

# LUNAR AND PLANETARY INSTITUTE

3303 NASA ROAD 1 HOUSTON, TEXAS 77058



## ANALYSIS OF RETURNED COMET NUCLEUS SAMPLES

*January 16-18, 1989*

### **Second Circular - Call for Abstracts**

*(Deadline: November 1, 1988)*

Thank you for your interest in the Workshop on Analysis of Returned Comet Nucleus Samples. More than 250 responses from around the world and across many scientific disciplines have been received.

#### **Workshop Dates and Location**

**Please note that the dates for this Workshop have been changed to January 16-18, 1989.** This change will avoid conflict with the International Mars Symposium. The Workshop will be held at the Embassy Suites in Milpitas, California, at the south end of the San Francisco Bay (see logistics section in this announcement).

#### **Workshop Objectives**

The Rosetta Mission will return samples from the nucleus of a comet for study in Earth based laboratories. The detailed study of these samples is a crucial component of a program of cometary science aimed at obtaining deeper understanding of the origin and evolution of a comet and its component and, by extension, the relationship of comets and their components to circumstellar and interstellar matter, to other solar system bodies and to evolutionary processes in the early solar system.

The objectives of the workshop are as follows. (1) To define the laboratory measurements, remote observations, and theoretical investigations, connected with the study of returned samples, which will be important for attaining these science goals. (2) To identify the technological developments necessary to make those measurements. (3) To determine the requirements for sample collection, delivery and curation which will be necessary to obtain and preserve samples in a suitable state to make those measurements. (4) To foster interdisciplinary interactions among scientists that will lead to optimization of future scientific returns from the Rosetta Mission and the analysis of returned comet nucleus samples.

#### **Workshop Presentations**

Presentations in the technical sessions will consist only of invited review talks of varying length and poster presentations. One evening session will feature a panel discussion. The reviews will cover the topics described under "Outline of Workshop Topics" and should serve as points of departure for new work addressed in more detail by posters. There will

be some room on the program for additional invited presentations, and suggestions for talks would be welcome (please submit to LeBecca Turner, LPI, by September 15). Manuscripts for invited papers should be brought to the workshop; information for manuscript contributors will be mailed under separate cover. A post-workshop publication will be produced.

Ample time will be provided for poster sessions. These sessions will be scheduled to occur during 2 hour long blocks of time set aside for a buffet lunch on Monday and for cocktails/hors d'oeuvres Monday and Tuesday evening in the poster area. Maximum poster size is limited to an area 4 x 4 feet. Poster presentations must be supported by a contributed abstract. The scheduling of poster displays will be announced in the final circular.

### **Abstracts**

Instructions and forms for submitting abstracts to the workshop are enclosed. Abstracts must be no longer than 2 pages, including figures, tables, and references. The **deadline** for receipt of abstracts by the LPI Publications Office is **November 1, 1988**. If you have any questions regarding the submission of your abstracts, please contact Stephanie Tindell, LPI Publications Office, at 713-486-2143.

### **Outline of Workshop Topics**

#### **I. SOURCE REGIONS FOR COMET COMPONENTS**

(What predictions can be made about the chemical and physical properties that could be confirmed by analysis of a returned comet sample?)

##### **A. Nature of presolar gases and grains as inferred from theory observation and experiment.**

1. Nucleosynthetic signatures and circumstellar matter (includes light and heavy elements, grains, gases).
2. Interstellar origins and processing (to include protostellar collapse stage, to include organic chemistry).

##### **B. Nebular and post-nebular processes bearing on composition and structure of comets and components.**

1. Solar nebular condensates, their structure, composition and mixing in the nebula.
2. Non-equilibrium synthesis and alteration of components, e.g. by radiation, thermal effects shock.
3. Aggregation of gas and dust to comets (microscopic to macroscopic properties).

4. Post-nebular processing of comet surface (cosmic ray irradiation, thermal evolution, crust formation; implications for sample site selection, sampling depth, and other sample return issues).

## II. INSIGHTS INTO COMETS AND EARLY SOLAR SYSTEM PROCESSES GAINED FROM OBSERVATIONS AND ANALYSES OF PRIMITIVE SOLAR SYSTEM MATERIALS

### A. Results from Halley: New cometary phenomena and limitations of data.

1. Gas and ice composition: Elemental, molecular (including relationship to parent molecules), and isotopic composition.
2. Dust composition, size distribution (heterogeneity) and density.
3. CRAF mission description.

### B. Evolutionary process in the early solar system as revealed by studies of primitive meteorites and interplanetary dust particles (e.g., thermal metamorphism, aqueous alteration, shock effects, cosmic ray irradiation).

### C. Carbon chemistry of meteorites: Relationships with parent body, solar nebular, interstellar and circumstellar phenomena.

## III. METHODOLOGIES FOR STUDY OF COMET NUCLEUS SAMPLES

(What can be learned from cometary samples with current measurement methods? What needs to be developed for the future to optimize science from returned sample?)

### A. Isotopic and radiometric measurements (light, heavy and noble elements).

### B. Mineralogy-Petrology (optical and electron microscopy, etc.)

### C. Chemical composition (grain by grain and bulk).

### D. Physical properties of grains and bulk samples.

### E. Organic chemistry.

### F. Icy sample handling techniques.

### G. Spectrometric and photometric properties.

### H. Macroscopic physical structure and chemical composition of core sample.

IV. LABORATORY SIMULATIONS OF ASTRO-PHYSICAL/CHEMICAL AND COMETARY PROCESSES

(What properties of comets and their components are predicted on the basis of laboratory experiments?)

- A. Astrophysical/chemical processes acting on cometary components and comets in the interstellar medium and the solar nebula.
- B. Cometary processes: e.g., accretion, crust formation, sublimation.

V. PANEL DISCUSSION TO ADDRESS THE FOLLOWING SAMPLE ACQUISITION, HANDLING, AND CURATION ISSUES

- A. Acquisition, handling and storing of icy samples: requirements for equipment, materials and environmental control.
- B. Strategy for preliminary examination and allocation of samples.
- C. Central analytical facility concept.

**Logistics**

The Embassy Suites in Milpitas, California has been selected as the meeting site for the workshop. A block of rooms have been reserved at special rates of \$57/\$67 single/double occupancy (plus 8% tax). These rates include a complimentary cooked-to-order breakfast each morning, a two room suite, and two hours of cocktails each evening. The hotel has a no-tipping policy for its staff. Each of the two room suites includes a separate living room, dining area, queen size sleeper, microwave, refrigerator, coffee maker, wet bar, television in each room and two dual line telephones. A brochure describing the facility is enclosed.

The Embassy Suites - Milpitas is located 5 minutes from Ames Research Center, 7 minutes from San Jose International, 30 minutes from Oakland International, and 45 minutes from San Francisco Airport. A map showing the location of the hotel in relationship to the San Jose/Oakland/San Francisco airports is also enclosed. The hotel provides courtesy transportation from San Jose airport to the hotel. A transportation service, the Airport Connection, is available at either the San Francisco or Oakland airport to Milpitas. Additional information on this transportation company will be provided in the final circular.

The hotel has provided the enclosed cards for your use in making your reservations. **Please send these cards to the hotel or call in your reservation by December 19th.** If you call in your reservation, be sure to identify yourself as part of the LPI Comet Samples Workshop group to qualify for the special room rates (standard rates are \$104/\$119).

More information concerning the workshop schedule, registration fee (expected to be ~\$100), transportation, and the hotel facilities will be sent to you in the final circular. If you have any questions concerning the meeting logistics, contact LeBecca Turner, LPI, at 713-486-2158.

*Sherwood Chang*  
*Workshop Convener*

#### PROGRAM COMMITTEE MEMBERS

Thomas Ahrens (Ex Officio)  
C. I. T.  
Seismology Lab 252-21  
Pasadena, CA 91125

Jeff Cuzzi  
NASA Ames Research Center  
MS 245-3  
Moffett Field, CA 94035

Lou Allamandola  
NASA Ames Research Center  
MC 245-6  
Moffett Field, CA 94035

Martha Hanner  
Jet Propulsion Laboratory  
Code 183-401  
4800 Oak Grove Dr.  
Pasadena, CA 91109

David Blake  
NASA Ames Research Center  
MS 239-4  
Moffett Field, CA 94035

John Kerridge  
Institute Geophysics  
University California  
Los Angeles, CA 90024

Donald Brownlee  
Physics Hall  
University of Washington  
Seattle, WA 98195

Larry Nyquist  
NASA JSC  
Code SN4  
Houston, TX 77058

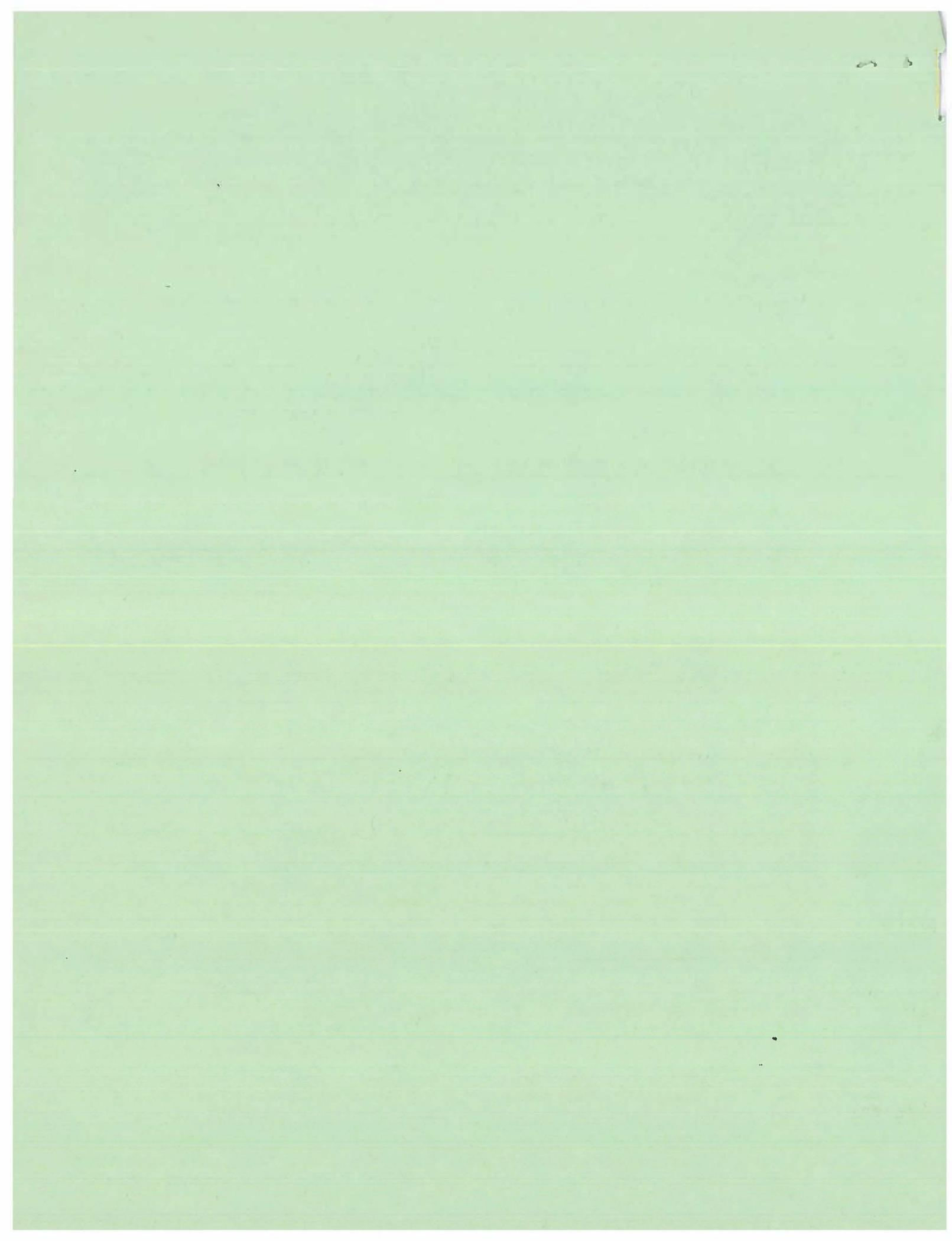
Theodore E. Bunch  
NASA Ames Research Center  
MS 245-5  
Moffett Field, CA 94035

Robert Walker  
McDonnell Center for  
Space Physics  
Box 1105  
Washington University  
St. Louis, MO 63130

Humberto Campins  
Planetary Science Institute  
2030 E. Speedway #201  
Tucson, AZ 85719

Paul Weissman  
Jet Propulsion Laboratory  
MC 183-601  
4800 Oak Grove Dr.  
Pasadena, CA 91109

Sherwood Chang, **Convener**  
NASA Ames Research Center  
Planetary Biology Division  
MS 239-9  
Moffett Field, CA 94035





**LUNAR AND PLANETARY INSTITUTE**  
**3303 NASA Road 1, Houston, TX 77058**

**ANALYSIS OF RETURNED COMET NUCLEUS SAMPLES**  
*Milpitas, California January 16-18, 1989*

**Final Circular**

The Program Committee is pleased to announce the final plans for what promises to be an exciting and productive meeting. A copy of the preliminary program is enclosed for your information. A highlight of the workshop will be a special address on Tuesday evening, January 17th by Prof. Linus Pauling, winner of the Nobel Prize in Chemistry, 1954, Nobel Peace Prize, 1963, and many other honors and awards in science. On Monday evening there will be a Panel Discussion on "Comet Sample Handling, Curation and Allocation" lead by Dr. Douglas Blanchard, NASA Johnson Space Center and Dr. Dieter Stöffler, Institute für Planetologie, Universität Münster. The regular daytime sessions will include talks on: Rosetta - Comet Nucleus Sample Return Mission Status Reports by Dr. Geoffrey Briggs, NASA Headquarters, and Dr. Marcello Coradini, European Space Agency; a Rosetta Mission Description by Dr. Gerhard Schwehm of the European Space Agency; the Comet Rendezvous Asteroid Flyby Mission by Dr. David Morrison of NASA Ames Research Center; and Planetary Protection Issues by Dr. John Rummel of NASA Headquarters. The sessions have been scheduled to allow as much time as possible for discussion.

**Registration:** A form to use for pre-registration is enclosed. You may pre-register prior to **January 6, 1989** at a fee of **\$100**. After January 6th, the registration fee by mail or at the meeting will be **\$110**. Foreign participants may pre-register by mailing the enclosed form and pay upon arrival at the workshop. All other pre-registration forms must include payment. Fees may be paid by cash or check in US dollars (we are unable to accept credit card payments). Checks should be made payable to the Lunar and Planetary Institute.

Registration will be held at the Embassy Suites on Sunday evening, January 15th from 7:30 - 10:00 p.m. and will continue the following morning starting at 7:00 a.m. The registration desk will be open each day from 8:00 a.m. - 5:00 p.m.) for registration, information and assistance.

**Meeting Location/Accommodations:** The meeting rooms and a block of sleeping rooms have been reserved at the Embassy Suites in Milpitas, California. The **deadline for hotel reservations** at rates of **\$57/\$67** single/double occupancy (plus 8% tax) is **December 19th**. A reservation card was enclosed in the second circular and a copy of the card is included with this announcement for those who may have misplaced the original. If you call in your reservation, please identify yourself as a workshop participant to qualify for the group rates (standard rates are \$104/\$119). The hotel telephone number for reservations is 1-800-362-2779 or 408-942-0400.

The Embassy Suites provides a complimentary cooked-to-order breakfast each morning, a two room suite, and two hours of cocktails each evening for registered guests at the hotel. Each of the two room suites includes a separate living room, dining area, queen size sleeper, microwave, refrigerator, coffee maker, wet bar, television in each room and two dual line telephones. The hotel is located about 15 minutes from San Jose International Airport, 30 minutes from Oakland International, and 45 minutes from San Francisco Airport. A map showing the location of the hotel in relationship to the airports is enclosed. The hotel provides courtesy transportation from the San Jose airport. A transportation service, the Airport Connection, is available at either the San Francisco or Oakland airport to Milpitas. An information sheet on this service is included with this circular.

**Student Opportunity:** In order to assist students who wish to attend the workshop, the registration fee and hotel accommodations will be paid for four students who are willing to serve as projectionist during the meeting. To apply, please send a letter explaining your interest in attending the workshop and what impact attendance might have on your career. In addition, please provide a letter of recommendation from your advisor or sponsor to accompany your application. Please mail your request and the letter of recommendation to LeBecca Turner, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, TX 77058 by **December 14th**. Be sure to include addresses and telephone numbers where you can be reached during the holidays, as well as your school address.

**Discounted Airfares:** American Airlines is offering discounted rates for this meeting. You may have your travel agent call their toll-free number 800-433-1790, and ask for Star File #S-56083. You must use both of these numbers to receive the discounted rates. A flyer with details is enclosed.

**Messages:** Messages received during the technical sessions will be posted on a message board at the workshop registration desk. Sessions will not be interrupted for telephone messages, except in the case of an emergency. The telephone number for messages is 408-942-0400. After 5:00 p.m., you will be notified by a signal light on the telephone in your room of any messages received by the hotel switchboard.

**Special Functions:** Monday and Tuesday evenings from 5:30 - 7:30 p.m., there will be a social and poster review session. There will be a group lunch and poster review session on Monday. These activities are included in the registration fee.

If you have any questions, or if we can be of any assistance with your plans to attend the workshop, please call me at LPI in Houston (713-486-2158).

LeBecca Turner  
for the Program Committee

## PROGRAM COMMITTEE MEMBERS

Thomas Ahrens  
C. I. T.  
Seismology Lab 252-21  
Pasadena, CA 91125

Lou Allamandola  
NASA Ames Research Center  
MC 245-6  
Moffett Field, CA 94035

David Blake  
NASA Ames Research Center  
MS 239-4  
Moffett Field, CA 94035

Donald Brownlee  
Physics Hall  
University of Washington  
Seattle, WA 98195

Theodore E. Bunch  
NASA Ames Research Center  
MS 245-5  
Moffett Field, CA 94035

Humberto Campins  
Planetary Science Institute  
2030 E. Speedway #201  
Tucson, AZ 85719

Sherwood Chang, **Convener**  
NASA Ames Research Center  
Planetary Biology Division  
MS 239-9  
Moffett Field, CA 94035

Jeff Cuzzi  
NASA Ames Research Center  
MS 245-3  
Moffett Field, CA 94035

Eberhard Grün  
Max-Planck-Inst. für Kernphysik  
Postfach 103980  
Saupfercheckweg 1  
D-6900 HEIDELBERG 1  
Federal Republic of Germany

Martha Hanner  
Jet Propulsion Laboratory  
Code 183-401  
4800 Oak Grove Dr.  
Pasadena, CA 91109

Alan Harris (Ex Officio)  
Jet Propulsion Laboratory  
Code 183-501  
4800 Oak Grove Dr.  
Pasadena, CA 91109

John Kerridge  
Institute of Geophysics  
University of California  
Los Angeles, CA 90024

Yves Langevin  
Universite de Paris, Sud  
Laboratoire Rene-Bernas  
91406 Orsay  
France

Larry Nyquist, **Convener**  
NASA Johnson Space Center  
Code SN2  
Houston, TX 77058

Gerhard Schwehm  
Space Science Dept. ESA  
ESTEC  
Postbus 299  
NL-220 AG Noordwijk  
The Netherlands

Paul Weissman  
Jet Propulsion Laboratory  
MC 183-601  
4800 Oak Grove Dr.  
Pasadena, CA 91109