

# **METEORITES NEWS**

**JAPANESE COLLECTION OF ANTARCTIC METEORITES**



**Volume 5, Number 1**

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**Tokyo**



## INTRODUCTION

The Meteorites News, Japanese collections of Antarctic meteorites, Volume 5, Number 1 have been planned to be published for the purpose of informing scientists of the basic characteristics of the meteorite specimens in the Japanese Collections of Antarctic Meteorites. This issue constitutes the one of such news, and contains data sheets for a number of meteorites collected from the bare ice area near the Yamato Mountains by the Japanese Antarctic Research Expeditions in the 1980-1981, 1981-1982 and 1982-1983 field season.

The meteorites news has been prepared by the Department of Antarctic Meteorites, National Institute of Polar Research (NIPR), Tokyo. We are indebted to Dr. Andrew L. Graham of British Museum Natural History for his discussions and review of our descriptions. Copies of sample request form and regulation are enclosed in this issue. Requests for Antarctic meteorite samples for scientific research are welcome from all qualified scientists in the world.

## SAMPLE REQUESTS

The Committee on Antarctic Meteorites Research (Chairman; professor Tatsuro Matsuda, Director-General of National Institute of Polar Research) will meet irregularly for the purpose of reviewing requests for Antarctic meteorites.

Requests to samples should be sent to:

Keizo Yanai  
Curator of Meteorites  
Department of Antarctic Meteorites  
National Institute of Polar Research  
9-10, Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan

Telephone: Tokyo (03) 962-4711  
Cable Address: POLARESEARCH TOKYO  
Telex: 2723515 POLRSC J

## REQUIERMENTS AND PROCEDURES FOR ANTARCTIC METEORITES

### RESEARCH ON JAPANESE COLLECTIONS

Formal requests for Antarctic meteorite samples for scientific research and display should be submitted in writing along with the formal request form to Professor Tatsuro Matsuda, Director-General of National Institute of Polar Research, and chairman of the Committee on Antarctic Meteorite Research.

Requests are welcome from all qualified scientists in the world and will be reviewed and considered one or two times each year by the Committee on Antarctic Meteorite Research of the NIPR in Japan. Consortium-type sample requests may also be submitted. When your proposal is accepted by the committee, the requested samples will be allocate to you from the Curator of Meteorites, Department of Antarctic Meteorites of the NIPR.

### GUIDELINES OF SAMPLE ALLOCATION

1. Sample allocation may be limited under one gram for each sample.
2. Sample allocation may be under 10 samples for each scientists, because NIPR don't have enough man power and processing facilities to satisfy all requests.
3. All samples are provided as a lone.
4. In principle, under 10 grams meteorites should not be allocated.
5. Ten-fifty grams meteorites should be allocated within 10% of original mass (weight).
6. In a case of museum display, it may be provided on an exchange basis.
7. Sample requests should include detailed sample numbers, preferable weight and minimum weight requirements, sites (crust, outer part, inner part, central part, etc.), shape (powder, grains, fragments, chips, cubes, plates, thin section and polished thin section) etc.

### SAMPLE DISTRIBUTION

1. Samples for the accepted requests will be allocated as soon as possible. Probably the allocation will be made within 3 months after the committee meeting.
2. Sublease of meteorite samples is not permitted to anybody except co-investigators of the proposed research. If sublease is required to other investigators, a new separate proposal form must be submitted to the Committee on Antarctic Meteorite Research prior to he sample transfer.

### SAMPLE RETURN

1. All meteorite samples unused and remained after studies must return to the curator immediately after the period noted in the requist sheet.
2. All polished thin section (P.T.S.) and thin section (T.S.) must return to the curator immediately completion of the proposed research.

## REPORTING RESULT

1. Any result of your studies is encouraged to be reported promptly. It is desirable to report at the Symposium on Antarctic Meteorites sponsored by the National Institute of Polar Research. The symposium will be held each year. The presented papers at this symposium will be published as the Proceedings of the symposium after review by the editorial committee of the NIPR. Two referees will read the paper. Instruction to contribution can be obtained from the Library of the NIPR.
2. It is also possible to submit paper to the Antarctic Record and to the Memoirs of the National Institute of Polar Research.
3. Twenty reprints of each article which was published in other journal than those of the National Institute of Polar Research should be sent to the curator by authors.

Technical details of the committee meeting and the procedures will be informed in due course from the secretary of the committee, Dr. Keizo Yanai (Curator of Meteorites).

Please mail to;

Keizo Yanai  
Curator of Meteorites  
Department of Antarctic Meteorites  
National Institute of Polar Research  
9-10, Kaga 1-chome, Itabashi-ku,  
Tokyo 173, Japan

## Japanese Collections of Antarctic Meteorites

### Yamato and Belgica Meteorites

<u>Collection Names</u>	<u>Meteorite Names</u>	<u>Abbreviations</u>
Yamato-69 meteorites	Yamato-691 to -699	Y-691 to Y-699
Yamato-73 meteorites	Yamato-7301 to -7312	Y-7301 to Y-7312
Yamato-74 meteorites	Yamato-74001 to -74663	Y-74001 to Y-74663
Yamato-75 meteorites	Yamato-75001 to -75308	Y-75001 to Y-75308
Yamato-79 meteorites	Yamato-790001 to -794093	Y-790001 to Y-794093
Belgica-79 meteorites	Belgica-7901 to -7905	B-7901 to B-7905
Yamato-80 meteorites	Yamato-8001 to -8014	Y-8001 to Y-8014
Yamato-81 meteorites	Yamato-81001 to -81113	Y-81001 to Y-81113
Yamato-82 meteorites	Yamato-82001 to -82211	Y-82001 to Y-82211
Yamato-83 meteorites	Yamato-8301 to -8342	Y-8301 to Y-8342
Yamato-84 meteorites	Yamto-8401 to -8459	Y-8401 to Y-8459

### Victoria Land Meteorites

<u>Collection Names</u>	<u>Meteorite Names</u>	<u>Abbreviations</u>
Mount Baldr meteorites	Mount Baldr a and b	MBR a and MBR b
Allan Hills-76	Allan Hills-761 to -769	ALH-761 to ALH-769
Allan Hills-77 meteorites	Allan Hills-77001 to -77307	ALH-77001 to ALH-77307
Purgatory Peak-77 meteorite	Purgatory Peak-77006	PGP-77006
Allan Hills-78 meteorites	Allan Hills-78001 to -78262	ALH-78001 to ALH-78262
Bates Nunatak-78 meteorites	Bates Nunatak-78001 to -78005	BTN-78001 to BTN-78005
Derrick Peak-78 meteorites	Derrick Peak-78001 to -78010	DRP-78001 to DRP-78010
Meteorite Hills-78 meteorites	Meteorite Hills-78001 to -78028	MET-78001 to MET-78028
Reckling Peak-78 meteorites	Reckling Peak-78001 to -78005	RKP-78001 to RKP-78005

## DATA SHEET

Information in data sheets for meteorite specimens include inventory data, field data, initial survey data and other pertinent sample information. The inventory data include a sample identification number, specimen weight and specimen dimensions. The field data give the location and the date of the field. Initial survey data consist of a classification by an optical and chemical examination of a specimen (petrographic description) and a description of macroscopic features (physical description), with information about degree of weathering and degree of fracturing.

The scale for apparent degree of weathering and fracturing is like that used in the NASA curatorial facilities.

Degree of Weathering

A - minor      B - moderate      C - severe

Degree of Fracturing

A - slight      B - moderate      C - severe

If you would like to obtain additional copies of the news, please contact Dr. K. Yanai, Secretary of the Antarctic Meteorite Research Committee, Department of Meteorites, National Institute of Polar Research.

We would like to thank Satsuki Ikadai, Miyuki Naito and Noriko Ohki for their assistance on the compilation of this issue.





Yamato-8004

Stone, Chondrite, L6

Weight: 77.59 gms

Dimension: 4.7 x 4.1 x 3.2 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 80121003

Found: Dec. 10, 1980, K. Shiraishi et al.

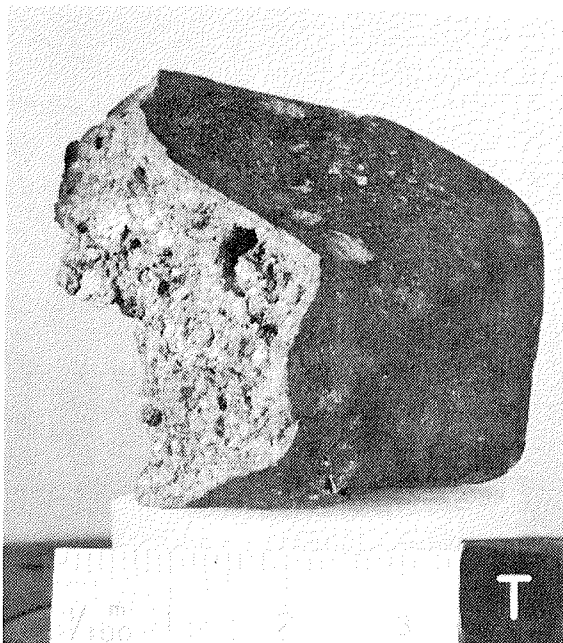
Physical Description:

An angular, partly crusted, eroded fragment. The fusion crust is dull black with a little polyhedral cracking. The interior of the stone has been much eroded by weathering and is coated with brown oxidation products. Chondrules are easily seen however and the stone is crossed by thin parallel sided veins.

Petrographic Description:

A granular aggregate of olivines and pyroxenes. Many of the crystals are subrounded and show approximately 120° junctions. Much of the section is lightly stained a pale yellow-brown by oxidation. The grain size of the silicates has a wide range but most commonly is about 0.2mm and the largest is around 1mm across. A number of recrystallised fragments of barred olivine chondrules are present. The interior material is birefringent but often shows undulose extinction. The olivine and pyroxene crystals have a few opaque inclusions but these are not abundant. Plagioclase is present as birefringent interstitial grains up to 0.1 mm long. Troilite grains up to 0.3mm across are often cracked and many show oxidation along cracks. Metal occurs as subangular grains up to 0.2mm across but rounded grains about 0.4mm across are common. Spinels are present as rounded grains up to 0.3mm long. A type 6 chondrite.

Microprobe data: olivine Fa24.8; orthopyroxene Fs19.7 Wo2.0; clinopyroxene Fs7.3 Wo46.4; feldspar An11.8 Ab80.5 Or7.7 and An11.5 Ab60.4 Or28.3.



Yamato-8010

Stone, Chondrite

L5

Weight: 109.32 gms

Dimension: 6.4 x 4.5 x 3.5 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 80121602

Found: Dec. 16, 1980, K. Shiraishi et al.

Physical Description:

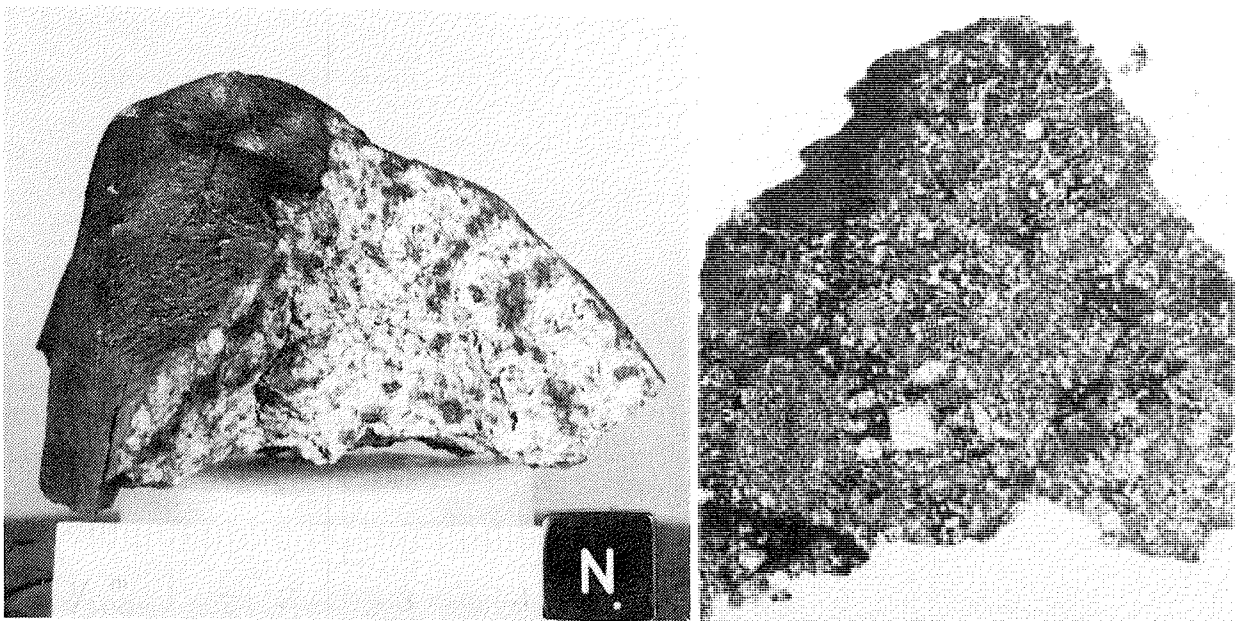
An angular fragment with two adjoining crusted faces. The fusion crust is dull black with patches of shiny oxidation products and some polyhedral cracking. The interior of the stone is pale grey in colour with small specks of brown oxidation products. It is extensively crossed by thin, black, parallel sided veins and chondrules are rare. Fits onto and is a fragment of Yamato-8011.

Petrographic Description:

This stone consists of a fine grained aggregate of crystals with chondrules and larger olivines up to 1mm across. The chondrule margins are often indistinct and both barred olivine and radiating pyroxene chondrules are present. The fine grained matrix consists of olivines and pyroxenes usually less than 0.02mm across. Grains of phosphate up to 0.1mm across are present. The stone is veined and the opaque minerals are usually the centres for zones of yellow-brown staining of the surrounding silicates. Metal and sulphide are common opaques, spinels easily seen. Metal grains are rounded to subangular and up to 0.6mm across though most are rounded and about 0.05mm in diameter. Troilite is up to 0.3mm across with very slight cracking and a little oxidation in these. Cracked spinels occur up to 0.5mm across. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	23.5	1.3	22.9-24.3
Low-Ca pyroxene	20.0	0.8	19.6-20.4

This meteorite is classified as an L5 chondrite.



Yamato-81012

Stone, Chondrite H5

Weight: 380.6 gms

Dimension: 8.7 x 7.4 x 3.3 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81121410

Found: Dec. 14, 1981, Y. Yoshida et al.

Physical Description:

An angular and weathered fragment with fusion crust remaining on the one exterior surface. Interior surfaces all show extensive weathering. No fresh interior visible. A few chondrules protrude from the fracture surfaces. The stone is cracked and weathering has deposited brown oxides on the sides of these cracks.

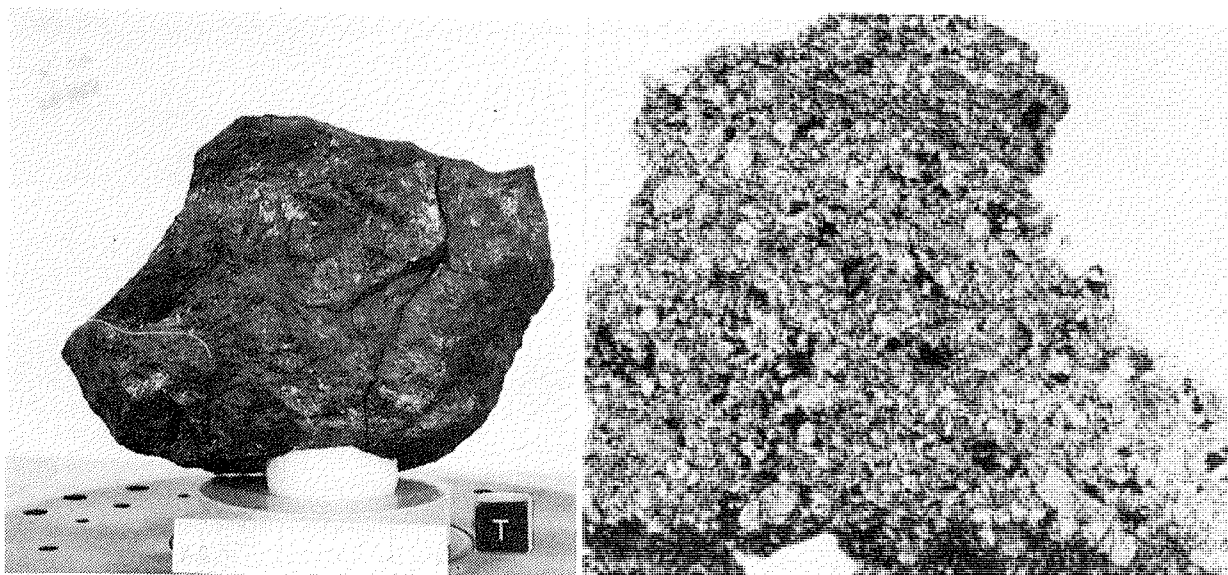
Petrographic Description:

The thin section shows well-developed chondritic structure, with variety of chondrule types. The chondrules are set in a granular matrix, which consist of olvine and pyroxene with minor amount of nickel-iron and less amount of troilite. Limonitic staining pervades the section, and veinlets and patches of reddish brown limonite are present.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.5	1.5	17.2-19.0
Low-Ca pyroxene	16.0	2.6	15.2-17.7

This meteorite is classified as an H5 chondrite.



Yamato-81016

Stone, Chondrite

H5

Weight: 1006.3 gms

Dimension: 8.0 x 7.9 x 7.3 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81121503

Found: Dec. 15, 1981, Y. Yoshida et al.

Physical Description:

A deeply weathered and cracked fragment. Fusion crust remains on one face. Interior is deep brown in colour and no grey coloured silicates observed.

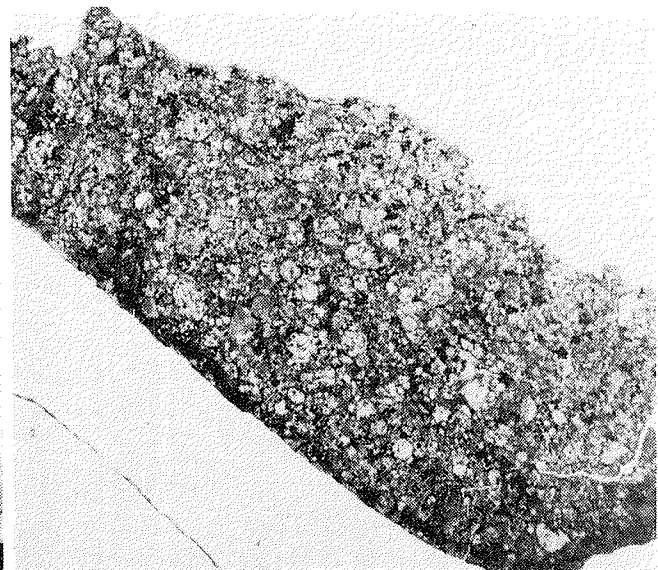
Petrographic Description:

The section shows well-developed chondritic structure, chondrules range from 0.2-1.3mm in diameter. A variety of chondrule types is present, commonest being olivine-pyroxene porphiritic and fine-grained pyroxene. The matrix consists of olivine and pyroxene with minor amount of nickel-iron and troilite. Limonitic staining pervades the section, and veinlets and patches of reddish brown limonite are present.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.6	1.8	17.9-19.4
Low-Ca pyroxene	16.1	2.5	15.5-18.0

This meteorite is classified as an H5 chondrite.



Yamato-81020

Stone, Chondrite carbonaceous type III (C03)

Weight: 270.34 gms

Location: Yamato Mountains, Antarctica

Dimension: 8.3 x 4.9 x 4.2 cm

Degree of Weathering:

Original Number: 81121701

Degree of Fracturing:

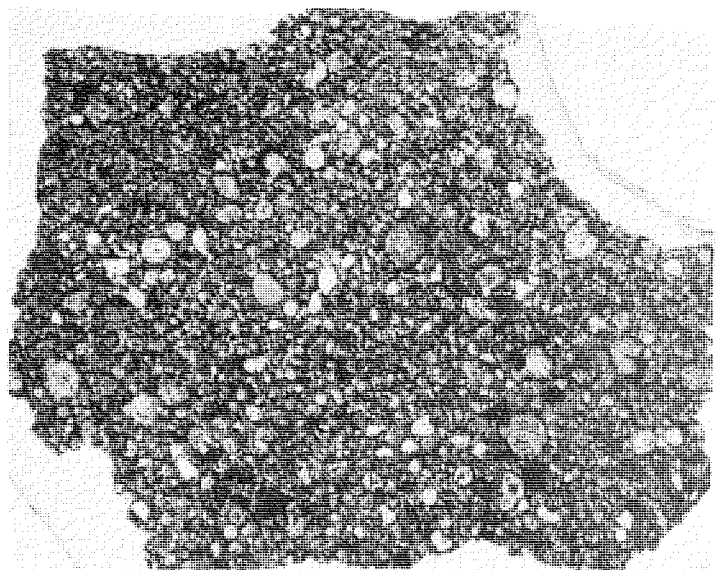
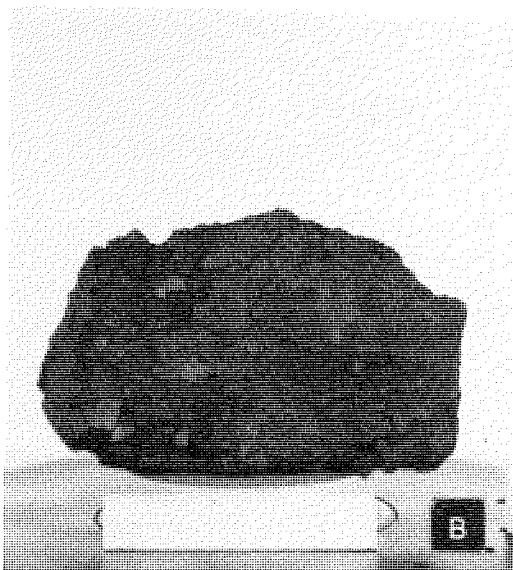
Found: Dec. 17, 1981, Y. Yoshida et al.

Physical Description:

A partly crusted individual with easily seen, spherical chondrules. The matrix is dark and contains abundant pale whitish fragments. Occasional pale green enehedral crystals project from the dark red-black matrix, which is coherent and has a glassy sheen.

Petrographic Description:

This stone consists of chondrules and abundant crystal fragments and aggregates set in dark, mainly opaque, interstitial material. The chondrules are small, nearly always less than 0.6mm in diameter with 0.1mm diameter more common. Most of the crystal aggregates and some chondrules are speckled with blebs of opaque material, this is usually metal. Twinned monoclinic pyroxene is fairly common but the dominant silicate is olivine. Lilac coloured glass is present in some chondrules and chondrule fragments. The section also has some highly irregularly shaped, very fine grained aggregates often about 0.2mm across. These consist of a mosaic of small crystals with very low birefringence. One aggregate of crystals with anomalous pale blue-grey birefringence is present in the section. The abundant opaque phases, mainly metal and troilite, occur as isolated rounded inclusions within and between chondrules. They are mainly around 0.01mm across, though rare examples up to 0.2mm occur. In these larger blebs metal and sulphide commonly co-exist with rounded borders. A little opaque spinel occurs and some oxidation products surround a few of the sulphides, some of which have cracks containing oxidation products. Microprobe data: olivines Fa0.2-65.9; low birefringence mineral: melilite plagioclase An88.5 Ab11.5; o-px Fs0.5-17.2.



Yamato-81025

Stone, Chondrite

C03

Weight: 55.40 gms

Dimension: 4.1 x 3.5 x 2.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81121706

Found: Dec. 17, 1981, Y. Yoshida et al.

Physical Description:

A partly crusted fragment, about two thirds of an individual. Fusion crust dull black, thin and cracking. Interior of the stone is dark grey-black and breaking into small angular fragments. It consists of a multitude of pale fragments less than 0.2 mm across and occasional euhedral pale green olivines set in a coherent, dark grey-red matrix. Similar to Yamato-81020.

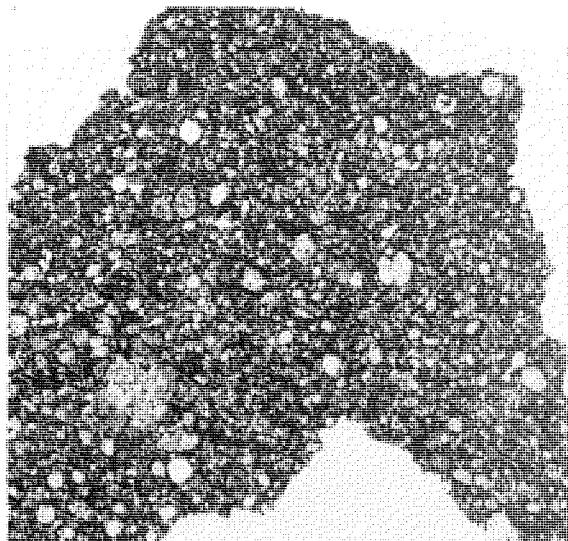
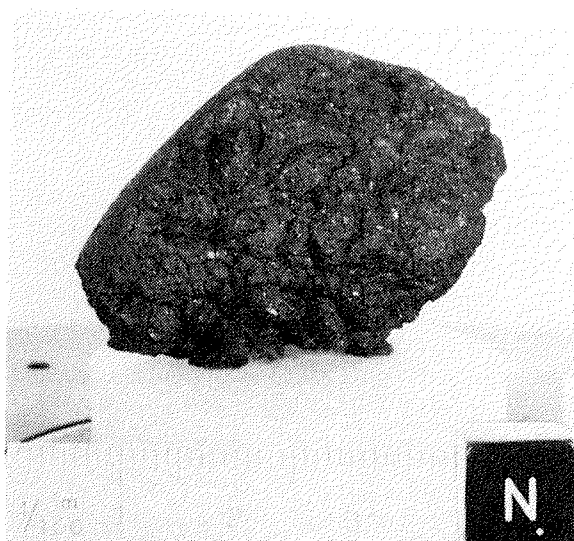
Petrographic Description:

In thin section this stone consists of chondrules and abundant chondrule fragments, crystal aggregates and clear, angular isolated olivine crystals set in a dark, mainly opaque matrix. Most of the crystal aggregates and many of the chondrules contain rounded opaque phases. Most of the chondrules and chondrule fragments are less than 0.2mm across with the majority around 0.05mm across. Very rarely the crystal aggregates are highly irregular, consisting of fine grained granular olivine and opaques, and up to 0.7mm across. Fine grained aggregates around 0.1mm across consisting of a multitude of low birefringence crystals with moderate relief. Twinned monoclinic pyroxene occurs but the dominant mineral, by far, is olivine. Opaque minerals are abundant. Both metal and troilite occur distributed throughout the section mainly as rounded grains about 0.01mm across. A few larger metal particles are present up to 0.2mm across. These are often rimmed by sulphide. Some of the sulphide is coated with oxidation products. This section is very similar to that of Yamato-81020 and these specimens should be regarded as part of one fall.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	17.3	89.8	0.2-64.3
Low-Ca pyroxene	1.6	78.3	0.4-13.8

This meteorite is classified as a C03 chondrite.



Yamato-81049

Stone, Chondrite

L6

Weight: 2748 gms

Location: Yamato Mountains, Antarctica

Dimension: 20.0 x 10.9 x 9.9 cm

Degree of Weathering:

Original Number: 81122701

Degree of Fracturing:

Found: Dec. 27, 1981, Y. Yoshida et al.

Physical Description:

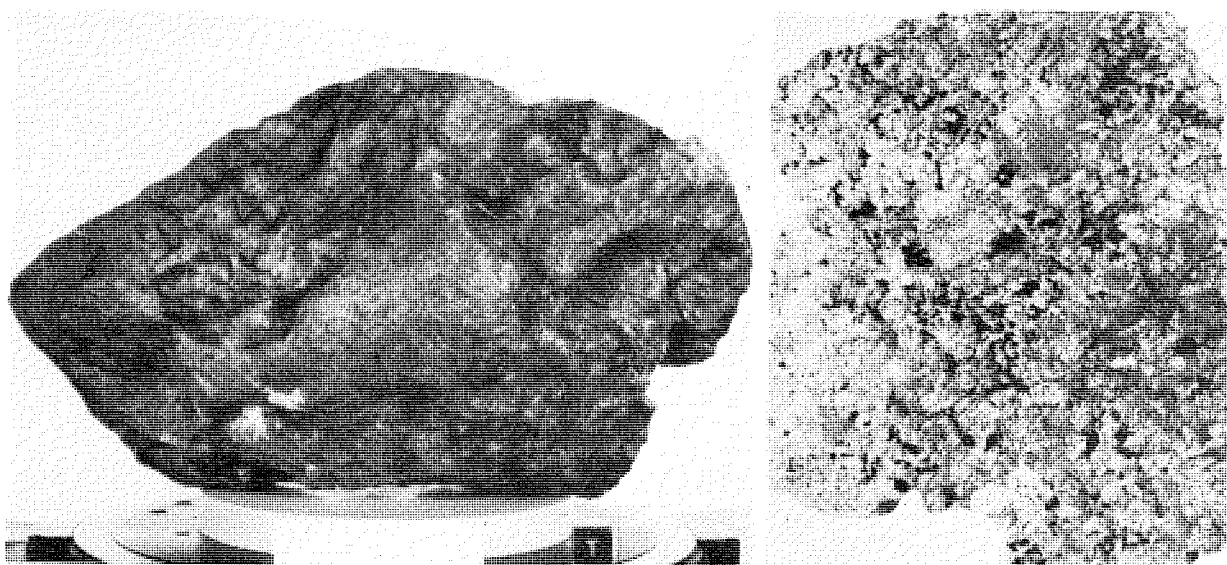
A sub-angular, partly crusted, orientated individual showing many cracks. The stone represents about three quarters of the original mass and it moderately oxidised. Probably an L-group stone, type 6.

Petrographic Description:

Chondrules are sparse and poorly defined, tend to merge with the granular matrix, which consist of olivine and pyroxene with minor subequal amount of nickel-iron and troilite. A little untwinned plagioclase is present. In some areas of the section, the silicates are stained pale brown and some of the nickel-iron grains are partly altered to reddish brown limonite. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.1	1.2	23.3-24.9
Low-Ca pyroxene	20.3	1.5	19.4-21.4

This meteorite is classified as an L6 chondrite.



Yamato-81058

Stone, Chondrite

H4

Weight: 395.0 gms

Dimension: 6.7 x 5.9 x 5.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81122801

Found: Dec. 28, 1981, Y. Yoshida et al.

Physical Description:

An angular, weathered fragment with fusion crust on two adjoining faces. A few chondrules are visible but most of the interior faces are coated with oxidation products.

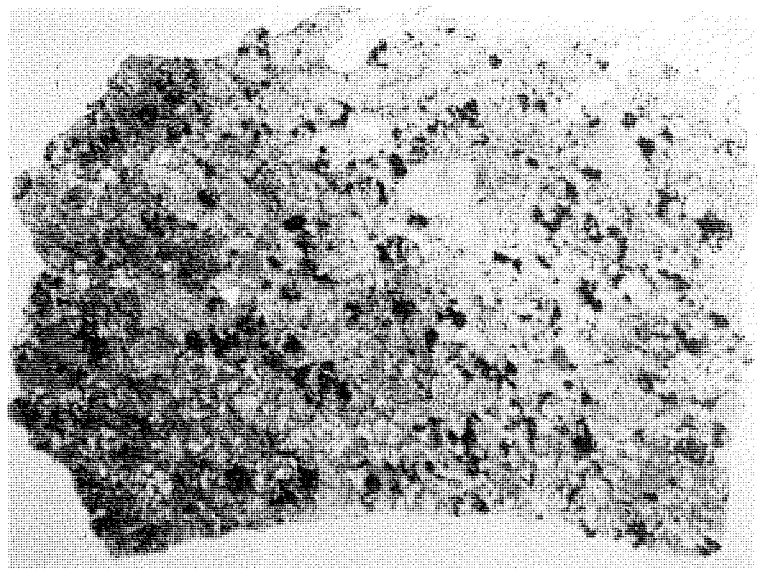
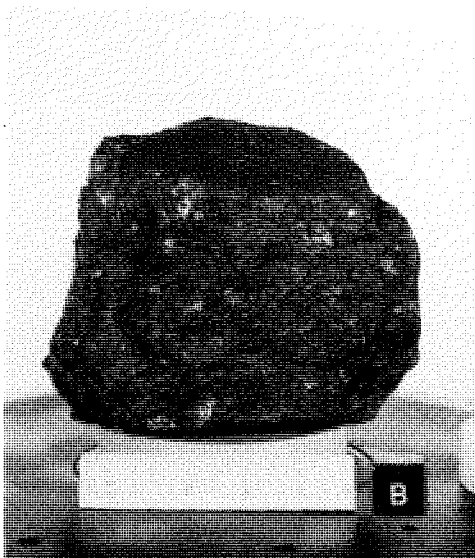
Petrographic Description:

The section shows well-developed chondritic structure, chondrules range from 0.2-1.5mm. The commonest types of chondrules are porphiritic olivine, olivine-pyroxene and barred olivine. Some brown devitrified glass is present between olivine and pyroxene crystals. The chondrules are set in a fine-grained matrix of olivine and pyroxene, with minor amount of nickel-iron and troilite. Chromite grains are present a little and smaller than 0.2mm in diameter. Many of the nickel-iron grains are partly altered to reddish brown limonite.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.2	1.9	17.5-19.4
Low-Ca pyroxene	15.8	2.5	15.2-17.5

This meteorite is classified as an H4 chondrite.





Yamato-81070

Stone, Chondrite

L4

Weight: 430.8 gms

Dimension: 8.3 x 5.6 x 5.4 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81122813

Found: Dec. 12, 1981, Y. Yoshida et al.

Physical Description:

An almost complete, angular crusted, individual. The stone is extensively cracked and weathering has penetrated along these. The weathering associated with the crust extends for about 2 mm into the stone. The interior is moderately weathered, green-grey in colour with many easily seen chondrules. Matrix is recrystallised, probably a low type 5 chondrite. Yamato-81071, -81072, -81073 fit onto this specimen.

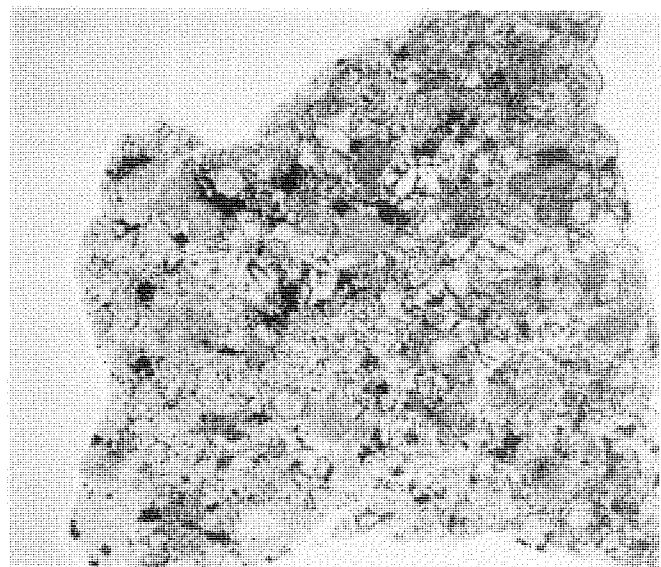
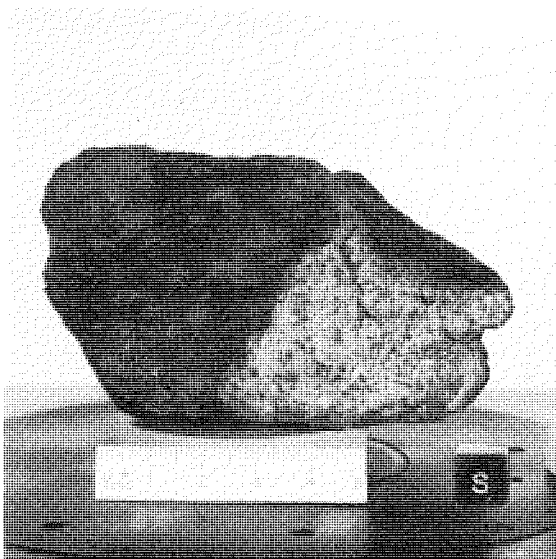
Petrographic Description:

The section shows a closely-packed aggregate of chondrules. Many are spherical. A variety of chondrule types is present: porphiritic olivine, granular olivine and pyroxene, barred olivine and radiated pyroxene. Some pyroxene shows polysynthetic twinning. Minor irregular nickel-iron and troilite are present on the surface of chondrules. Some areas of the section shows pale brown in color and many grains of nickel-iron are partly altered to reddish brown limonite.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	23.1	1.7	22.3-24.1
Low-Ca pyroxene	19.6	2.5	18.5-22.1

This meteorite is classified as an L4 chondrite.



Yamato-81075

Stone, Chondrite

L4

Weight: 1161.3 gms

Dimension: 13.9 x 8.9 x 7.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81122818

Found: Dec. 28, 1981, Y. Yoshida et al.

Physical Description:

An angular fragment with fusion crust on three faces. The stone is moderately weathered and shows extensive cracking. It is about two thirds of an individual which was probably part of a shower. Chondrules are present but not common. Probably a type 6 chondrite. Similar to Yamato-81070 and may be part of that stone. Fragments fitting to this stone: Y-81076, -81077, -81082. Other very similar fragments are probably part of this stone but too small to fit satisfactorily, Y-81078, -81079, -81080, -81081, -81083, -81084, -81085, -81086, -81087 to -81091, -81093 to -81117.

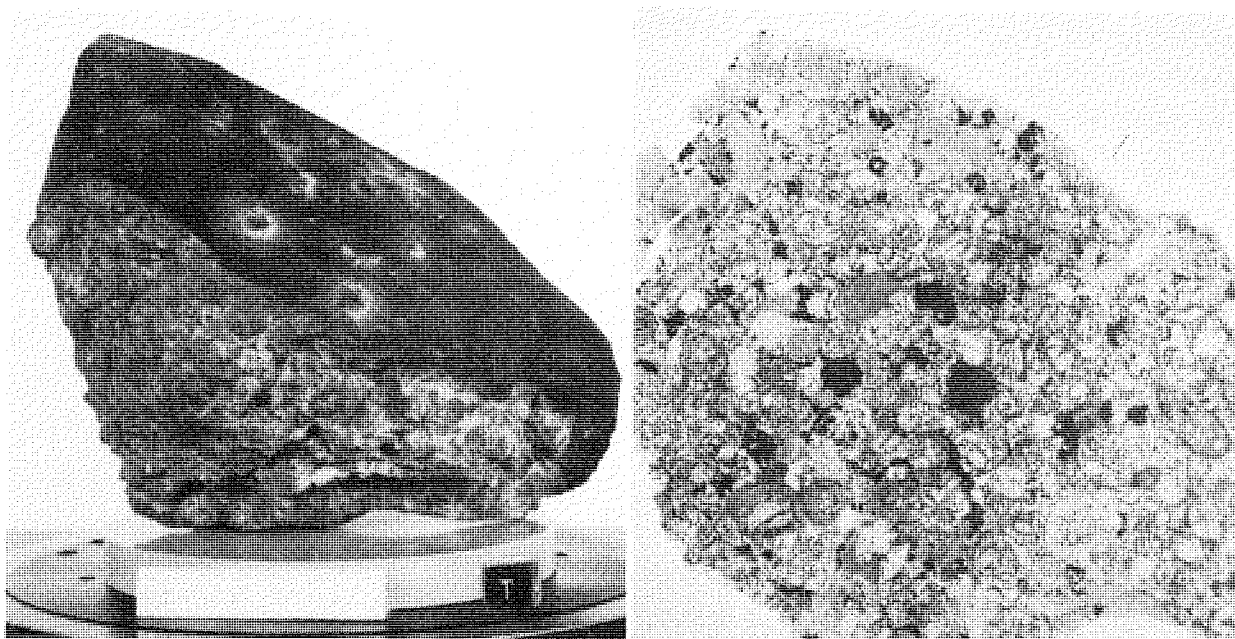
Petrographic Description:

The thin section shows a closely-packed aggregate of chondrules with a little fine grained matrix. Many chondrules are spherical with variety of chondrule types: porphiritic olivine, olivine-pyroxene, barred olivine and fine granular olivine-pyroxene. Some pyroxene shows polysynthetic twinning. Minor nickel-iron and troilite are present. Grain size of many nickel-iron is larger than troilite grains. Pale brown limonitic staining pervades the section, and many of the nickel-iron grains are partly altered to reddish brown limonite.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	23.5	1.4	22.9-24.7
Low-Ca pyroxene	20.0	2.3	19.0-21.7

This meteorite is classified as an L4 chondrite.



Yamato-81124

Stone, Chondrite

H5

Weight: 10790 gms

Location: Yamato Mountains, Antarctica

Dimension: 24.0 x 20.0 x 20.0 cm

Degree of Weathering:

Original Number: 81122901

Degree of Fracturing:

Found: Dec. 29, 1981, Y. Yoshida et al.

Physical Description:

An almost complete, crusted, individual whose crust is cracking into a mosaic and separating from the interior. Deep cracks penetrate the specimen. The interior of the stone is pale grey in colour with abundant brown staining from oxidation products. Chondrules not easily seen. Probably a type 6 chondrite.

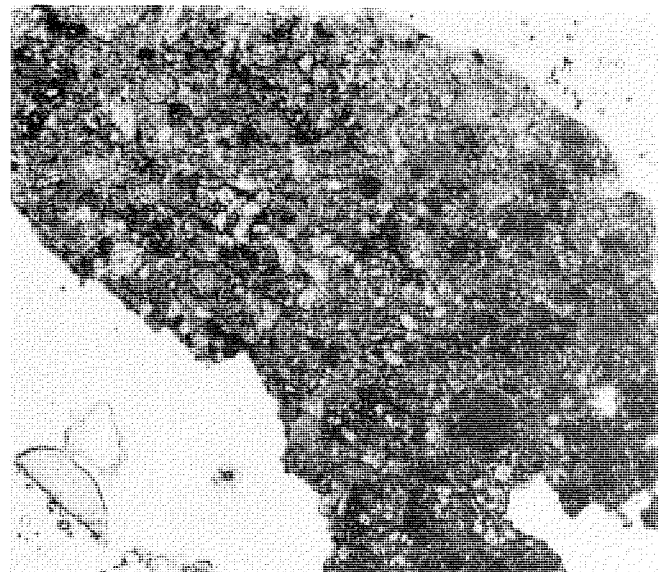
Petrographic Description:

In thin section the stone consists of a granular matrix of olivine and pyroxene crystals interspersed with metal and troilite. Chondrules and obvious chondrule fragments are common. The chondrules are often clearly discernable and the degree of obliteration of the chondrule boundaries varies widely. Within the chondrules the intercrystal material, once glass, is now microcrystalline but has very low birefringence. Twinned monoclinic pyroxene is very rare. Metal and sulphide occur as highly irregular grains, the troilite is polycrystalline and often contains cracks filled with oxidation products. The metal grains are sometimes associated with red-brown alteration products. In some areas the silicates are lightly stained yellow-brown. Pale red-brown and opaque spinels are present.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	17.3	2.4	16.3-18.3
Low-Ca pyroxene	14.9	2.2	14.3-15.9

This meteorite is classified as an H5 chondrite.



Yamato-81132

Stone, Chondrite

H5

Weight: 6607 gms

Dimension: 23.7 x 12.7 x 12.7 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 81122909

Found: Dec. 29, 1981, Y. Yoshida et al.

Physical Description:

A complete, elongate individual with small patches of fusion crust adhering to two faces. Oxidation has removed most of the fusion crust exposing a brown weathered interior. No new fracture surface is exposed and the internal structure of the stone is not visible.

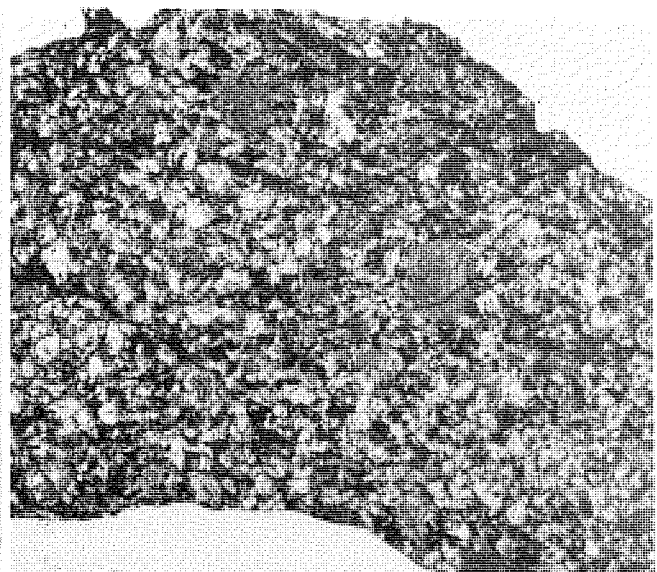
Petrographic Description:

In thin section this stone consists of a granular aggregate of olivine and pyroxene crystals averaging about 0.2 mm across. There is a little, interstitial finer grained material. Chondrules are rare and their boundaries are generally very poorly defined. The silicates are equilibrated and apatite and merrillite are present. Metal and troilite are homogeneously distributed throughout the section as sub rounded grains averaging about 0.1 mm across but 0.04 mm is the more usual size. The section contains a little veining and in some areas the silicates are heavily stained by oxidation products. Some of the troilite has cracks of oxidised material.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.2	2.1	17.5-19.2
Low-Ca pyroxene	16.3	1.8	15.5-17.0

This meteorite is classified as an H5 chondrite.



Yamato-82024

Stone, Chondrite

L6

Weight: 420.29 gms

Dimension: 7.6 x 5.9 x 5.2 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: Y82122202NI

Found: Dec. 22, 1982, T. Katsushima et al.

Physical Description:

A partly rounded individual stone nearly completely covered with fusion crust. It represents approximately half an individual which broke very early on entry. The interior is moderately fresh; chondrules not seen in the small area which is not crusted. The stone contains veins probably of metal.

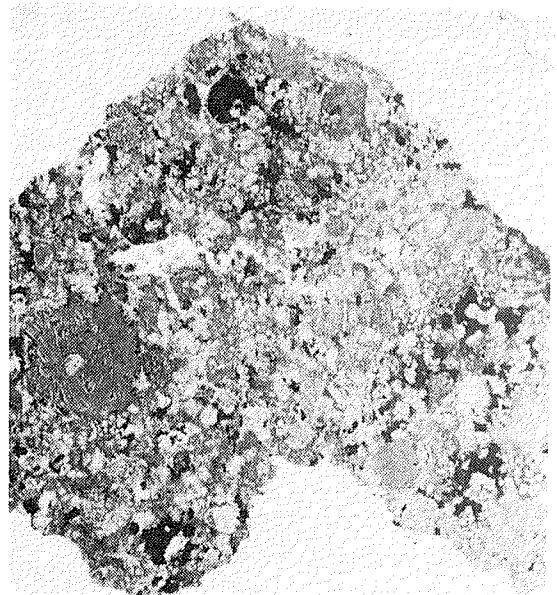
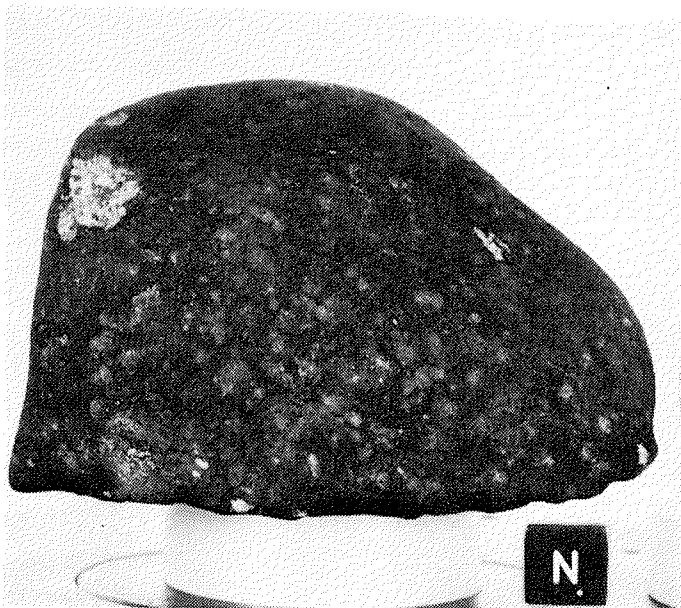
Petrographic Description:

In thin section this stone is composed of a few poorly defined chondrules about 1mm across set in a well crystalline aggregate of olivines and pyroxenes. The matrix grain size has a wide range, from 0.2mm across down to around 0.01mm across. Some areas show extensive staining by oxidation products. Metal is present as rounded to subangular grains rarely up to 2mm across but most are less than 0.1mm in diameter. Troilite occurs as interstitial angular grains with occasional cracks filled with oxidation products. One chromite about 1mm across is present and phosphates are easily seen as grains up to 0.3mm across occur. Both merrillite and apatite are present.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	23.9	1.0	23.4-24.3
Low-Ca pyroxene	20.4	1.7	19.6-21.0

This meteorite is classified as an L6 chondrite.



Yamato-82026

Stone, Chondrite

H5

Weight: 119.36 gms  
 Dimension: 6.6 x 4.6 x 2.7 cm  
 Degree of Weathering:  
 Degree of Fracturing:

Location: Yamato Mountains, Antarctica  
 Original Number: Y82122204NI  
 Found: Dec. 22, 1982, T. Katsushima et al.

Physical Description:

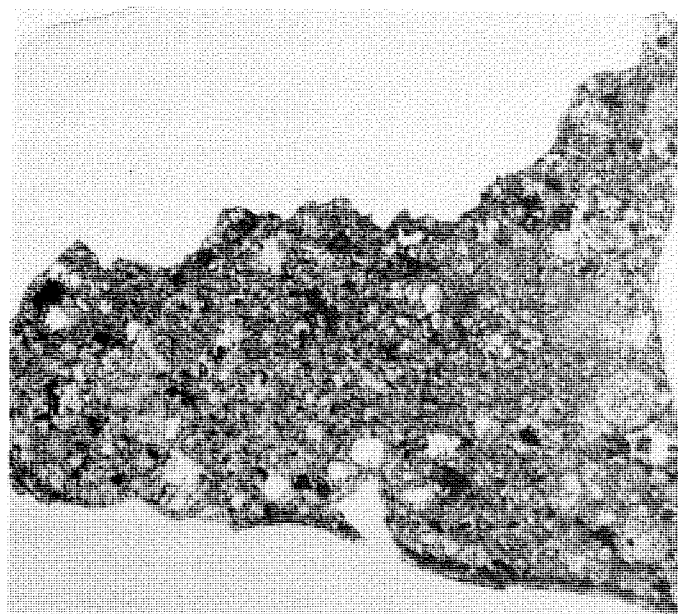
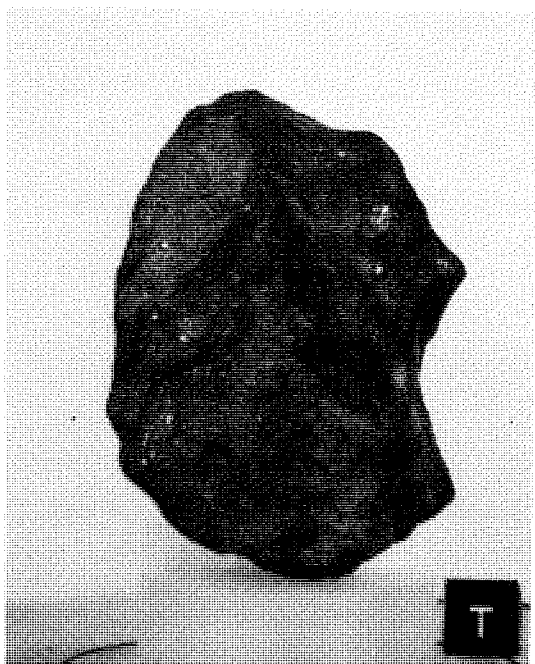
Subangular fragment nearly completely covered by a partly oxidised fusion crust. Chondrules not seen on the exposed interior surface. Weathering moderate but pervasive and not in veins.

Petrographic Description:

This meteorite consists of an aggregate of rare chondrules, each around 1mm across, and chondrule fragments set in a well crystalline matrix which ranges in grain size from a maximum of about 0.2mm across. Chondrule boundaries are generally indistinct and fine-grained matrix merges with chondrule matrix. The section is crossed by sinuous veins of limonitic oxidation products. Angular, and in some parts ragged, metal grains up to 0.4mm across are present. Troilite has been attacked by weathering and now appears as aggregates of oxidation products containing minor troilite residua. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.5	2.9	16.6-20.6
Low-Ca pyroxene	16.2	3.4	15.0-17.1

This meteorite is classified as an H5 chondrite.



Yamato-82036

Stone, Chondrite

L6

Weight: 307.66 gms  
 Dimension: 4.4 x 3.5 x 2.7 cm  
 Degree of Weathering:  
 Degree of Fracturing:

Location: Yamato Mountains, Antarctica  
 Original Number: A82122302  
 Found: Dec. 23, 1982, T. Katsushima et al.

Physical Description:

An angular fragment with thin, dull black fusion crust on two surfaces. Approximately 70% of those surfaces are still crusted. Exposed interior surfaces are dark brown. No inclusions visible on interior surfaces. Interior is a granular aggregate of olivine and orthopyroxene with a few visible chondrules. Weathering of interior visible as veining.

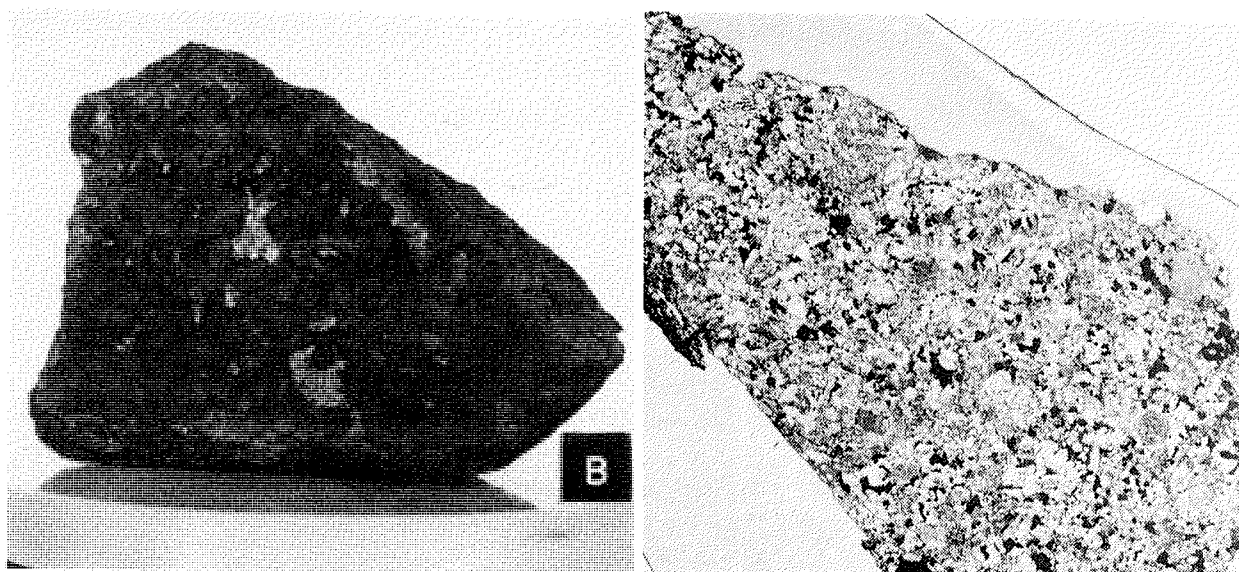
Petrographic Description:

In thin section this meteorite consists of a few indistinct chondrules having borders well integrated with the matrix which consists of recrystallised olivines and pyroxenes. The chondrules are up to 1.5mm across and the matrix consists of crystals around 0.2mm across with an abundance of clear, finer grained material around 0.04mm across. Opaques seem to be homogeneously distributed throughout the section and there is a little brown staining of the silicates, mainly along cracks and crystal edges. Troilite shows some oxidation and some metal grains are rimmed by oxides. Cr-rich spinel is well distributed throughout the section, the grains range in size from a maximum of 0.2mm across.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	25.1	1.1	24.4-25.6
Low-Ca pyroxene	20.7	1.3	19.6-21.3

This meteorite is classified as an L6 chondrite.



Yamato-82037

Stone, Achondrite, Ca-rich. Eucrite

Weight: 45.43 gms

Dimension: 4.5 x 3.5 x 2.6 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: A82122303

Found: Dec. 23, 1982, T. Katsushima et al.

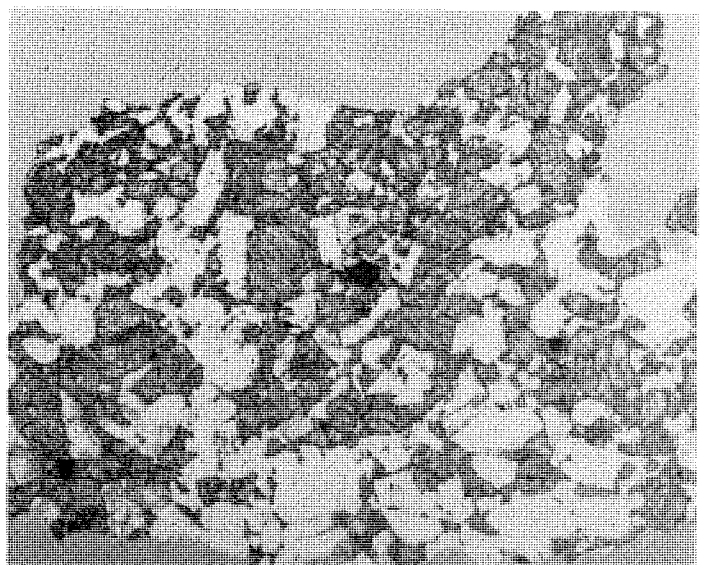
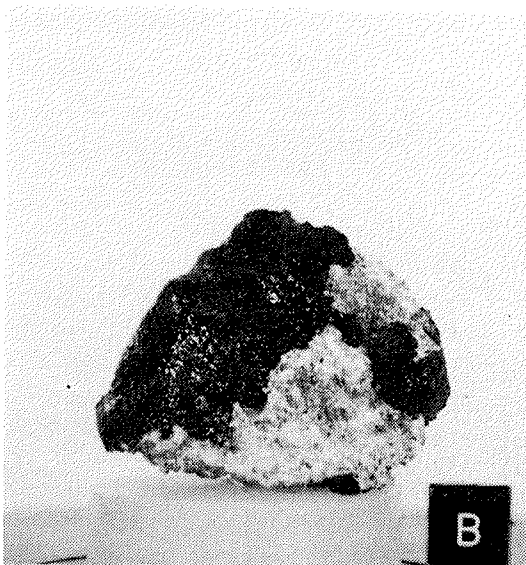
Physical Description:

A subangular, partly crusted fragment, about 2/3 of an individual stone. The fusion crust is black and shiny for the greater area but a part of the crust is dull and has lost the shiny 'skin'. Interior consists of an equi-granular aggregate of feldspar and pyroxene. The feldspar has preferentially weathered out, thus emphasizing the pyroxene. One indistinct but finer grained clast is present, otherwise the texture is remarkably uniform. Possibly an unbrecciated eucrite.

Petrographic Description:

An assemblage of coarsely crystalline pyroxene and feldspar in approximately equal modal proportions. The plagioclase crystals are rounded and up to 1mm across. The pyroxene crystals tend to be smaller than the feldspars but examples up to 1mm across occur. Multiple aggregates of both are common and the pyroxene is often present as an interstitial phase. Both Cr-spinel and ilmenite occur, the ilmenite usually associated with the chromite. Pyroxene has very fine exsolution lamellae of of sub-calcic augite.

Microprobe data: Feldspar An90.4 Ab9.2 Or0.4, very little zoning, Pyroxenes Fs45.2 En35.5 Wo19.3 -- Fs59.7 En36.4 Wo4.3, continuous zoning, most common composition Fs53 En36 Wo11. Chromite (9.7% TiO<sub>2</sub>) has ilmite exsolution lamellae. Opaque iron oxides present (?magnetite).





Yamato-82038

Stone, Chondrite

H3

Weight: 199.9 gms

Dimension: 6.8 x 5.4 x 4.1 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: A82122304

Found: Dec. 23, 1982, T. Katsushima et al.

Physical Description:

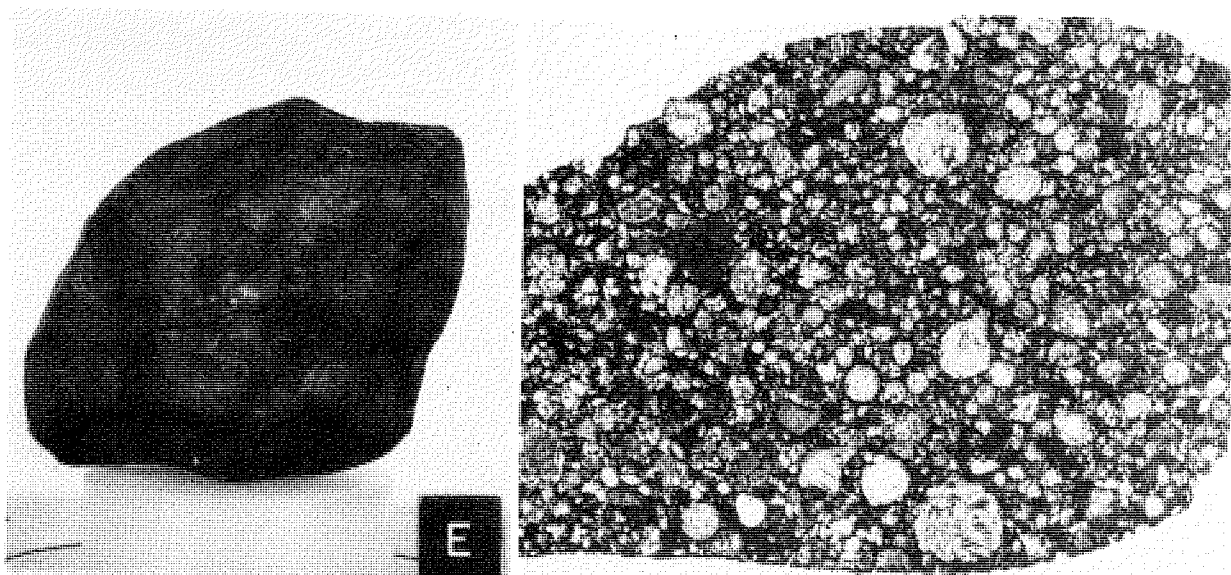
A subangular individual stone almost completely crusted. Where the crust is missing abundant chondrules are visible. Here the weathering has removed the interchondrule material, emphasizing the chondrules.

Petrographic Description:

The thin section contains abundant chondrules and chondrule fragments set in a dark, oxidised, matrix. Chondrules range in size up to 1mm across but the most common size is around 0.2mm across. Porphyritic olivine chondrules are common and quenched porphyritic pyroxene chondrules occur, both types often contain a pale brown to lilac coloured glass. Radiating pyroxene and barred olivine chondrules are present but not common. Metal and troilite are present almost exclusively within the matrix. The troilite is porous and partially oxidised. Metal is present in grains up to 0.2mm across, the larger grains have rounded inclusions of oxide and minor troilite. Microprobe analyses give the following results:

	Average	% M. D.	Range
Olivine	11.2	49.8	1.3-30.1
Low-Ca pyroxene	8.3	26.5	3.0-13.6

This meteorite is classified as an H3 chondrite.



Yamato-82042

Stone, Carbonaceous chondrite, CM2

Weight: 37.08 gms

Location: Yamato Mountains, Antarctica

Dimension: 4.2 x 3.3 x 2.7 cm

Degree of Weathering:

Original Number: 82122405

Degree of Fracturing:

Found: Dec. 24, 1982, T. Katsushima et al.

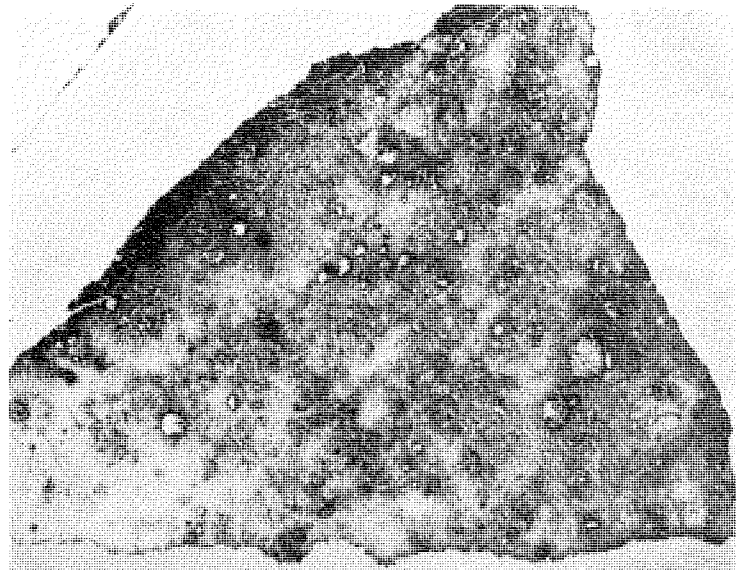
Physical Description:

An angular, partly crusted fragment. Fusion crust is dark black and showing very little terrestrial oxidation. Interior of the stone is dull grey with very few crystallites visible. One or two inclusions around 1mm across are present. On one face of the stone the fusion crust has partly weathered away leaving a pale surface coated with epsomite+clay minerals.

Petrographic Description:

In thin section the stone consists of very fine grained yellowish-brown material containing numerous small crystals around 0.03 mm across, a few larger crystals up to about 0.1 mm across and very rare, chondrule-like objects up to 0.4 mm across. The crystals are olivines and olivine fragments, calcite, dolomite. Most of the olivines are surrounded by dark brown coronas. Pale yellow, low birefringence subhedral 'crystals' are common, probably altered olivines. These do not have brown alteration coronas and are more iron rich than the unaltered olivines. Rare opaques consist of iron oxide, troilite, pentlandite and metal. Rare round metal grains up to 6  $\mu$ m across occur within forsterite crystals. There is slight cracking of the specimen near the fusion crust but there are no internal cross cutting veins.

Microprobe data: Olivine  $Fa_{0.2}$  with very rare values up to  $Fa_{35}$ . Some zoning. Pentlandite contains up to 3.5 % Co. Orthopyroxene not found. Metal 7-9 % Ni, 1 - 1.5 % Co.



Yamato-82043

Stone, Chondrite

L6

Weight: 96.18 gms

Dimension: 4.6 x 3.9 x 3.3 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82122406

Found: Dec. 24, 1982, T. Katsushima et al.

Physical Description:

A partly crusted fragment of a discoid stone. The anterior and posterior crusts are preserved. The fusion crust is thin and oxidation does not extend below it even though there is extensive polygonal cracking. The interior of the stone is a granular aggregate of chondrules and crystalline matrix. A few large chondrules are present, one, only part of which remains, may well have been 1cm across. The interior is moderately weathered.

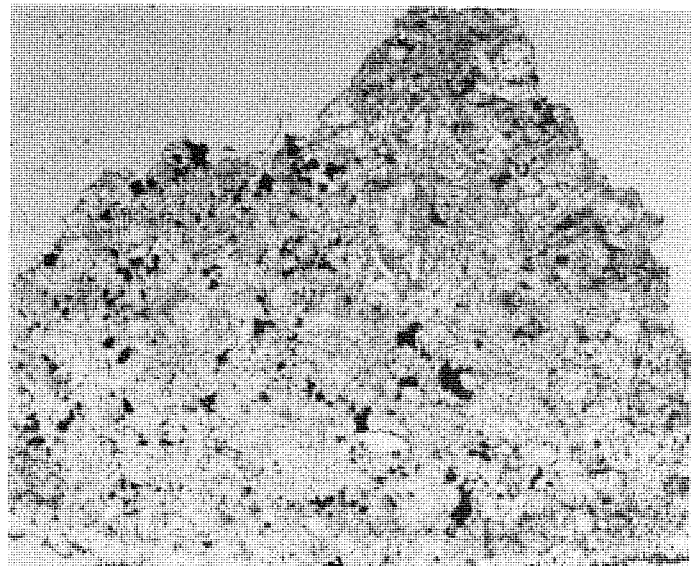
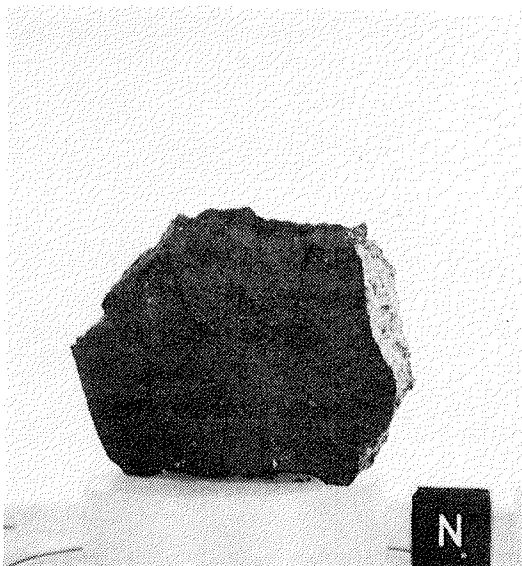
Petrographic Description:

In thin section this chondrite consists of a few ill defined chondrules set in an aggregate of olivine and pyroxene crystals with occasional interstitial feldspar. The crystal size of the major silicate components ranges from a maximum of about 0.5mm across. 120° crystal junctions are common and the fabric of the stone suggests recrystallisation. Opaques are evenly distributed throughout the section and consist of two phase metal, some with plessitic texture, troilite and chromite. Much of the troilite is cracked and these cracks are fitted with iron oxides. Some of the metal and sulphide grains are at centres of pale brown stained areas.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.5	1.3	23.7-25.3
Low-Ca pyroxene	20.5	2.2	19.4-21.2

This meteorite is classified as an L6 chondrite.



Yamato-82052

Stone. Achondrite, Ca-rich. Howardite.

Weight: 70.32 gms

Location: Yamato Mountains, Antarctica

Dimension: 5.0 x 3.1 x 3.3 cm

Degree of Weathering:

Original Number: 82122505

Degree of Fracturing:

Found: Dec. 25, 1982, T. Katsushima et al.

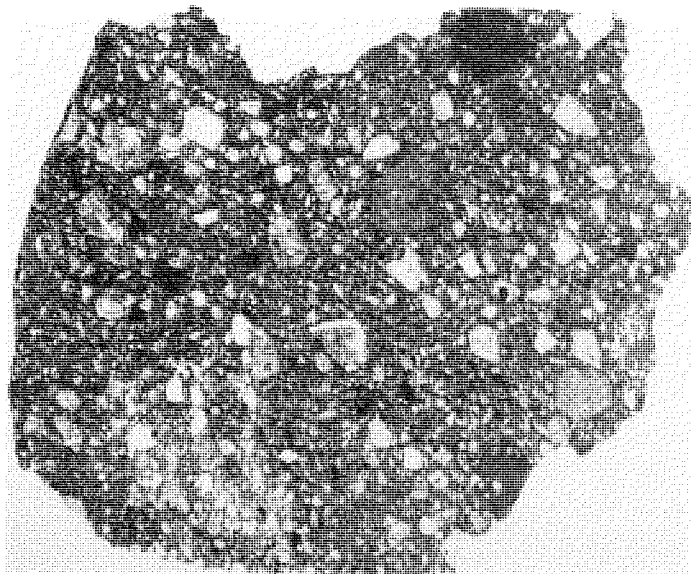
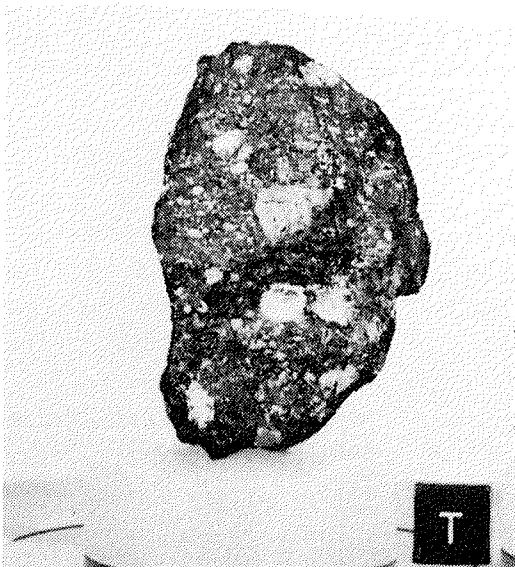
Physical Description:

A partly crusted subangular fragment. It is about two thirds of an individual. Apparently similar in hand specimen to Yamato-82049 but these specimens cannot be fitted together. The stone consists of pale coloured clasts, rounded and angular up to 8mm across set in a dark grey matrix containing pale clastic fragments about 1mm across. A polymict breccia; one clast showing basaltic texture, another possibly of cumulate eucrite. Similar in some respects to Yamato-791960.

Petrographic Description:

This section consists of clasts around 1mm across and angular mineral fragments which range in size from 1mm to 0.1mm across set in a fine grained semi-opaque matrix. Most of the clasts consist of pyroxenes and feldspar and show a relatively coarse grained, unbrecciated texture. One fine grained clast is present, 0.5mm across, consisting of rounded pyroxenes around 0.01mm across with interstitial, equally fine grained, feldspar. A few isolated, angular to sub-rounded, pyroxene crystals are present with a composition around Fs26 Wo2.

Microprobe data: Feldspar range Ab19.5 An79.4 Or1.1 to Ab7.7 An91.1 Or0.4; most common composition Ab13.5 An86 Or0.5. Pyroxenes, low-Ca pyroxenes range En62.5 Fs35.7 Wo1.8 to En31.7 Fs66.2 Wo2.1 and a further common value En72 Fs26 Wo2. Augite En26 Fs31 Wo43 to En40.3 Fs42.8 Wo16.9, pigeonite En34.2 Fs63.1Wo2.7 to En49.3 Fs38.6Wo12.1.



Yamato-82055

Stone, Chondrite

L3

Weight: 946.75 gms

Dimension: 12.2 x 7.5 x 6.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82122508

Found: Dec. 25, 1982, T. Katsushima et al.

Physical Description:

A partly crusted, subangular fragment with three uncrusted brown surfaces showing interior. One large chondrule/inclusion visible 7mm across. The fusion crust is thin and dull black. Interior of stone consists of abundant chondrules and chondrule fragments set in a dark matrix. Weathering moderate to low. Stone may have been shocked as chondrules do not protrude from a fractured surface.

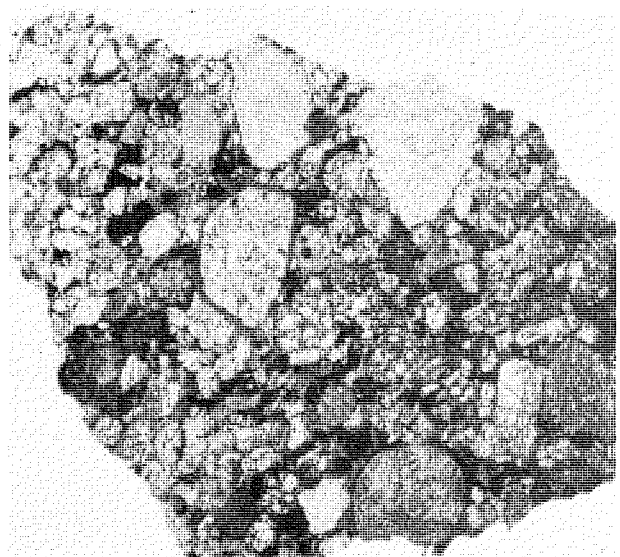
Petrographic Description:

A close packed aggregate of chondrules, most of them deformed, and chondrule fragments set in a fine grained, dark matrix. Lilac to brown glass is present in some olivine chondrules while in others the glass has partly devitrified and is slightly birefringent. Two recrystallised inclusions are present consisting of olivine and orthopyroxene. Monoclinic pyroxene fairly abundant but less so than olivine. Metal grains up to 1mm in length occur rarely but most metal is subrounded and less than 0.2 across. Troilite is well distributed throughout the section and sometimes appears to be porous with oxidation products. There is no veining but some staining of the silicates around opaques.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.1	6.5	8.8-25.9
Low-Ca pyroxene	15.3	45.5	3.3-38.1

This meteorite is classified as an L3 chondrite.



Yamato-82056

Stone, Chondrite

L3

Weight: 913.79 gms

Dimension: 16.6 x 7.6 x 3.9 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82122509

Found: Dec. 25, 1982, T. Katsushima et al.

Physical Description:

An elongated and flattened, almost completely crusted individual. The thin dull black fusion crust shows flow lines on one side of the specimen. The interior consists of abundant chondrules and pale subangular fragments up to 3mm across set in a dark, glassy matrix. The chondrules do not protrude from a broken surface.

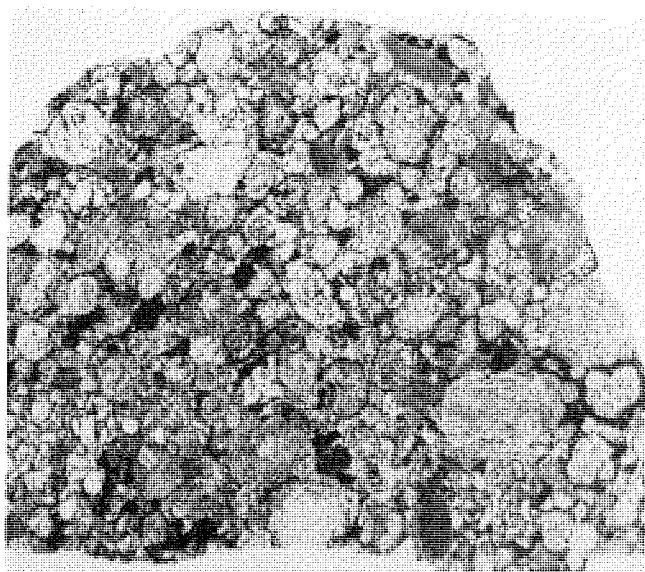
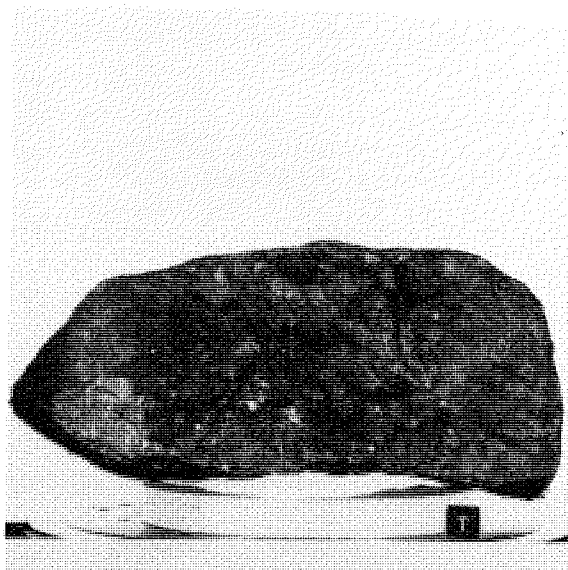
Petrographic Description:

The section shows closed-packed aggregate of sphenical to ellipsoidal chondrules with relatively little matrix. The size of chondrules ranges from 0.3-1.5mm in diameter. Many are 0.7-1mm. Nickel-iron and troilite are concentrated around chondrules, but some present as droplet in chondrules. A variety of chondrule types is present: porphyritic olivine, granular olivine pyroxene, and fine grained pyroxene. Pale brown limonitic staining pervades the section.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.6	2.9	20.8-26.3
Low-Ca pyroxene	14.9	37.0	4.6-30.1

This meteorite is classified as an L3 chondrite.



Yamato-82058

Stone, Chondrite

L3

Weight: 127.95 gms

Dimension: 6.4 x 3.8 x 3.1 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82122512

Found: Dec. 25, 1982, T. Katsushima et al.

Physical Description:

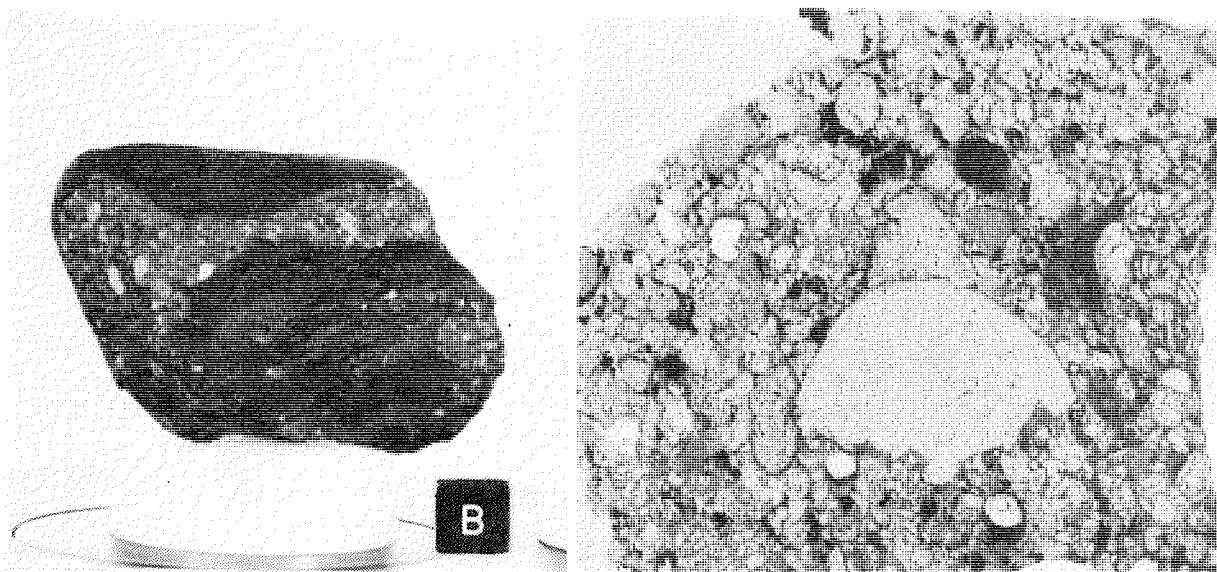
A subangular, almost complete individual with 50% of fusion crust present. Moderately weathered. Abundant chondrules and chondrule fragments set in a dark glassy matrix. Inclusions/ chondrules up to 4mm across occur. Similar to Yamato-82055 but not as fresh.

Petrographic Description:

In thin section the stone consists of a close packed aggregate of chondrules, some of which are distorted and a few interstitial chondrule fragments. There is a little very fine grained pale brown matrix but most of the interstitial material is metal and troilite. Numerous chondrules contain interstitial pale brown-lilac coloured glass while in others the brown material is microcrystalline. Twinned monoclinic pyroxene is fairly common. Two distinct inclusions are present in the section, one 5 mm across consisting almost entirely of aluminous orthopyroxene but with minor olivine and partly rimmed by olivine. The other consists of zoned euhedral olivine phenocrysts up to 0.3 mm across set in a matrix of smaller euhedral olivines all set in a fine grained matrix. These inclusions are metal free. Metal and sulphide are distributed between chondrules and inclusions throughout the section. A few chondrules contain opaque phases. Troilite sometimes shows cracks filled with oxide and occasionally is present as a spongy looking aggregate. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	21.2	18.0	6.4-25.7
Low-Ca pyroxene	13.4	35.6	4.6-25.4

This meteorite is classified as an L3 chondrite.



Yamato-82061

Stone, Chondrite

H4

Weight: 148.7 gms

Location: Yamato Mountains, Antarctica

Dimension: 6.0 x 4.8 x 3.7 cm

Degree of Weathering:

Original Number: 82122602-1

Degree of Fracturing:

Found: Dec. 26, 1982, T. Katsushima et al.

Physical Description:

An angular fragment with one rounded face which is crusted. The crust is thin but discoloured by oxidation which extends below the crust and the interior. Interior consists of abundant chondrules set in a fine grained grey matrix. This has weathered out of the weathered interior face emphasizing the abundance of chondrules. The stone is now in two parts with fragments.

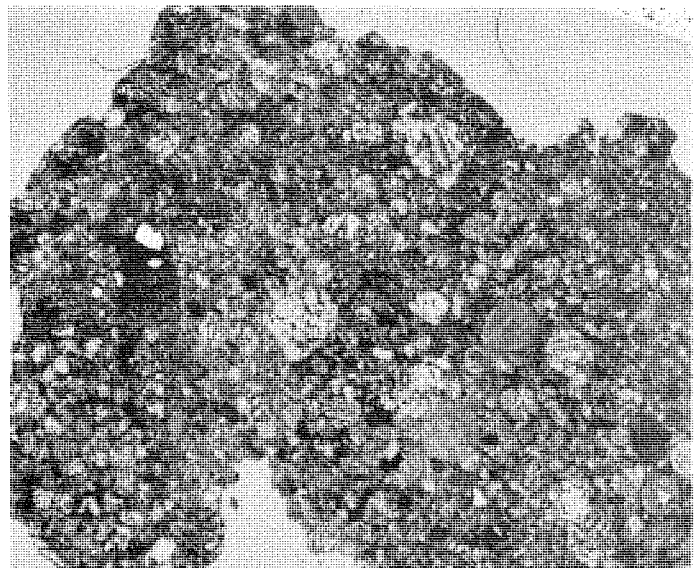
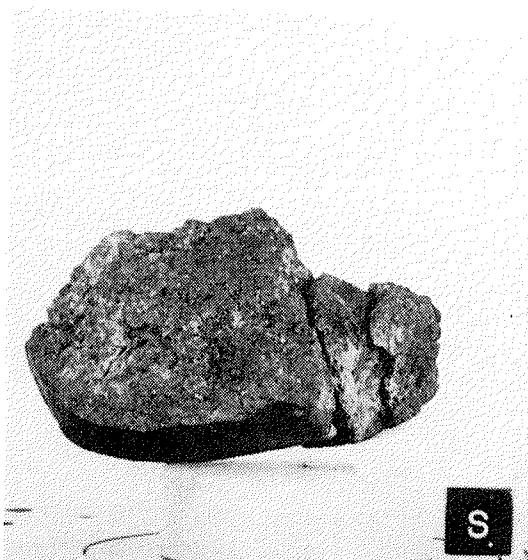
Petrographic Description:

The thin section shows numerous chondrules and abundant chondrule and mineral fragments set in a partly recrystallised, relatively fine grained, matrix. Chondrules are mainly circular in section and range in size from 1mm to 0.1mm across. Porphyritic olivine and radiating pyroxene chondrules are present. Monoclinic low-Ca pyroxene fairly common. Opaque phases consist of metal, troilite, oxidation products and minor Cr-rich spinel. Metal occurs as angular grains up to 0.5mm across; troilite is present as slightly smaller similarly angular grains. Both metal and troilite show oxidation at their surfaces and these phases are often at the centres of a red-brown stained area.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	19.0	3.2	17.8-19.8
Low-Ca pyroxene	16.3	2.9	15.0-18.6

This meteorite is classified as an H4 chondrite.





Yamato-82066

Stone. Achondrite, Ca-rich Eucrite

Weight: 191.40 gms

Dimension: 7.4 x 5.6 x 3.4 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82122606

Found: Dec. 26, 1982, T. Katsushima et al.

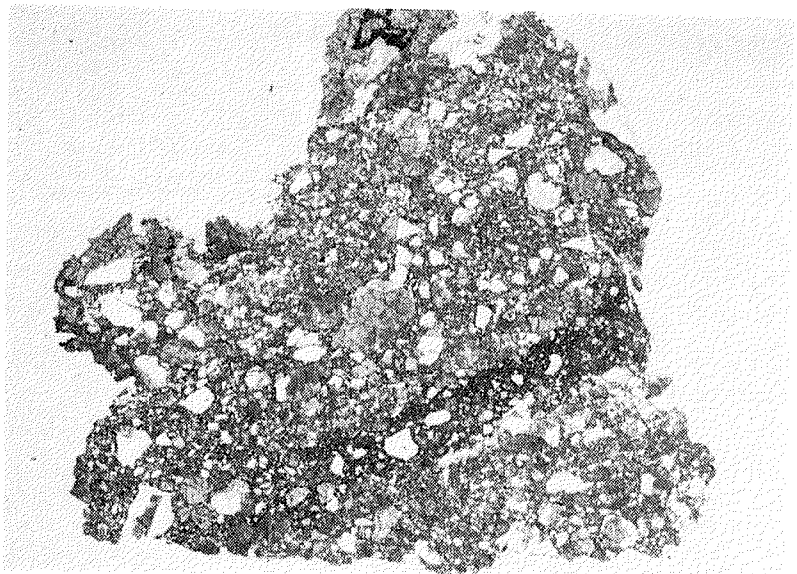
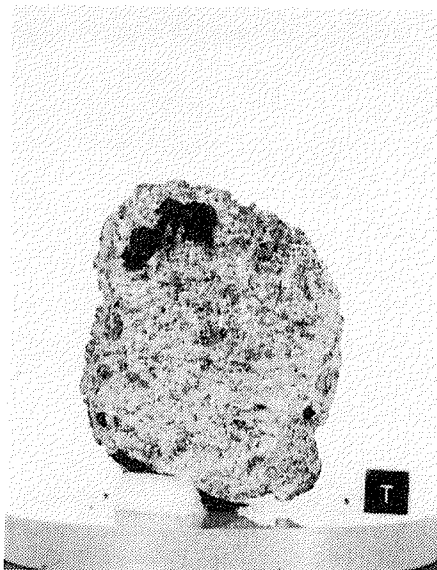
Physical Description:

A partly crusted individual. Weathering has deeply etched the surface. Fine grained but contain clasts of more coarsely crystalline eucritic material. The boundary between these two lithologies is not always well defined. Probably a polymict eucrite.

Petrographic Description:

In thin section this specimen consists of a fragmental breccia of angular to subangular clasts set in a fine grained groundmass. The clasts are occasionally polyminerallic, up to 1mm across, but more commonly are angular monominerallic fragments around 0.3mm across. The groundmass consists of plagioclase and pyroxene mineral fragments mainly about 0.05mm across. The pyroxenes often show fine exsolution lamellae and are generally clouded. The section appears to contain no diogenitic fragments.

Microprobe data: High-Ca pyroxenes Wo45.1-42.8 Fs24.9-26.1, low-Ca pyroxenes Wo4.4-2.6 Fs59.1-56.1. Feldspar An93.7 Ab6.0 Or0.3 to An69.3 Ab27.0 Or3.7, most common composition Ab9An90.5 Or0.5.



Yamato-82081

Stone, Chondrite

L6

Weight: 939.27 gms

Dimension: 11.2 x 10.2 x 6.6 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82123105

Found: Dec. 31, 1982, T. Katsushima et al.

Physical Description:

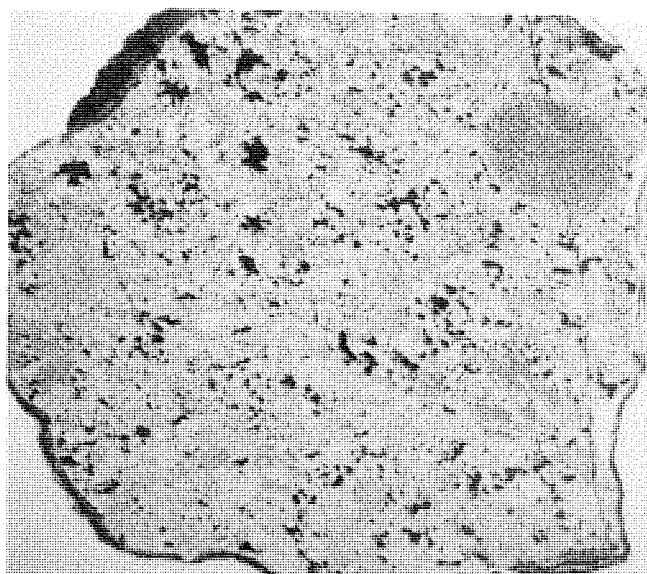
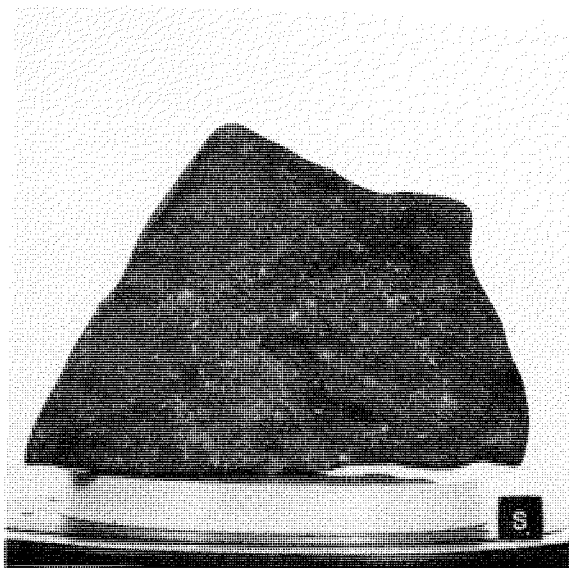
A very nearly completely crusted, highly angular individual with five faces. The fusion crust is dull black with patches of deep brown, it is only slightly cracked. Two faces of the stone have secondary fusion crust. The interior is only visible in two very small areas, it is pale grey-green in colour and no chondrules were seen.

Petrographic Description:

Chondrules are sparse and poorly defined, tend to merge with granular matrix consisting of olivine and pyroxene with minor subequal amount of nickel-iron and troilite. One thin shock vein is present across the section. Minor amount of plagioclase is present as interstitial grains between olivine and pyroxene. Some of plagioclase crystals change to maskelynite. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.0	2.3	21.4-25.2
Low-Ca pyroxene	20.7	3.3	19.4-26.0

This meteorite is classified as an L6 chondrite.



Yamato-82082

Stone, Achondrite, Ca-rich Eucrite

Weight: 662.28 gms

Dimension: 8.7 x 7.2 x 7.0 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 82123107

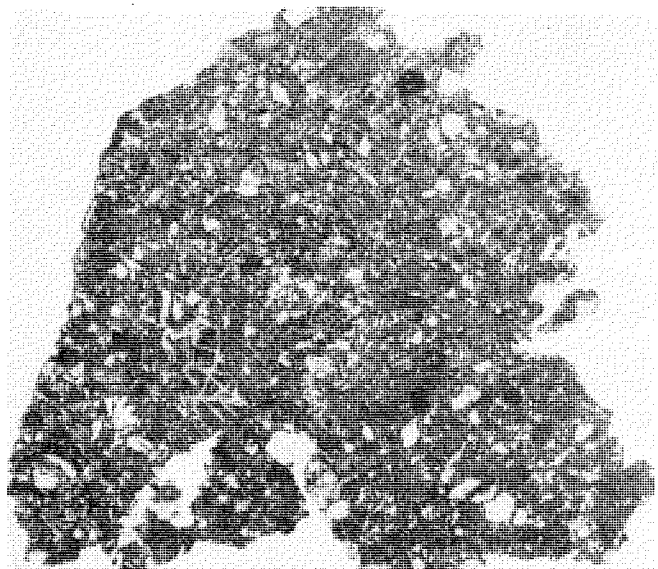
Found: Dec. 31, 1982, T. Katsushima et al.

Physical Description:

This is an almost completely crusted individual whose crust has retained nearly all its shiny glassy surface, except for a small area at the 'front' of the stone. Flow lines in the fusion crust radiate from the front and along the sides of the stone. The interior of its stone is five-grained, mid-grey in colour with a few more coarsely crystalline areas.

Petrographic Description:

In thin section the stone consists of brown pyroxenes and angular fragments of partly clouded plagioclase crystals set in a very fine-grained matrix. The pyroxenes range up to 0.7 mm across and show narrow exsolution lamellae. Feldspars range up to 0.4 mm across and they often show slightly corroded borders. A few basaltic clasts are present ranging up to 2 mm across. The borders of these clasts are very poorly defined. Metal and sulphide grains are rare but iron oxides and small Cr-rich spinels are easily seen. The pyroxene compositions are commonly  $Fs_{57}Wo_3$  but there are a few analyses extending to more calcic compositions, up to  $Fs_{43}Wo_{23}$ . Feldspar ranges from  $Ab_{20}An_{78}$  to  $Ab_7An_{93}$ .



Yamato-82091

Stone. Achondrite, Ca-rich. Howardite.

Weight: 108.35 gms  
 Dimension: 6.3 x 5.0 x 3.4 cm  
 Degree of Weathering:  
 Degree of Fracturing:

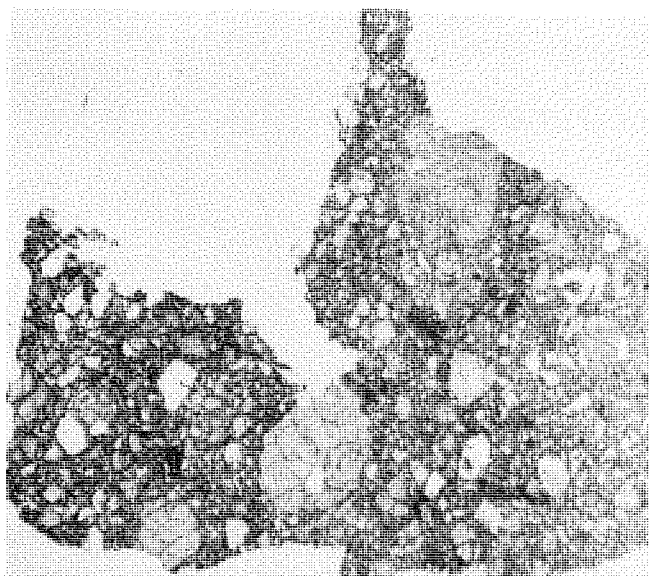
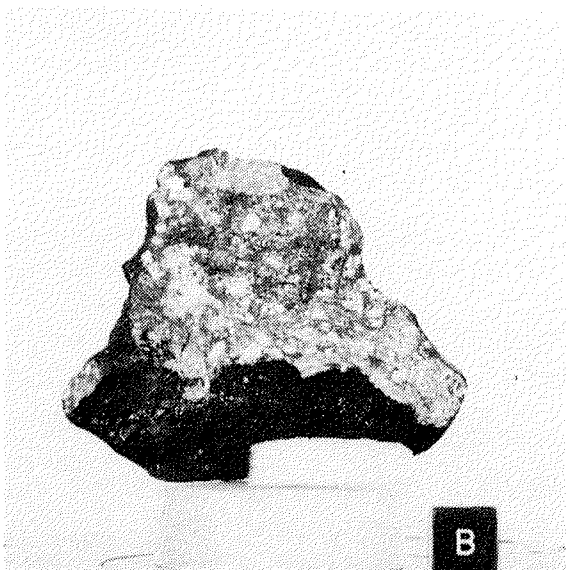
Location: Yamato Mountains, Antarctica  
 Original Number: SY82123101N0  
 Found: Dec. 31, 1982, T. Katsushima et al.

Physical Description:

A partly crusted fragment, approximately 75% of a single individual. No secondary crust. Interior consists of pale, often coarse grained, fragments set in a dark grey matrix which includes small white fragments.

Petrographic Description:

,52-1 (,51-1 coarse grained eucritic clast). In thin section the host material consists of abundant fragmental pyroxene and plagioclase crystals. Clastic pyroxenes up to 2mm across are present, plagioclase crystals are smaller and range up to 0.6mm across. The specimen also contains eucritic clasts 1.5mm across (section, 51-1). A small amount of metal and sulphide is present as rounded grains up to 0.04mm across. Spinel occurs as cracked and rounded grains up to 0.2mm across. Olivine is also present. Microprobe data: Bulk meteorite (,52-1). Plagioclase Ab4.4-10.6 An95.5-88.9 Pyroxenes, dominant compositions En72 Fs25 Wo3; En67 Fs30 Wo3; En55.7-42.2 Fs42.8-53.3 Wo1.5-2.4. Pigeonite En36.5 Fs54 Wo9.5. Augite En30-20 Fs30-41 Wo40. Olivine Fa85.



Yamato-82094

Stone, Carbonaceous Chondrite

C03

Weight: 216.59 gms  
 Dimension: cm  
 Degree of Weathering:  
 Degree of Fracturing:

Location: Yamato Mountains, Antarctica  
 Original Number: SY82123104N0  
 Found: Dec. 31, 1982, T. Katsushima et al.

Physical Description:

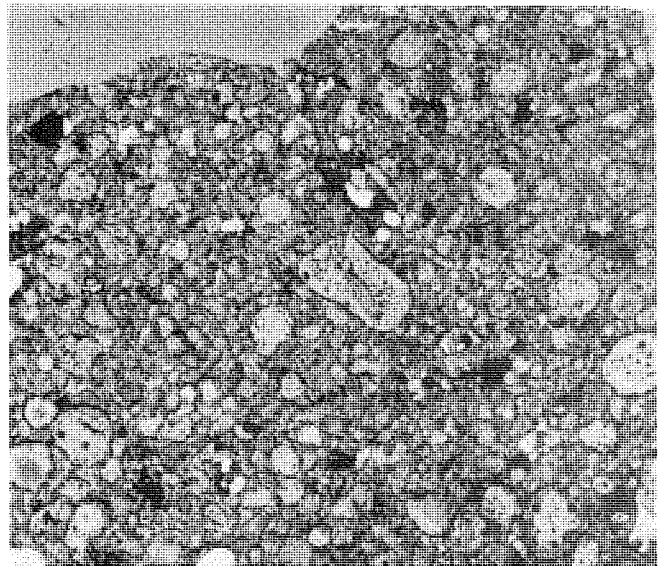
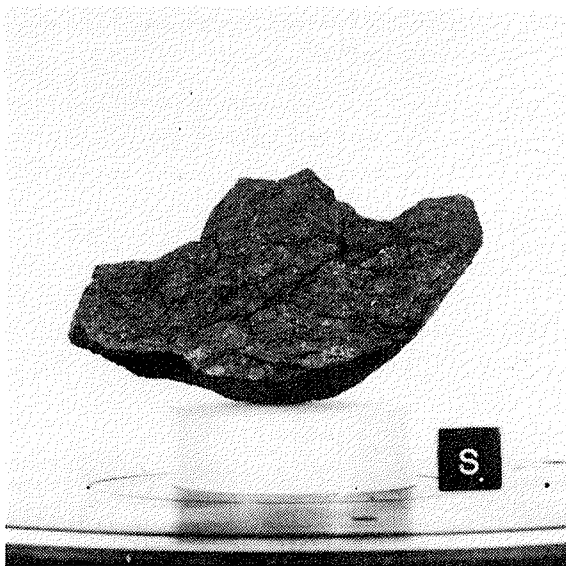
A very weathered and cracked, partly crusted, dome-shaped fragment, now in seven fragments. The fusion crust is dull black with abundant dark brown shiny patches. The interior of the stone is a uniform brown colour with occasional small (-0.5mm across) lighter patches. Chondrules visible on weathered surface.

Petrographic Description:

In thin section this stone consists of abundant closely packed chondrules and chondrule fragments set in a very fine grained, pale brown-green matrix. Most chondrules are less than 0.4mm across, commonly around 0.1 to 0.2mm across. A few larger chondrules are present, with the largest 2mm across. Melilite-spinel-fassaite-anorthite inclusions are present up to 1mm across but more commonly 0.1mm across. Olivine is by far the most abundant silicate mineral and many granular olivine chondrules occur. Monoclinic pyroxene is readily seen however. The section is crossed by a few sinuous cracks which are filled with red-brown limonitic material. Metal and troilite are abundant with the metal usually present as rounded globules about 0.04mm across. Troilite is often much weathered and occurs as porous aggregates. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	1.7	73.5	0.5-5.7
Low-Ca pyroxene	1.5	66.7	0.4-5.7
Anorthite An99.5.	Fassaite, melilite.		

This meteorite is classified as a C03 carbonaceous chondrite.



Yamato-82095

Stone, Chondrite

L3

Weight: 710.18 gms

Dimension: 12.3 x 7.3 x 5.6 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010201

Found: Jan. 2, 1983, T. Katsushima et al.

Physical Description:

A subangular, crusted individual. Moderately weathered. Crust retains flow lines. Interior is generally brown in colour with a few pale chondrules. In some areas a dark glassy matrix is present.

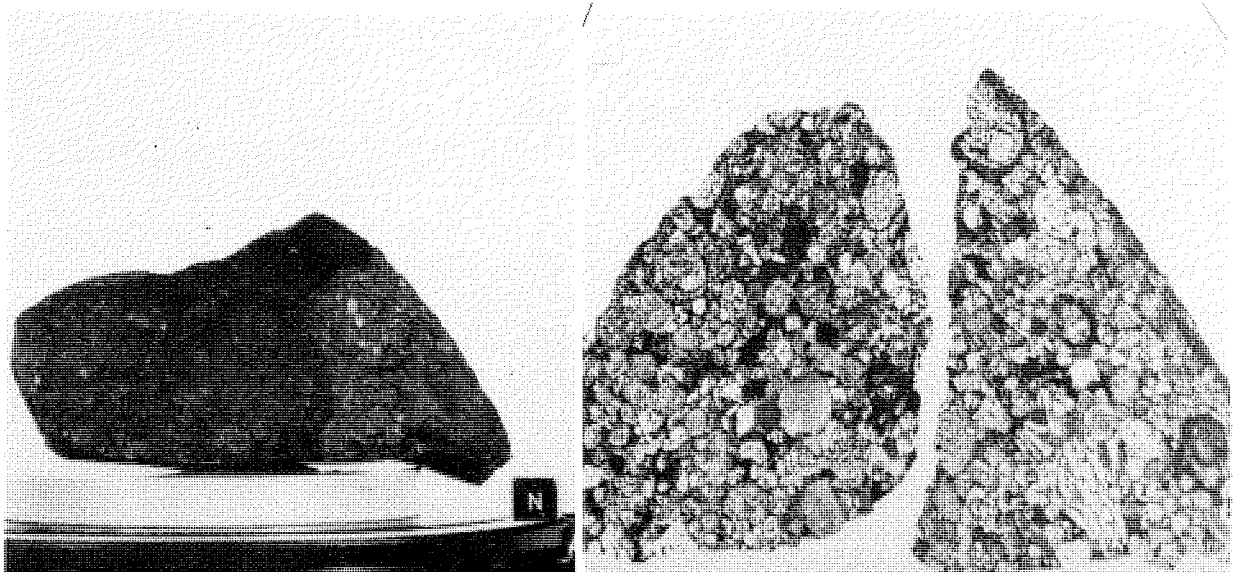
Petrographic Description:

In thin section this stone consists of abundant closely packed chondrules with some chondrule fragments all of which are set in a very fine grained dark brown matrix. Chondrules range in size to a maximum of about 1.4 mm across. Radiating pyroxene, barred olivine and porphyritic olivine chondrules are present, some contain lilac to pale brown glass. Twinned monoclinic pyroxene is common. Metal and troilite occur as irregular angular grains up to 1 mm across, the most common size being 0.1 to 0.2 mm. Some troilite shows a porous structure due to oxidation. The silicates are, in the main, not stained by oxidation products and there is no veining. Very similar in texture and mineral chemistry to Yamato 82096 and is probably to be paired with this stone.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.6	3.0	18.1-27.2
Low-Ca pyroxene	12.4	32.3	4.8-21.4

This meteorite is classified as an L3 chondrite.



Yamato-82096

Stone, Chondrite

L3

Weight: 168.51 gms

Dimension: 6.2 x 4.5 x 3.0 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010202

Found: Jan. 2, 1983, T. Katsushima et al.

Physical Description:

A subangular, nearly completely crusted individual. Interior consists of abundant chondrules and chondrule fragments set in a dark brown glassy matrix.

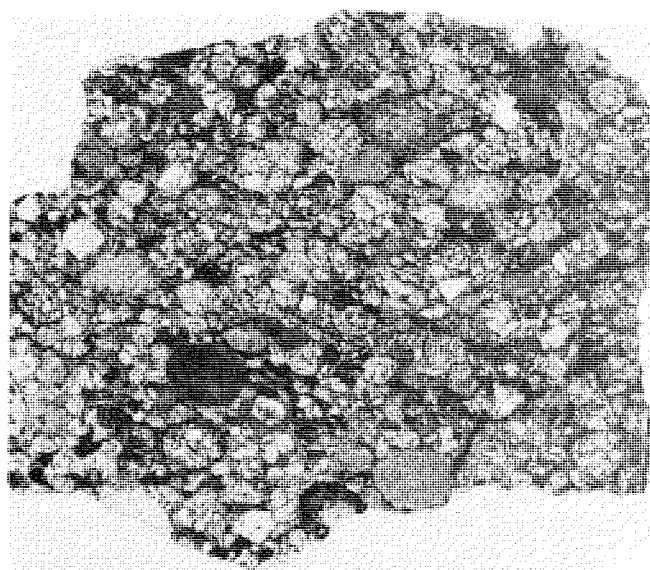
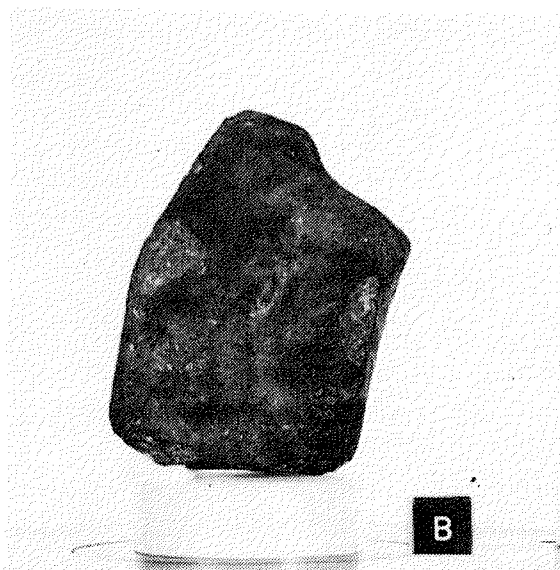
Petrographic Description:

In thin section this stone consists of abundant closely packed chondrules and chondrule fragments set in a fine grained matrix. Some chondrules are distorted while others are almost perfectly circular; they range in size up to around 2mm across. Pale lilac to brown glass is present in some chondrules. Twinned monoclinic pyroxene is common. Metal and troilite are homogeneously distributed, metal in angular grains up to 0.3mm across. Some of these are extensively oxidized. Troilite is present in small angular grains up to 0.2mm across but most are around 0.05 and show evidence of partial oxidation. This stone is similar to texture and mineral chemistry to Yamato-82095 and is probably to be paired with this stone.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.9	3.2	21.9-29.4
Low-Ca pyroxene	15.7	36.9	4.3-34.1

This meteorite is classified as an L3 chondrite.



Yamato-82100

Stone, Achondrite, Ca-poor. Ureilite

Weight: 12.36 gms

Location: Yamato Mountains, Antarctica

Dimension: 2.6 x 2.5 x 1.2 cm

Degree of Weathering:

Original Number: 83010303

Degree of Fracturing:

Found: Jan. 3, 1983, T. Katsushima et al.

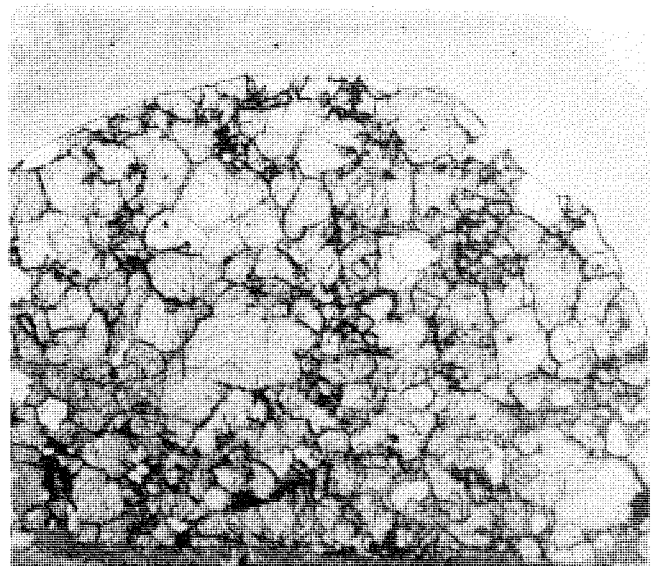
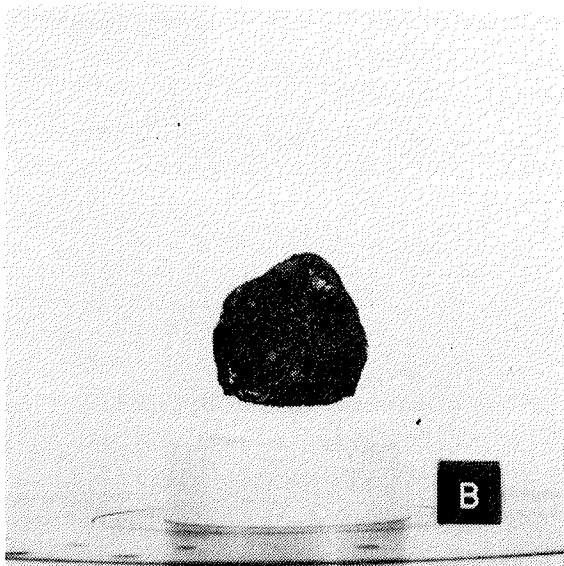
Physical Description:

A complete, crusted orientated individual. The fusion crust is shiny black with very fine flow lines. The anterior surface shows abundant cracks many of which meet at 120° suggesting crystal boundaries. Two differently weathering minerals are present, one more resistant and retaining its glassy crust, the other weathering to a dull surface. The latter mineral has etched borders resulting from weathering. Probably olivine is the more weathered mineral, pyroxene the less weathered. The stone is a ureilite.

Petrographic Description:

The stone consists of an equigranular assemblage of olivine and pigeonitic pyroxene. The grain size ranges 0.5 mm to 2 mm and 120° junctions are common. The stone has been lightly shocked, the pyroxenes show undulose extinction and the cleavage is well developed. The silicates contain a little free metal, very rarely as rounded metal grains around 20 μm in diameter but more usually as very fine grained material and veins less than 3 μm wide. Most of the metal occurs as discontinuous veining around 30 μm wide between silicate crystals. The remainder of this veining is composed of abundant graphite and very minor troilite and niningerite. Diamonds were not noticed during the preparation of the thin section. Some of the silicates are stained brown by oxidation products.

Microprobe data: Olivine  $Fa_{2.8}$  (rim)  $Fa_{17.6}$  (core); pyroxene  $En_{76.5}$   $Fs_{14.8}$   $Wo_{8.7}$





Yamato-82111

Stone, Chondrite

H6

Weight: 9011 gms

Dimension: 22.9 x 14.5 x 11.7 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010801

Found: Jan. 8, 1983, T. Katsushima et al.

Physical Description:

A rounded individual with a few small patches of crust remaining distributed randomly over the specimen. The present surface is a fairly uniform shiny mid-brown colour and shows signs of incipient spheroidal weathering. Very similar to Yamato-82161 and may be part of a shower.

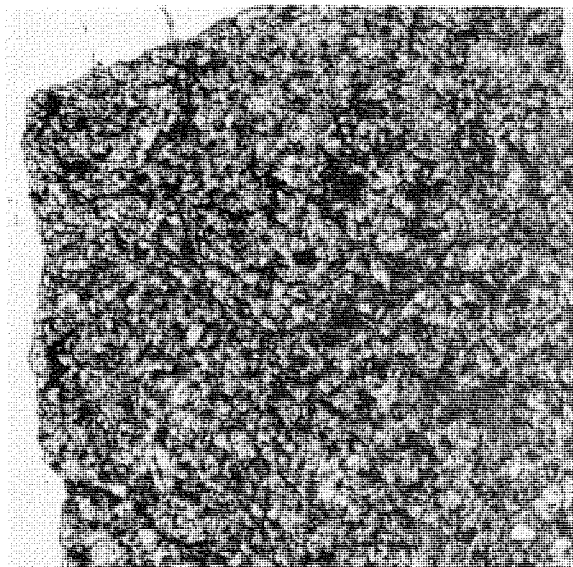
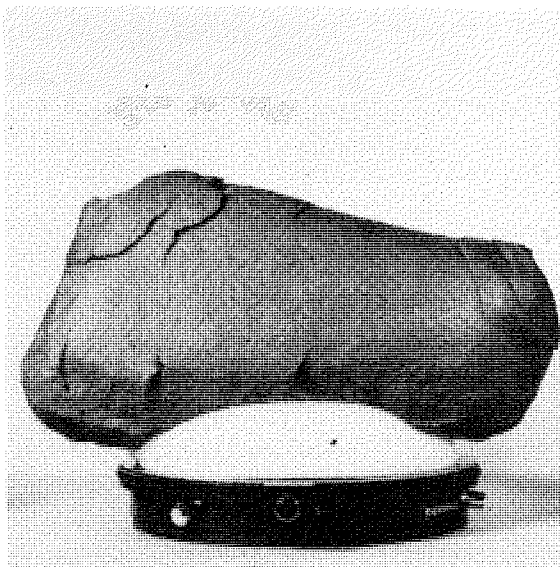
Petrographic Description:

The section shows nearly granular texture of olivine pyroxene, nickel-iron and troilite. Remnants of chondrules are very rare. A little untwinned plagioclase is present as interstitial grains between olivine and pyroxene. Thin limonite veins develop throughout the section, but only small amount of the nickel-iron grains are altered to reddish brown limonite.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.6	1.8	17.8-19.3
Low-Ca pyroxene	16.2	2.1	15.4-16.9

This meteorite is classified as an H6 chondrite.



Yamato-82122

Stone, Chondrite

H6

Weight: 1521.8 gms

Dimension: 11.7 x 8.7 x 7.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010809

Found: Jan. 8, 1983, T. Katsushima et al.

Physical Description:

A rounded, heavily weathered but coherent, almost complete individual which has lost some fragments by spheroidal weathering. Small patches of fusion crust remain, and are situated at the centres of the original faces of the stone. The internal features obscured by brown limonitic weathering products and chondrules are rare. This specimen is apparently similar to Yamato-82111 and is best regarded as part of that fall.

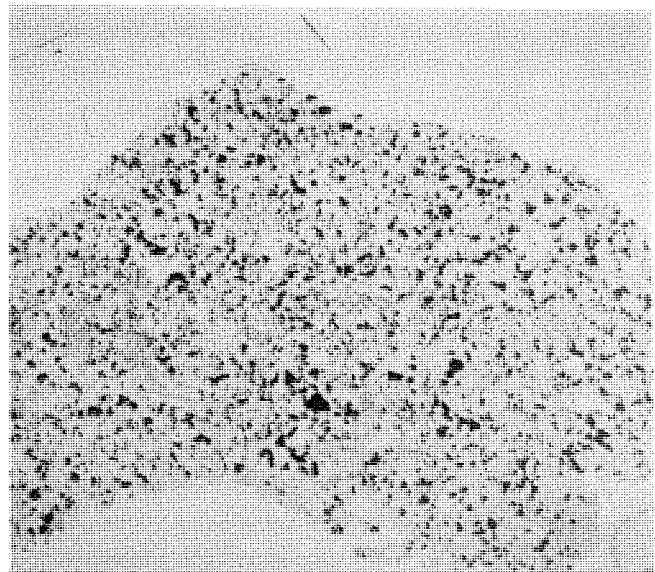
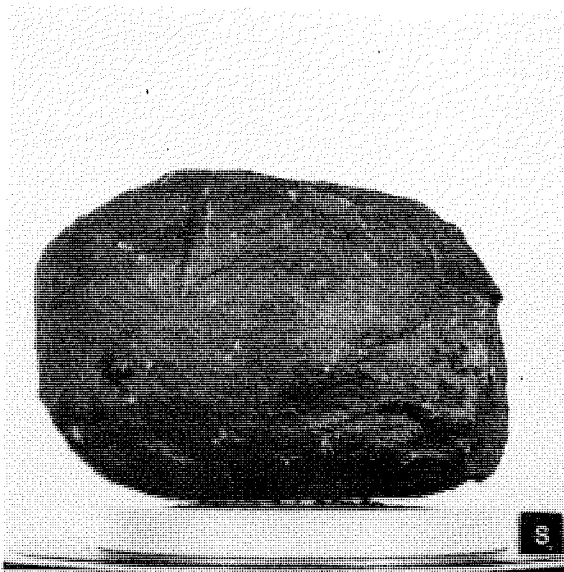
Petrographic Description:

The section shows nearly granular texture of olivine, pyroxene, nickel-iron and troilite. Remnants of chondrules are very rare. Weathering degree is moderate with thin limonite veins throughout the section. The texture and the weathering degree of this meteorite is similar to Yamato-82111.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	19.4	2.0	18.7-20.0
Low-Ca pyroxene	16.7	1.5	15.9-17.2

This meteorite is classified as an H6 chondrite.



Yamato-82133

Stone, Chondrite

H3

Weight: 93.28 gms

Dimension: 4.7 x 3.4 x 3.0 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010820

Found: Jan. 8, 1983, T. Matsushima et al.

Physical Description:

A very weathered and friable mass with a little fusion crust. Chondrules are clearly visible and abundant and set in a dark, very oxidised matrix. This matrix has been preferentially weathered away leaving the chondrules projecting from the interior surfaces.

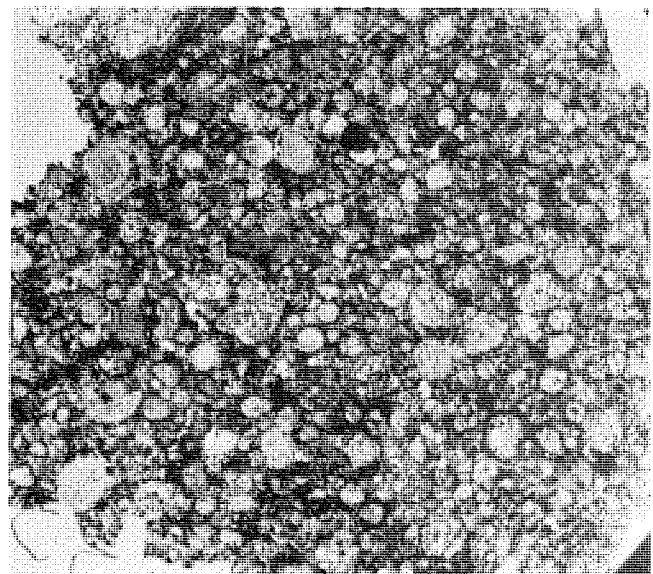
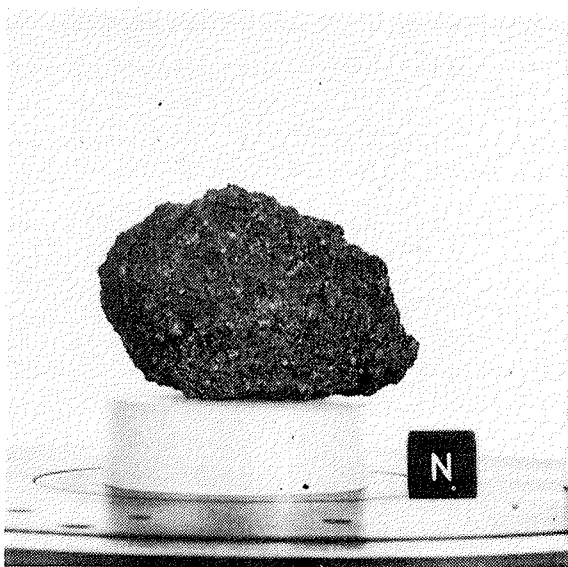
Petrographic Description:

A close-packed aggregate of chondrules and clastic fragments set in a network of brown-yellow iron oxides. Many chondrules are completely rimmed by oxides. Porphyritic, radiating and granular crystalline chondrules are present. Abundant pink, partly devitrified, glass occurs within chondrules. Polysynthetically twinned pyroxene is common. Troilite is mainly present as porous aggregates of residual material associated with iron oxides. A few small troilite crystals are within the chondrules. Metal is present as small, well distributed fragments.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	15.4	33.1	0.6-27.8
Low-Ca pyroxene	11.4	48.9	2.1-37.6

This meteorite is classified as an H3 chondrite.



Yamato-82161

Stone, Chondrite

H6

Weight: 757.56 gms

Dimension: 11.6 x 10.6 x 4.5 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010848

Found: Jan. 8, 1983, T. Katsushima et al.

Physical Description:

Exterior fragment of a large mass with one small piece of fusion crust remaining. Very weathered, the surface of the mass is brown with pale green flecks of olivine and pyroxene. No veining or other internal distinguishing features visible. Very like Yamato-82111 and possibly part of that fall.

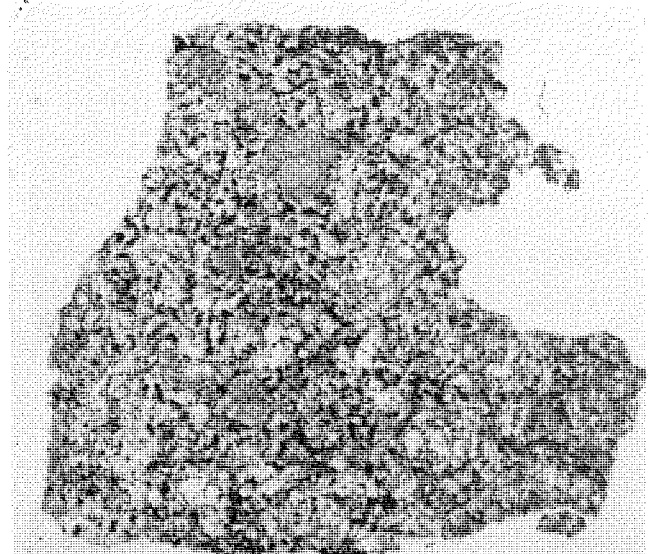
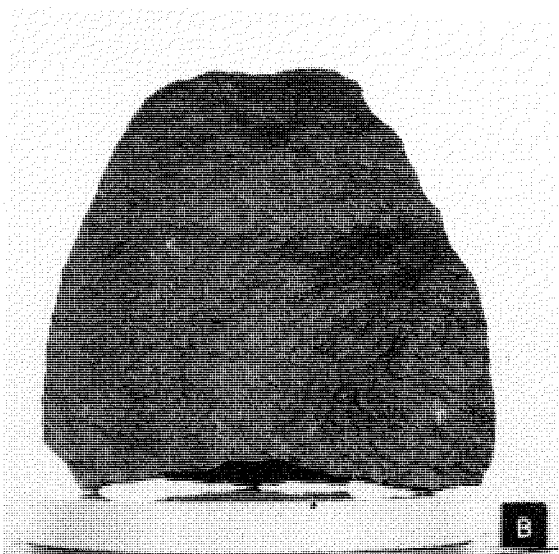
Petrographic Description:

Seen in thin section this meteorite consists of a granular aggregate of olivines and low-Ca pyroxenes having an average grain size of around 100  $\mu\text{m}$  across. A little more finely crystalline interstitial material is present and a few ill defined chondrules also occur. A thoroughly equilibrated meteorite. Metal occurs as rounded to sub-rounded grains, the largest having a maximum dimension of about 100  $\mu\text{m}$ , and is occasionally associated with oxides. Troilite grains are generally smaller than the metal grains and slightly less abundant. Some troilite shows slight cracking where it has been oxidised. In some areas of the section the silicates have been stained pale brown by iron oxides.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.7	2.1	17.5-19.5
Low-Ca pyroxene	16.6	3.7	15.6-24.4
Plagioclase An	12.6 Or 5.6		

This meteorite is classified as an H6 chondrite.



Yamato-82163

Stone, Chondrite

H6

Weight: 3622 gms

Dimension: 16.1 x 13.5 x 10.2 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010850

Found: Jan. 8, 1983, T. Katsushima et al.

Physical Description:

A very oxidised, rounded, partly crusted individual stone which is now showing extensive spheroidal weathering. The fusion crust is dull black and only remains at the approximate middle of the original faces. The corners (edges) have all been eroded away. The specimen is similar in appearance to Yamato-82111 and is best considered part of that fall.

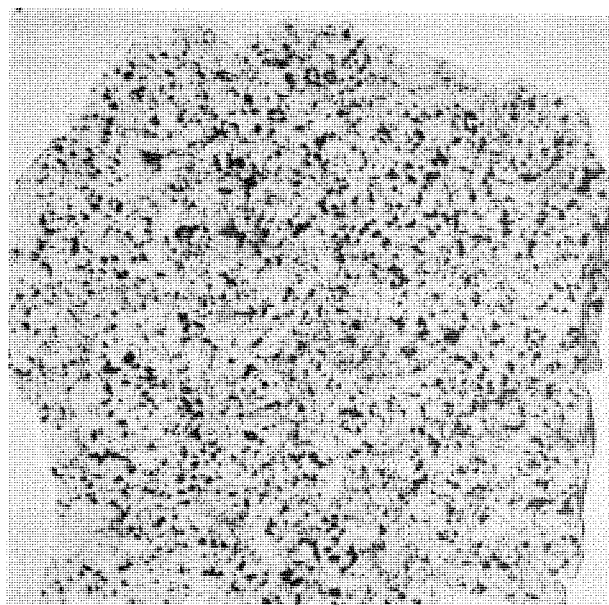
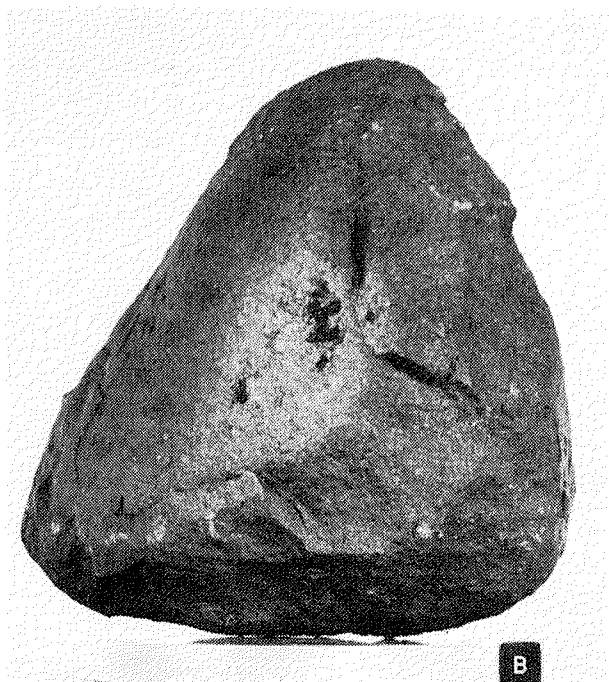
Petrographic Description:

Most of the section shows nearly granular texture of olivine, pyroxene, nickel-iron and troilite. A little barred olivine chondrules are remained. The size of crystals is 0.1-0.3mm in diameter. Weathering degree is moderate. The texture of this section is apparently similar to Yamato-82111 and -82122.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	19.6	1.5	18.6-20.2
Low-Ca pyroxene	16.9	2.3	16.1-17.4

This meteorite is classified as an H6 chondrite.



Yamato-82177

Stone, Chondrite

H6

Weight: 1122.6 gms

Dimension: 11.2 x 10.2 x 5.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83010909

Found: Jan. 9, 1983, T. Katsushima et al.

Physical Description:

A very weathered but coherent angular fragment with a little dull black fusion crust remaining on the one rounded face. The fusion crust has been largely eroded away and the stone is showing spheroidal weathering. The interior of the stone is red-brown in colour and consists of a granular aggregate of silicates and partially oxidised opaque minerals. Chondrules are rare. Very similar to Yamato-82111 and best regarded as part of that fall.

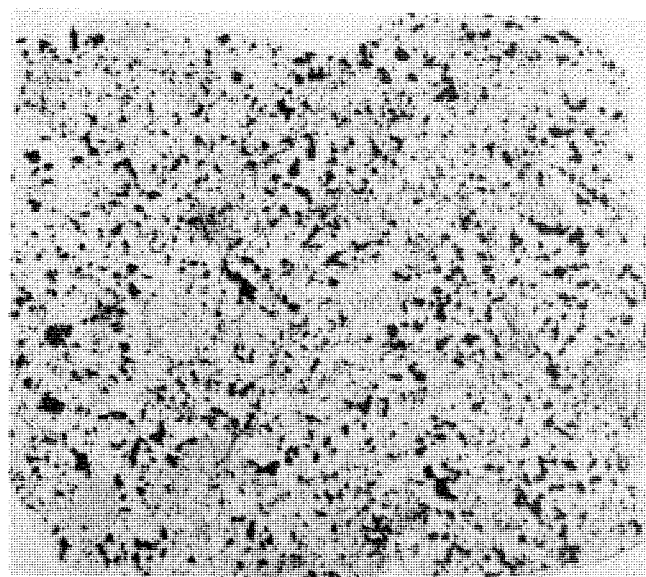
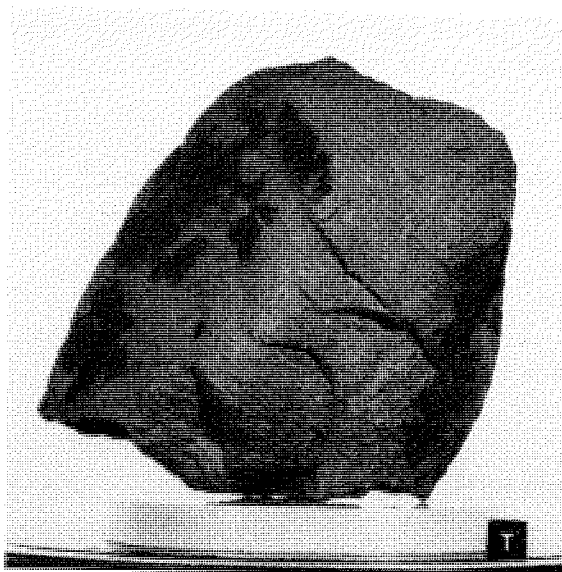
Petrographic Description:

A few ill-defined chondrules are present. Most of the sections shows nearly granular texture of olivine, pyroxene, nickel-iron and troilite. A little plagioclase grains are present as interstitial grains and inclusion of olivine and pyroxene. Many of nickel-iron grains are partly altered to reddish brown limonite.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.7	2.5	17.7-19.7
Low-Ca pyroxene	16.5	3.2	15.4-20.5

This meteorite is classified as an H6 chondrite.



Yamato-82178

Stone, Chondrite

L6

Weight: 884.6 gms

Dimension: 9.4 x 8.7 x 5.5 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83011001

Found: Jan. 10, 1983, T. Katsushima et al.

Physical Description:

A subrounded, almost completely crusted, orientated individual stone. The fusion crust is dull black with shiny patches of brown oxidation products and shows extensive polygonal cracking. The interior of the stone is pale grey-green with rare chondrules and the occasional thin vein.

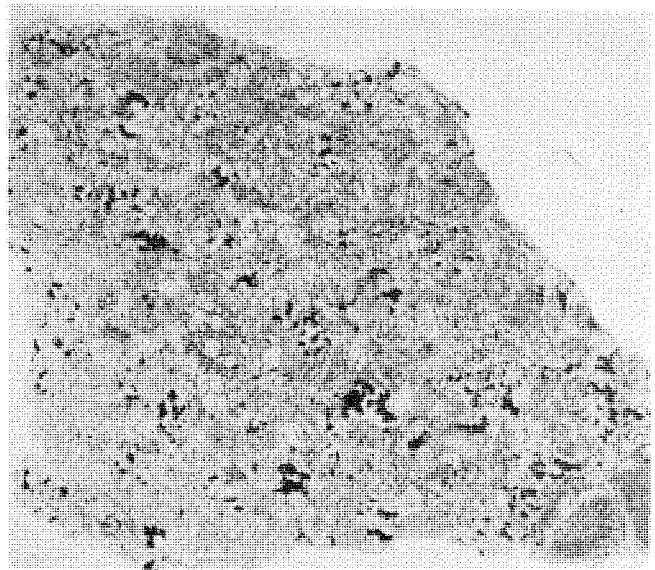
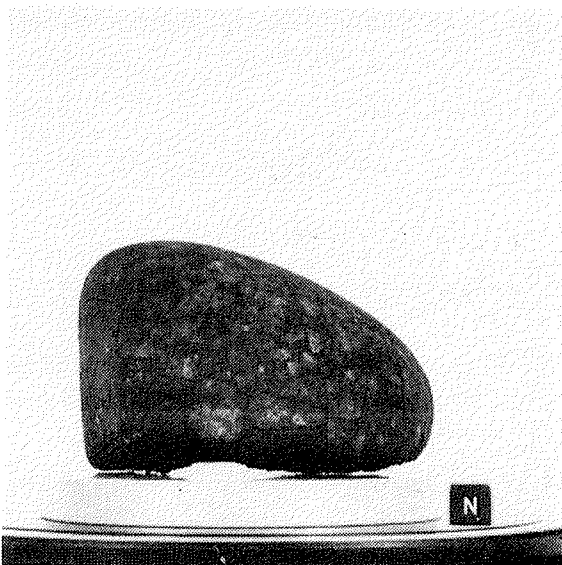
Petrographic Description:

Chondrules are sparse and poorly defined, tending to merge with the granular matrix, which consist of olivine and pyroxene with minor subequal amounts of nickel-iron and troilite. A little untwined plagioclase is present. Some nickel-iron grains obtain reddish brown oxidized halo. Weathering degree of this section is low.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.4	1.1	23.9-25.1
Low-Ca pyroxene	20.3	1.6	19.8-20.9

This meteorite is classified as an L6 chondrite.



Yamato-82182

Stone, Chondrite

H5

Weight: 227.64 gms

Dimension: 7.3 x 5.6 x 4.4 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83011005

Found: Jan. 10, 1983, T. Katsushima et al.

Physical Description:

A nearly completely crusted, angular individual. Crust beginning to oxidise and spall. Moderately altered interior with a few visible chondrules. Chondrules project out of the matrix.

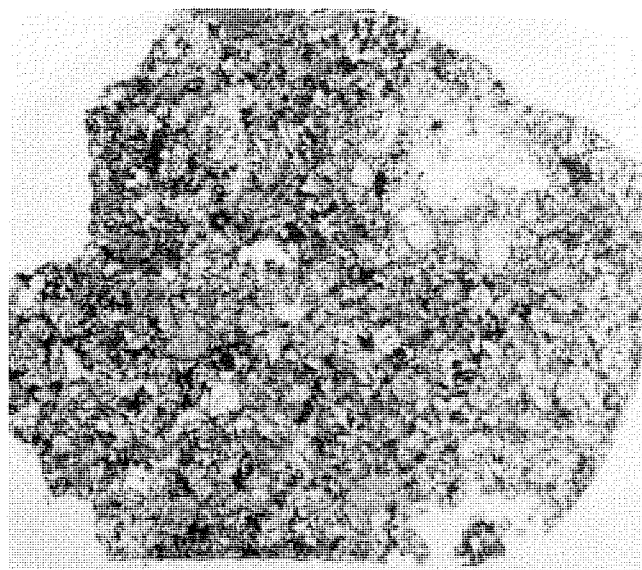
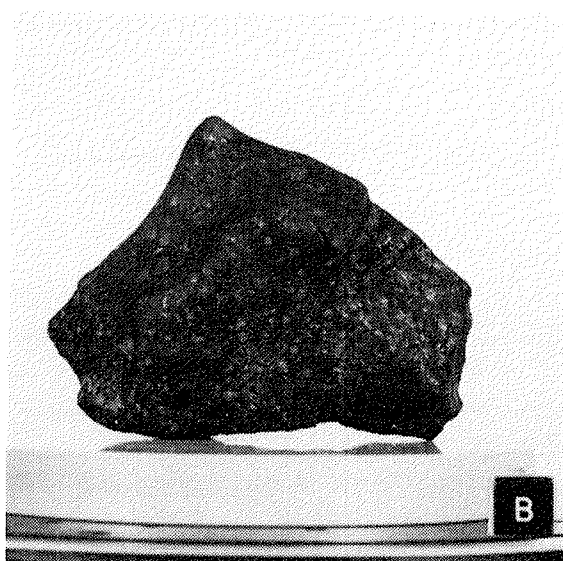
Petrographic Description:

In thin section this stone is composed of olivine and pyroxene crystals around 100 um across forming a partly recrystallized groundmass containing numerous chondrules. These chondrules, though easily recognized, often show indistinct borders to the matrix. Barred olivine, radiating pyroxene and granular pyroxene chondrules are present. A little striated low-Ca pyroxene is also visible. Angular, interstitial metal grains are common, averaging about 0.2 mm across. Chromite grains up to 0.2 mm across occur but most spinel is around 50 um in diameter. Troilite is less abundant than metal, is well dispersed and the grains often show small cracks now filled with oxides. The silicates are lightly stained by oxidation products but no veining is present.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.4	3.2	17.4-23.9
Low-Ca pyroxene	16.6	6.5	15.3-23.0

This meteorite is classified as an H5 chondrite.





Yamato-82187

Stone, Chondrite

L6

Weight: 1238.8 gms

Dimension: 15.7 x 7.4 x 4.6 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83011010

Found: Jan. 10, 1983, T. Katsushima et al.

Physical Description:

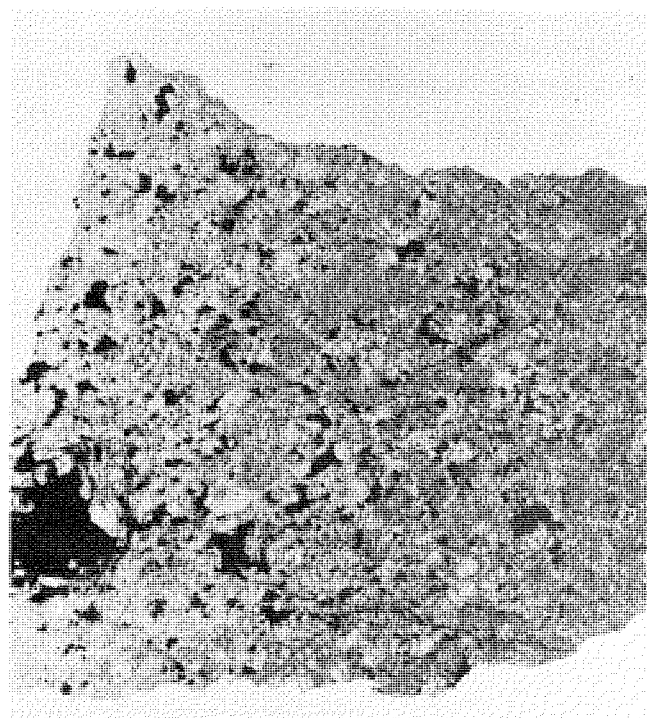
A complete, almost wholly crusted, tabular, individual stone. The fusion crust is dull black with shiny patches of oxidation products and abundant polyhedral cracks. The interior of the stone is poorly exposed but appears to be pale grey-green with abundant brown specks. Chondrules are rare and no veins were seen.

Petrographic Description:

Chondrules are sparse and poorly defined, tending to merge with the granular matrix consisting of olivine and pyroxene with minor amount of nickel-iron, troilite and plagioclase. Weathering degree of this section is low. Texture and weathering degree of this chondrite is similar to Yamato-82178. Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	24.2	1.6	23.1-24.8
Low-Ca pyroxene	20.2	1.6	19.2-20.8

This meteorite is classified as an L6 chondrite.



Yamato-82188

Stone, Chondrite

H5

Weight: 2581 gms

Dimension: 18.2 x 12.1 x 7.8 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83011201

Found: Jan. 12, 1983, T. Katsushima et al.

Physical Description:

A complete, almost wholly crusted, angular individual with two straight cracks running into the specimen. The fusion crust is dull black with shiny patches of oxidation products and abundant polyhedral cracking. The interior of the stone is poorly exposed but moderately weathered and chondrules are visible.

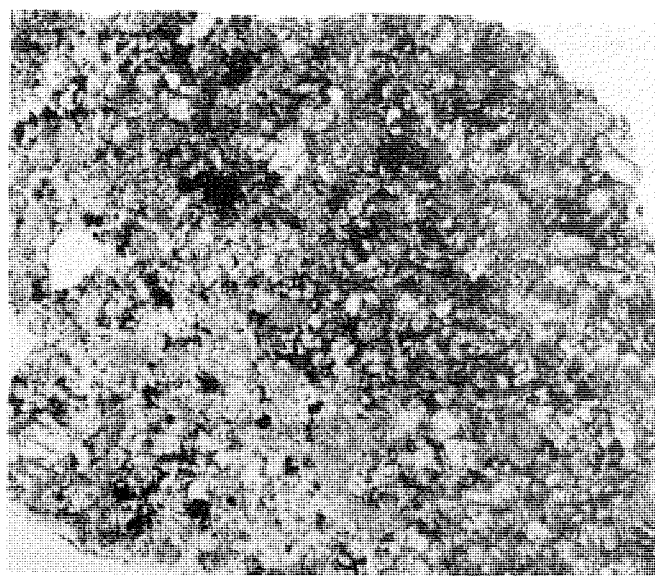
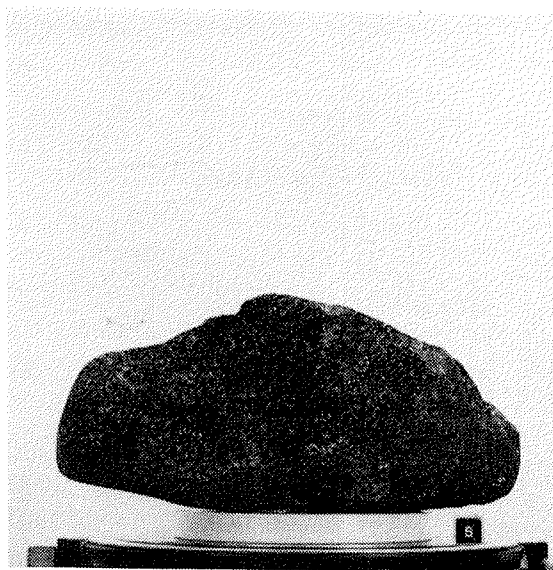
Petrographic Description:

The section shows well-developed chondritic structure. The chondrules are set in a granular matrix. The variety of chondrule types is present: porphyritic and granular olivine, barred olivine and fine grained pyroxene. Irregular-shaped minor nickel-iron and lesser troilite are present between olivine and pyroxene. Most areas of the section show reddish brown in colour for limonitic staining.

Microprobe analyses give the following results:

	Average	% M.D.	Range
Olivine	18.4	2.3	17.6-20.7
Low-Ca pyroxene	16.1	2.2	15.3-16.9

This meteorite is classified as an H5 chondrite.



Yamato-82210

Stone, Achondrite, Ca-rich Eucrite

Weight: 36.69 gms

Dimension: 5.2 x 3.5 x 1.9 cm

Degree of Weathering:

Degree of Fracturing:

Location: Yamato Mountains, Antarctica

Original Number: 83011502

Found: Jan. 15, 1983, T. Katsushima et al.

Physical Description:

A partly crusted fragment forming approximately one third of an individual. The fusion crust is shiny and resicular with no marked flow lines. Internally the specimen is a fine grained breccia with a few basaltic inclusions.

Petrographic Description:

In thin section this stone consists of abundant coarse-grained, basaltic clasts up to 5 mm across and a few areas of brecciated, granular crystals of pyroxene and plagioclase set in a fine grained fragmental matrix. The feldspars are clear and the pyroxenes show no visible exsolution lamellae. Two very fine grained basaltic clasts are also present. Despite this variation in texture, the various clasts and the matrix have very similar mineral chemistries. The pyroxenes range in composition from  $Fs_{40}Wo_{20}$  to  $Fs_{29}Wo_{39}$  with one analysis  $Fs_{29}Wo_{39}$ . The feldspars range from  $Ab_{19}An_{79}$  to  $Ab_{28}An_{72}$ .

