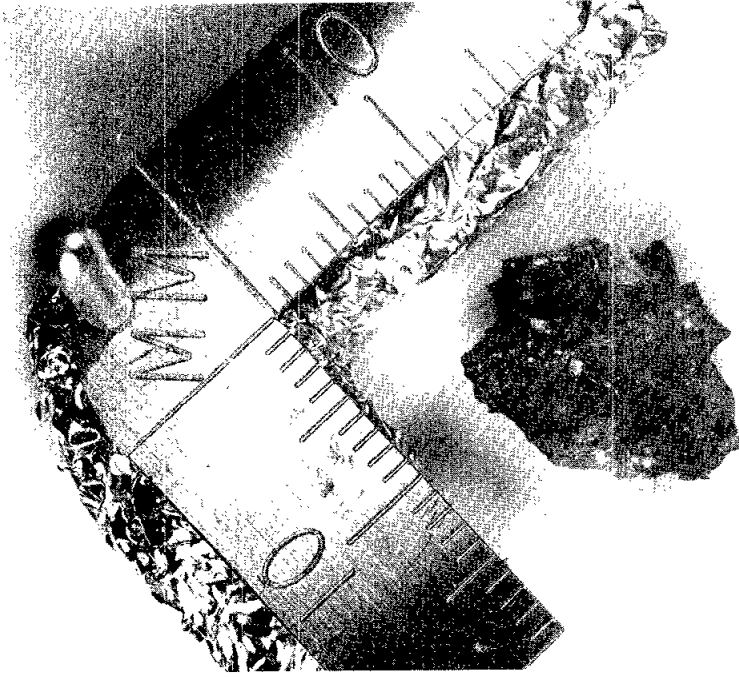
Generic No.: 68536
Rock Type: Basalt/vesicular
glass

Weight (g): 1.85
Dimensions (cm): 2 x 1 x .5
Color (fresh): Light to dark gray
Shape: Irregular
Variability: Very variable
Coherence: intergranular - coherent
fracturing - fractured
Fabric/texture: See "Special Features"
Cavities (%): Vesicles in glass portion, none in basalt
Surface: See "Special Features." One side fresh; one side coated with various powders.
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						All fine-grained.
Pyroxene						Proportions hard to de-
Opaque						fine. Possibly plagioclase dominant

Special Features: Mostly basalt (or high grade metamorphic) split by vein of dark vesicular glass. Basalt has rounded shiny areas up to 1 mm across whose nature is variable and unclear. One patch of brownish speckled material about .1 mm across is visible. Detailed description applies to basalt

68537



Generic No.: 68537

Rock Type: Breccia

Weight (g): 1.41

Dimensions (cm): 1-1/2 x 1 x 1

Color (fresh): Dark gray

Shape: Angular

Variability: Very variable

Coherence: intergranular - coherent
fracturing - none

Fabric/texture: See "Special Features"

Cavities (%): None

Surface: Very irregular, one face glassy

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>	
Basalt	Dark gray	50				
Coating glass	Variable	50				

Special Features: Probably basalt coated with glass containing white fragments. Glassy region contains transparent, vitreous inclusions - may be plagioclase.
