



Antarctic Meteorite NEWSLETTER

A periodical issued by the Antarctic Meteorite Working Group to inform scientists of the basic characteristics of specimens recovered in the Antarctic.

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INTRODUCTION

The discovery in 1969 of meteorites in the region of the Yamato Mountains, Antarctica, has prompted recent expeditions to search for more specimens. The Japanese have subsequently found nearly 1,000 pieces near the Yamato and a joint American-Japanese team have found over 300 pieces in the Transantarctic Range on the other side of the continent. The meteorites have been found in "blue ice" areas of the Antarctic which are regions where the wind has stripped the ice of its snow cover, thereby exposing the finds.

In an attempt to adequately document, describe, handle, and distribute the U.S. collection, the National Science Foundation, Division of Polar Programs has requested the assistance of the Lunar Sample Curator, Johnson Space Center, and the Curator of Meteorites, Smithsonian Institution. The NSF convened an ad hoc committee on November 11, 1977, in Washington, D.C. for the purpose of discussing the curation of Antarctic meteorites. The participants at this meeting were: D. Bogard (JSC/NASA), W. Cassidy (U. Pittsburgh), B. French (NASA Hqs.), B. Mason (Smithsonian), U. Marvin (Smithsonian), J. Papike (SUNY, Stony Brook), C. Ponnamperna (U. Maryland), L. Rancitelli (Battelle, N.W.) and M. Turner (NSF). The result of this session along with other discussions between NASA, NSF and Smithsonian officials is the white paper titled, "A plan for the collection, processing, and distribution of the U.S. portion of the Antarctic meteorites collected during 1977-78" (contained in Appendix 1). This paper defines the philosophy behind the curation scheme, spells out in broad terms the program for curation, and details the responsibilities of each institution. Please read this document if you are at all interested in eventually obtaining specimens for scientific research.

A section within this paper under III.7 and III.8 lists the duties of two advisory groups to the National Science Foundation called the Meteorite Working Group and the Meteorite Steering Group. The Steering Group is composed of four members, one each from NSF, NASA, SI and the university community. The Working Group is composed of approximately ten members representing the curation groups and selected members of the scientific community. The membership of the Steering Group is fixed while the Working Group will rotate membership as required and approved by the National Science Foundation. A complete membership list of both groups including addresses, institutional affiliations and telephone numbers can be found as Appendix 2.

During the meetings of the Scientific Committee for Antarctic Research (SCAR) held recently in Chamonix, France, the U.S. delegate called attention to the recent Antarctic meteorite finds and suggested that questions pertaining to future collection programs be taken under consideration with a view to assuring proper international coordination and protection of this important scientific resource.

PROCESSING AND CURATION OF ANTARCTIC METEORITES

Antarctic meteorites collected during the 1977-78 field season in the vicinity of Allan Hills were treated with some care because of their potential value as specimens which have resided in a cold and relatively clean environment since their fall to Earth. At the time of their recovery in the field, meteorites were placed in Teflon bags and packed in padded metal shipping boxes furnished by the JSC Curatorial Facility. These were shipped at below freezing temperatures to the Johnson Space Center. In a specially established area within the JSC Curatorial Facility, the meteorites will be initially processed, i.e., they will be weighed, photographed (orthogonals for larger specimens), described, and dried of moisture. For most meteorites, a chip will be taken for the preparation of thin sections for initial classification. For many meteorites, an additional chip will be taken and kept at below freezing temperatures for special studies requiring such samples. A Smithsonian Institution number, beginning with 30,001, will be assigned to all specimens and splits. Most meteorites collected during the period 1977-78 by the joint U.S.-Japan team will eventually be sawed, and half will be sent to the Japanese Institute for Polar Research whose representatives participated in the field collection.

Most of the meteorite processing will take place in a dry nitrogen environment in a manner similar to lunar sample processing but under less rigorously controlled conditions. The intent is to prevent any serious contamination of the specimens during processing, to document the specimens and their subsamples, and to make samples available for detailed scientific study as soon as possible. The anticipated order of processing for the initial group of specimens will emphasize the rarer meteorite types but will attempt to cover all major groups represented in the collection. It is anticipated that during the next two to three months, the following will be processed: One carbonaceous chondrite, one large iron, four achondrites, a few chondrites of lower metamorphic grade, several larger ordinary chondrites, and a number of pebble-sized meteorites.

An initial survey will be conducted for the purpose of providing a basic characterization of the collection. In addition to the macroscopic data obtained during sample processing, this survey will be based on brief petrographic descriptions of thin sections by the Smithsonian Institution and the Japanese Institute of Polar Research. Data derived from rapid nondestructive counting of selected specimens will also be included if possible.

Periodic (about 2-5 month intervals) newsletters will be published, which contain basic processing and initial survey information that has been collected on meteorites up to the date of issue. This initial survey information will be of use to anyone wishing to request samples for research and analysis. This constitutes the first of such newsletters, and basic information on three Antarctic meteorites is included herein. If you wish to continue to receive these newsletters, you must inform the Secretary of the Meteorite Working Group. A form for this purpose is attached.

5. Field reports of discoveries by U.S. parties should be reported to the NSF and should be cast for publication in Meteoritical Bulletin format, whereas complete descriptions may be published in the journal of choice of the senior author. Newsletters describing results of the initial processing and the initial survey will be prepared periodically for wide distribution. A monograph will be prepared on the meteorites collected during each field season.

6. A block of numbers will be assigned by the Smithsonian Institution for the Antarctic meteorites. An SI catalog number will be assigned to each specimen and will be carried by that specimen throughout processing and distribution.

7. Final decisions on the processing, initial survey, and subdivision of each meteorite will remain with the NSF, after consideration of the recommendations of the Meteorite Working Group (MWG) appointed by NSF and consisting of the PI (Chairman), representative(s) of JSC, representative(s) from SI, and representatives from the interested scientific community. The committee will report to the NSF via MSG (see below) and will be charged with the following:

a. Defining the conditions of initial processing of each sample at JSC.

b. Conducting a preliminary examination on each sample (either through direct participation or through selected investigators).

c. Publishing results of the initial descriptions and of the availability of samples for scientific study.

d. Determining the initial division of each meteorite as to the size of the portions stored under cold conditions, sent to Japan, sent to the SI, and retained at JSC. The size of the portions distributed to the SI and JSC will be based on the mass available, the scientific uniqueness of the meteorite, and the relative probability that a number of meteorite investigators will request samples.

e. Recommending what research needs to be done on those samples not being requested.

8. Advice to the NSF on the programmatic aspect of the Antarctic Meteorite Program shall be vested in a Meteorite Steering Group (MSG) consisting of representative of the NSF (chairman), a representative of the Smithsonian Institution, a representative of the NASA Office of Space Sciences, and Dr. William Cassidy, principal investigator for Antarctic meteorite collection. This committee will be charged with the following:

a. Suggest institutional and programmatic support.

b. Review, approve and transmit to NSF for final approval the recommendations by MWG regarding distribution of samples to repositories and distribution of samples for investigation.

c. Act as an appeals board for any contested decision of the program to NSF.

d. Recommend ways to expand the international cooperation in research on Antarctic meteorites.

9. The disposition of samples to interested meteorite investigators will be based upon the merit of the proposed research, the mass of sample available, the uniqueness of the meteorite requested and any special requirements stipulated. The MWG will review all sample requests. Accepted requests will be directed to either the JSC or SI to be filled depending upon the sample requirements indicated by the investigator. No work beyond meteorite classification will be done before distribution to the Japanese.

In one to two years, or when the majority of the specimens obtained from the 1977-78 field season have been processed, a catalog will be published. The catalog will contain all the specimen information published in the newsletters, plus photographs, brief descriptions of the field areas, and other pertinent sample information. Readers are invited to send comments and suggestions on the newsletter and the attached plan for meteorite curation to the Chairman of the Meteorite Steering Group, Dr. Mort D. Turner. We anticipate possible opportunities for improvement of these procedures.

REQUIREMENTS AND PROCEDURES FOR ANTARCTIC METEORITE SAMPLE REQUESTS

Formal requests for Antarctic meteorite samples for scientific research should be submitted in writing to the Secretary, Meteorite Working Group, Curator's Branch, Code SN2, Johnson Space Center, NASA, Houston, Texas 77058. Requests are welcome from all qualified U.S. and foreign scientists and will be reviewed and considered two or three times each year by the Meteorite Working Group of the National Science Foundation. In order for a request to be considered, it must arrive in the Secretary's office prior to a deadline published periodically in the newsletter. Consideration will be given to sample requests independently of whether or not the requestor is presently funded for meteorite or lunar sample studies. It should be noted that sample allocation does not in any way commit funding agencies to financing of the proposed research on Antarctic meteorites. Requests for financial support for research, if required, must be submitted separately to the appropriate funding agencies.

Sample requests should provide detailed scientific justification of the proposed research. Requests for specific samples should include sample numbers, weight requirements, special handling and shipping requirements, etc. Consortium type sample requests which are aimed at in-depth studies of specific samples by groups of scientists of different specialities are encouraged. Relevant sample information will be contained in the newsletters published by the Meteorite Working Group of the NSF through the Office of the Curator, Johnson Space Center, Houston, Texas.

Investigators wishing to study polished thin sections of Antarctic meteorites in support of their sample requests can do so at the thin section libraries, which are being established at the Johnson Space Center (contact Secretary, Meteorite Working Group), at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (contact Brian Mason, Curator), or at the National Institute of Polar Research, Ministry of Education, 1-9-10, Itabashi-ku, Tokyo, 173, Japan (contact T. Nagata, Director and K. Yanai, Curator). These sections are for optical examination only and cannot be loaned out.

All allocated Antarctic meteorite samples remain the property of the National Science Foundation and are subject to recall to avoid any unnecessary duplication of effort. Any changes in the scope of research on allocated samples not detailed in the original sample request must be coordinated in advance with the Meteorite Working Group.

IV. Suggested field procedures for collecting Antarctic meteorites.

1. Given ideal field conditions:

a. Photograph specimen(s) in situ. Mark ice with a number and an arrow pointing north (if possible), place a scale next to the specimen, and take as many photos as necessary to show details of the meteorite and the site.

b. Use clean Teflon bags and other equipment supplied by JSC to collect meteorites without ever touching them.

c. All meteorites should be deep frozen and out of sunlight.

2. Given less than ideal field conditions:

a. Scoop up the meteorite somehow; a dirty and undocumented meteorite is better than no meteorite at all.

3. If meteorites are too large to fit into bags:

a. Photograph the meteorites as completely as possible.

b. Collect by whatever means are necessary, assuming that the interiors will stay clean whatever is done to the surface.

c. If a specimen cannot be collected immediately, document the location and plan a return trip.

V. Processing and initial survey at JSC.

1. Strawman processing steps:

a. Place specimen in GN₂ (dry nitrogen gas) cabinet and maintain cold through step f.

b. Assign SI number to specimen; weigh and describe specimen.

c. Take orthogonal photographs.

d. Take chip for thin section and document.

e. If required, take chip for long-term cold storage and document.

f. Let specimen warm to room temperature inside a dry N₂ cabinet or freeze dry and collect volatiles.

g. Make Al mold of specimen.

h. Store specimen in dry GN₂ until distribution plan is formulated.

i. Determine cutting plan.

j. Saw and/or break specimen as required. Document and describe new faces.

k. Package samples in dry N₂ and distribute as required.

2. Processing priorities will be assigned based on:

a. Field notes on tentative characteristics of collection, e.g., number, size, meteorite type, sample condition (broken surfaces, etc.), sample association (possible single fall).

b. First specimens processed should be one or more examples of specimens believed to belong to a single meteorite fall, so that if these first attempts are

ANTARCTIC METEORITE DATA SHEET

Sample No. 30001
Field No. 78010210A
Weight (gms) 252.0
Meteorite Type L-6 Chondrite

Physical Description:

Fusion crust is mainly missing. One large surface was produced by breaking after fall; complementary fragment is probably in the collection. Original surfaces are considerably weathered. Sawed surface showed unweathered metal particles to within ~1 cm of the surface. Specimen contains several cracks and appears slightly friable.

Other Characteristics:

One existing broken surface contained an irregular, medium gray, fine grained clast ~0.7 cm across. No clasts were noted on the sawed face.

Petrographic Description:

Antarctic meteorite 30001 is a typical L6 chondrite. Chondrules are sparse and poorly defined; maximum diameter is 1.9 mm. Major minerals are olivine (Fa₂₅) and orthopyroxene (Wo_{1.7} En₇₇ Fs₂₁). About 10% of plagioclase (Ab₈₃ An₁₁ Or₆) is present as untwinned birefringent grains up to 0.15 mm across. Minor phases are nickel-iron (~8%), troilite (~6%), diopside (~4%), chromite (<1%) and merrillite (<1%). The small section examined shows no signs of shock or veining. A moderate amount of limonitic staining is present around most nickel-iron grains, none around troilite.

unsuccessful we have not lost an entire meteorite.

- c. In general, larger specimens (>100 g) should be processed before smaller specimens.
 - d. Priorities based on specimen type.
 - e. Priorities based on ease and continuity of processing operations.
3. Grouping of samples to facilitate processing may be made as:
- a. All pieces with broken surfaces, collected in a small area, and apparently part of the same meteorite may be grouped. Effort will be made to relate morphologies of these.
 - b. Ordinary chondrites of same classification may be grouped.
 - c. Carbonaceous chondrites and achondrites will be processed as individuals.
 - d. Iron meteorites will have minimal initial processing.
4. Nature of initial survey.
- a. Intent of initial survey is to basically characterize specimens to facilitate distribution of information without usurping interests of the scientific community.
 - b. Information obtained will consist of macroscopic and binocular descriptions of morphology, fusion crust, and cut and broken surfaces of specimens, and sufficient petrographic information to tentatively classify the meteorite.
 - c. Initial survey examination of any thin sections deemed necessary shall be limited to person(s) designated by the MWG.
 - d. For the 1977-78 meteorite collection any required thin sections will be prepared and examined optically at the Smithsonian Institution.
 - e. A thin section library will be established at JSC and SI for the purpose of inspection but not detailed examination.
 - f. Neither SI nor NASA will conduct investigation of meteorites without proposing work to MWG.
5. Criteria for sample distribution.

Committee decisions as to the cutting and distribution plan for each meteorite will be based on the quantity and "uniqueness" of the specimen. Ordinary meteorites might include ordinary chondrites and most types of irons without long terrestrial ages. Extraordinary meteorites would probably include carbonaceous chondrites, achondrites, breccias, most stony irons, and any other objects that look extraordinary. For ordinary meteorites the majority of the sample remaining after division of the specimen with the Japanese would be sent to the SI, and only a relatively small amount would remain at JSC as a special cold storage sample or for detailed processing. For extraordinary meteorites a relatively large portion would be retained at JSC for detailed processing and a relatively small amount would be sent to the SI.

In the case of extraordinarily precious meteorites, processing steps 1f through 1k above might be deferred pending more detailed studies and discussions. Larger proportions might be retained in cold storage or under nitrogen storage if there appeared to be a special reason for doing so.

ANTARCTIC METEORITE DATA SHEET

Sample No. 30002
Field No. 77122927
Weight (gms) 235.2
Meteorite Type L-5 Chondrite

Physical Description:

Specimen reasonably angular with complete, brownish-black fusion crust which shows appreciable weathering. No broken surfaces to indicate crustal thickness. One large fracture. A few chipped corners show appreciable rusting.

Other Characteristics:

Specimen is approximately 6.5x4.5 cms in dimension.

Petrographic Description:

The meteorite is classified as an L5 chondrite.

Chondrules are prominent and well-defined, 0.3-0.6 mm in diameter; most are porphyritic olivine, some fine-grained pyroxene. The matrix is dominantly olivine, in angular grains up to 1.0 mm in maximum dimension, with lesser amounts of orthopyroxene. Minor minerals in the matrix are nickel-iron, troilite, and chromite; plagioclase is present as very small grains difficult to recognize. The section is stained brown with limonitic materials, and the metal grains are corroded evidently by terrestrial weathering, troilite is unaffected. Microprobe analyses show uniform composition in the olivine (Fa₂₅) and orthopyroxene (Wo_{1.2} En₇₇ Fs₂₂), plagioclase composition averages Ab₈₄ An₁₀ Or₆, but appears somewhat variable.

Procedures to be used in processing selected samples at JSC for meteorite investigators will be established at the conclusion of the initial processing described above and will be based on the character of the specific meteorite and on the capabilities of the Curatorial Facility.

VI. Reporting information.

1. Newsletter

The information gathered by the MWG during the initial survey will be reported periodically in a Newsletter. The Newsletter will be compiled and edited by the MWG and distributed by the JSC Curator's Office. Copies will be mailed to the members of the Meteoritical Society, Lunar Sample Principal Investigators and the NSF for distribution to interested Antarctic researchers. These basic lists will be updated and upgraded from time-to-time.

The Newsletter will be issued when a sufficient number of meteorites have been processed initially to warrant an early report. The periodicity of issue will depend upon the rapidity of initial processing and/or the relative importance of reporting the information. For example, a group of irons might be processed completely before an issue is compiled while a special issue might be printed with the information obtained on a single unusual meteorite.

The content of the Newsletter will be selected so that rapid reporting of information to the scientific community will be accomplished. Information about each processed meteorite will include field observations, initial survey data and inventory data. The field observations will note the location of the find, classification guess, apparent pairing relations with other samples, description of field occurrence, possible sources of contamination, mishandling during collection, photo documentation and other pertinent observations. The initial survey information will consist of classification by simple optics, a brief optical examination of a thin section (if needed) and a description of macroscopic features. Inventory data includes the assigned identification number, specimen weight, and photographs (if available).

2. Monograph or catalogue.

A monograph will be published at some time after the specimens obtained during a field season have been initially characterized. The purpose of the monograph is to provide an integrated account of the field observations, the initial survey, the processing and other systematic data.

The publication of the monograph will be undertaken by Smithsonian under the direction of an editor appointed by MSG. The editor will be responsible for the organization but not necessarily the content of the individual sections. Sectional authors such as the field investigator, the processing supervisors, and the initial survey team will write and review their portions.

The monograph will contain sections that describe the collection, such as: field observations by the PI which may include maps, photographs and site and location descriptions. The processing section may include details of handling specimens, photographs of equipment used and an account of the procedures. Every specimen will be listed by number, with pertinent data on type, weight, and photographs, if possible. Additional characterization information such as photomicrographs, chemical data, age data, etc., may be published.

ANTARCTIC METEORITE DATA SHEET

Sample No. 30306
Field No. 78010402
Weight (gms) 19.91
Meteorite Type Carbonaceous Chondrite - Type C2

Physical Description:

Color: The color is a charcoal-gray with a slight olive-green cast. Weathering rind is 2.0 - 4.0 mm deep and of a lighter gray than the interior.

Interior: Interior is a fine-grained gray matrix with \approx 2-3% light colored inclusions throughout groundmass. Inclusions are irregular in shape. No obvious chondrules are present BUT a few 0.1 - 0.2 spherical-shaped areas are present. These areas are lighter in color. No white veins were observed.

Other Characteristics:

Fusion Crust: Crust is present on approximately 40-60% of the sample. Differential weathering has removed fusion crust in one large area. Remainder of fusion crust is cracked and broken, with furrows across specimen. Crust remaining stands above the interior of the specimen \approx 0.5 - 1.0 mm. Selected areas of crust are vesicular and glassy. - The specimen is remarkably free of limonite stain.

Petrographic Description:

Examination shows that it is a C2 carbonaceous chondrite. Chondrules are sparse, small [up to 0.5 mm diameter], and poorly defined; most consist largely of granular olivine, and some contain small globular grains of nickel-iron. The bulk of the meteorite (80 - 90%) consists of opaque to translucent olive-brown matrix, the translucent material showing weak birefringence; an X-ray powder photograph shows that the matrix consists largely of a layer-lattice silicate, which by analogy with other C2 meteorites can be tentatively identified as a ferruginous chlorite. Scattered through the matrix are colorless birefringent grains, mostly olivine, up to 0.3 mm but usually less than 0.1 mm across. Rare grains of chromite are present in the matrix. A notable feature is the apparent absence of metallic sulphides. The meteorite is moderately porous, containing irregular voids up to 0.3 mm across; the specific gravity, 2.58, measured on a small fragment, is therefore probably somewhat lower than the true value. No evidence of weathering was seen, which suggests that the meteorite may be a recent fall.

The date of publication will probably be one to two years following the initial survey of the collection. The intent is to publish a monograph that is useful in summarizing a single year's collection as opposed to publishing early information.

I wish, do not wish to continue receiving the Antarctic Meteorite
Newsletter.

NAME _____

ADDRESS _____

COMMENTS:

Please mail to:

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Curator's Branch, Code SN2
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Houston, Texas 77058

A PLAN FOR THE COLLECTION, PROCESSING, AND DISTRIBUTION
OF THE U.S. PORTIONS OF THE ANTARCTIC METEORITES
COLLECTED IN 1977-78

I. The aims of the program are:

1. To collect Antarctic meteorites and preserve portions of them under practical pristine conditions so that certain scientific information they may contain is not compromised.
2. To distribute samples as generously as is feasible to scientists and museums.
3. To process a portion of the samples for scientific study in a noncontaminating environment and to fully document such processing.
4. To facilitate international scientific investigations of the collection.

II. Interested parties:

1. The NSF which funds and furnishes logistic support to all U.S. field parties working on the Antarctic continent.
2. The Smithsonian Institution, which maintains the national meteorite collection and has offered its facilities and expertise for curating Antarctic meteorite samples to be used for public displays and for the scientific research that does not require special processing.
3. NASA, which has an ongoing program of funding meteorite research and has offered the facilities and expertise of the Curatorial Facility at the Johnson Space Center for the initial documentation and processing of specimens under cold and clean conditions.
4. The scientific community which conducts research on meteorites.

III. General guidelines for the processing and distribution of specimens:

The following procedures are designed to fulfill all of the stated aims of the program including the interests of all parties. Each meteorite will be treated as a special case and its handling will be determined by expert observers on the basis of its size and character. The guidelines may have to be changed or abandoned under certain conditions.

1. Meteorites will be collected under clean conditions with packaging materials furnished by the JSC Curatorial Facility and shipped from McMurdo to the Johnson Space Center at sub-freezing temperatures..
2. Initial processing and documentation of the meteorites at JSC will include weighing, photography, retention of a subsample at below freezing temperatures, freeze-drying, preparation of a shell, and chipping and sawing. A small chip will be taken from each specimen, where required, for the purpose of preparing a thin section and classifying the meteorite type.
3. The principal investigator and co-investigator of the field party which collected the meteorites will have the option of participating in the initial survey.
4. One-half of every meteorite collected during the 1977-78 field season will be sent to Japan as per international agreement.

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APPENDIX II