LUNAR AND PLANETARY INFORMATION BULLETIN

NUMBER 15 FEBRUARY 1978

Universities Space Research Association
LUNAR AND PLANETARY INSTITUTE
3303 NASA Road #1
Houston, TX 77058
713/488-5200

IT'S TIME FOR THE NINTH L&PSC

The 9th LUNAR AND PLANETARY SCIENCE CONFERENCE will convene at the Johnson Space Center on Monday, March 13, 1978 at 8:30 a.m. with a series of concurrent topical sessions and continue with a full program through noon on Friday, March 17.

The program, compiled by the Program Committee which is chaired by Michael B. Duke, NASA/JSC and Thomas R. McGetchin, LPI, is included with this Bulletin for your pre-conference planning.

The conference is structured along seven topics:

Constraints on structure, composition, and history of planetary interiors. Studies to determine physical, chemical and thermal models for present states and histories of planetary interiors.

Characteristics and movements of materials on lunar, planetary and asteroidal surfaces. Studies of compositions, chemical reactions, rates of overturn, lateral and vertical mixing, erosion rates, volatile transport at the surfaces of and within regoliths, and other studies of dynamic surface processes.

Characterization and evolution of volcanic landforms. Studies of the origin, fractionation, and emplacement history of volcanic rocks; the characterization and regional distribution of volcanic deposits and studies of volcanic morphologic features; and determinations of ages of volcanic features.

Characterization and evolution of planetary crusts. Studies of the nature, origin, fractionation, emplacement mechanisms, and time scales for development of planetary crusts.

Nature and effects of impact processes. Studies related to the mechanics of impact cratering, the characteristics of impact crater deposits, the processes of formation modification of impact craters and basins, and the physical and chemical effects of impact processes on materials.

Extraterrestrial materials as solar/interplanetary/interstellar probes. Studies of solar and cosmic ray interactions; interactions of cometary and/or meteoritic particles with planetary surfaces; the search for extra-solar system components.

Earliest history of the solar system. Studies of the physical state, chemical composition, and homogeneity of the solar nebula; physics, chemistry and chronology of condensation and accretion processes; early history of solid bodies.

(continued page 2)

The program has been compiled from the 453 abstracts accepted for publication in LUNAR AND PLANETARY SCIENCE IX. This abstract volume will be mailed to first authors at the end of February and will be distributed to all conference attendees.

Some of the highlights of the Conference this year include the two evening plenary sessions:

Tuesday, March 14 - 8:00 p.m. "In the Beginning..."
Chaired by John A. Wood, Harvard College Observatory, the topic is to consider supernova genesis of meteoritic isotope anomalies and related topics.

Wednesday, March 15 - 8:00 p.m. "Looking Forward"
Chaired by Christopher Kraft, Johnson Space Center, the topic is to look at plans and programs for the immediate future, 1978-82, with an emphasis on the opportunities and science yield.

The Tuesday afternoon segment of the program has been reserved for special sessions. Two sessions planned so far are:

Industrial Development of Cis-Lunar Space
Organized by D. Criswell (LPI); E. Crum (JSC) and R. Williams (JSC)

Planetary Interiors: What is it we really know?
Chaired by Gary Latham (Marine Science Institute, Geophysics Laboratory)

For details of these special sessions see page 3 and 4 this Bulletin.

Other activities scheduled through the week include the Conference Smoker at the Nassau Bay Resort Motor Inn on Monday, March 13 at 8:00 to 11:00 p.m., and an Open House at the Lunar and Planetary Institute on Thursday evening from 6:00 to 7:30 p.m.

The Friday morning session will be a review of the conference by scientists who will summarize each of the seven topics.

Registration will begin on Sunday at the Nassau Bay Resort Motor Inn from 6:00 to 9:30 p.m. and will continue throughout the Conference in Building 2, Johnson Space Center from 8:00 a.m. to 5:00 p.m. There is no charge for registration. Anyone wishing to pre-register may contact Pam Jones at LPI 713/488-5200, ext. 50.

The scientists attending the Conference will take advantage of the gathering to hold many small consortia and working group meetings. One of these meetings which has extended a conference-wide invitation is the Consortium 12054 meeting. Members of this Consortium will meet at 6:00 p.m. Sunday, March 13 in the Berkner Room of the Lunar and Planetary Institute. The group will discuss and if possible establish: 1) the surface residence time for 12054; 2) the rates of lunar surface processes studied using 12054 samples (microcratering, formation of iron group solar flare tracks, growth of cosmogenic ^{26}Al activity accreta and dust accumulation, solar wind sputtering and implantation of solar wind and lunar "atmospheric" noble gases). For more information about this consortium, contact Jack Hartung, SUNY, Stony Brook 516/751-7401.

INDUSTRIAL DEVELOPMENT OF CIS-LUNAR SPACE

Special Session *9th LUNAR & PLANETARY SCIENCE CONFERENCE*

Tuesday, March 14, 1978
1:30 p.m.

Building 2, Auditorium
Johnson Space Center

ORGANIZERS: D. Criswell (LPI) E. Crum (JSC) R. Williams (JSC)

P R O G R A M

Welcome: Crum)

Introduction: (Williams)

Non-Terrestrial Resources - A NASA Point of View (S. Sadin/NASA-HQ)	1:35
Material Needs of a Space Solar Power Station (L. Bell (NASA-JSC)	1:55
Near Earth Resources (J. Arnold/La Jolla)	2:15
Development of Lunar/Space Industries (D. Criswell/LPI)	2:35
Resource Potential of the Central Highlands of the Moon (N .Hubbard/NASA-JSC)	2:55
Mining Lunar Material (D. Carrier/Woodward-Clyde)	3:15
Electrostatic/Magnetic Separation of Lunar Materials (Ion Inculet/Univ. Western Ontario)	3:35
Refining Lunar Materials (R. Waldron/LPI)	3:55
Extraterrestrial Manufacturing for Large Space Structures (To be announced)	4:15
An Environmental Impact Matrix of the Use of Extraterrestrial Resources (Paul K. Grogger/Univ. Colorado)	4:35
Question Sessions (Speakers in Panel Forum - D. Criswell, Moderator)	4:45

PLANETARY INTERIORS: WHAT IS IT WE REALLY KNOW?

Special Session *9th LUNAR & PLANETARY SCIENCE CONFERENCE*

Tuesday, March 14, 1978
1:30 p.m.

Gilruth Center - Room 104
Johnson Space Center

CHAIRMAN: Gary Latham, Marine Science Institute/Geophysics Laboratory

After fifteen years of spacecraft exploration, it is appropriate to pause and review what we really know about the interiors of the planets, other than Earth. The seven talks in this special session, while not totally inclusive, offer a broad review of our present state of knowledge regarding planetary interiors.

TOPIC	SPEAKER
The Thermal Model/Density Model Game	Sean Solomon
Geological Constraints on the Composition and Structure of Planetary Interiors	Jim Head/ Tom McGetchin
Gravity Fields and Tectonics	Roger Phillips
Magnetic Fields	Chris Russell
Petrology-Trace Elements	Michael Drake
Major Planets	Bill Hubbard
Major Planet Satellites	John Lewis

The LUNAR AND PLANETARY INFORMATION BULLETIN is published by the Lunar and Planetary Institute. There are usually four issues per year. It is distributed free on request to lunar and planetary scientists, educators, and students and their institutions.

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3303 NASA Road #1
Houston, TX 77058 U.S.A.
(telephone: 713/488-5200, ext. 35)

CONFERENCE INFORMATION

MESSAGE CENTER

A Message Center will be established in the lobby of Building 2. Persons who have a need to contact you during the Conference should be instructed to call Houston, Texas, 713-483-3011. The Message Center will be operational during each day of the Conference from 8:00 a.m. - 5:00 p.m. Messages will be placed on a bulletin board at the Registration Desk. There will be no paging during the Conference. Participants are reminded not to make long distance phone calls from any JSC phone. Pay telephones are available in both Building 2 and the Gilruth Center.

TRANSPORTATION ASSISTANCE

Assistance for arranging airline reservations is available from the Airlines Traffic Office in Room 130 of Building 1. Conference badges must be worn for entrance to this building. This service will be available each day of the Conference from 8:00 a.m. - 5:00 p.m.

SMOKER

A Cash Bar Smoker for all Conference participants and their wives/husbands/dates will be held on Monday, March 13, 1978, at 8:00 p.m. in the Nassau Bay Resort Motor Inn, 1700 NASA Road One.

LUNAR AND PLANETARY INSTITUTE OPEN HOUSE

Participants at the Conference are invited to visit the Lunar and Planetary Institute between 9:30 a.m. and 12:00 noon and from 2:30 p.m. - 5:00 p.m. each day. Tours of the building will be given at 10:00 a.m. and 3:00 p.m. Monday through Friday. An informal Open House will be held at the LPI Thursday, March 16, 6:00 p.m. - 7:30 p.m. All Conference participants are invited to attend.

NASA TOUR

Arrangements may be made in the lobby of Building 2 for a conducted tour of the Johnson Space Center. Tours will require approximately 1-1/2 hours and will include visits to the Mission Control Center and Space Environmental Simulation Laboratory.

BREAKFAST AND LUNCHEON

Breakfast and luncheon will be available from restaurants and cafeterias within the JSC area. Two cafeterias are open at JSC, one in Building 3 and the other in Building 11. They are open from 7:00 a.m. - 2:00 p.m. Monday through Friday.

BUS SERVICE

A shuttle bus service between JSC, LPI, and the various motels/hotels will operate each day from 7:30 a.m. - 9:30 a.m., from 11:30 a.m. - 1:30 p.m., and from 5:00 p.m. - 6:30 p.m. In addition, a shuttle bus service will operate continuously between the Building 2 Auditorium and the Gilruth Recreation Center, and will travel to the LPI each hour on the hour, from 8:00 a.m. - 6:00 p.m.

BADGES

During the period of the Conference, your Conference badge will allow you entrance to the various buildings where sessions are being held. Your JSC and LPI hosts will be pleased to offer any assistance.

REGISTRATION

Registration will begin on Sunday, March 12, 6:00 p.m. -9:30 p.m. at the Nassau Bay Resort Motor Inn. Registration will continue in Building 2, Johnson Space Center, 8:00 a.m. - 5:00 p.m. Monday through Friday.

PROGRAM COMMITTEE

The Conference program was prepared on the basis of submitted abstracts. The Program Committee consisted of M. Duke *(Johnson Space Center)* and T. McGetchin *(Lunar and Planetary Institute)*, Co-Chairmen; A. Bence *(State University of New York at Stony Brook)*; J. Boyce *(NASA Headquarters)*; P. Coleman *(University of California)*; A. Duba *(Lawrence Livermore Laboratory)*; D. Gault *(Murphye Center of Planetology)*; E. Gibson *(Johnson Space Center)*; C. Hohenberg *(Washington University)*; R. Huguenin *(University of Massachusetts)*; A. Irving *(Lunar and Planetary Institute)*; R. T. Merrill *(University of Washington)*; R. B. Merrill *(Lunar and Planetary Institute)*; R. Phillips *(Jet Propulsion Laboratory)*; L. Rancitelli *(Battelle Pacific Northwest Laboratory)*; R. Saunders *(Jet Propulsion Laboratory)*; and C. Simonds *(Lunar and Planetary Institute)*.

Monday, March 13, 1978

VII-A EARLY SOLAR SYSTEM I: CONDENSATION, FRACTIONATION AND COOLING HISTORY

Building 2 Auditorium
8:30 a.m.

Chairmen: D. Burnett
J. Macdougall

Boynton
Rare-Earth Elements as Indicators of Supernova Condensation

Wagner, Larimer
Condensation and Stability of Chemically Heterogeneous Substances

Wai, Wasson, Willis, Kracher
Nebular Condensation of Moderately Volatile Elements, Their Abundances in Iron Meteorites, and the Quantization of Ge and Ga Abundances

Wark
Early Solar System Stratigraphy: The Condensation Sequence from Allende to Chondrites, and the Origin of Chrondrules

Hertogen, Janssens, Palme, Anders
Late Nebular Condensates and Other Materials Collected by the Meteorite Parent Bodies

Bunch, Chang
Carbonaceous Chondrite (CM) Phyllosilicates: Condensation or Alteration Origin?

Chang, Mack, Lennon
Carbon Chemistry of Separated Phases of Murchison and Allende Meteorites

Arrhenius, Fitzgerald, Markus
Kinetic Isotope Fractionation and the Composition of Metsorites

Benjamin, Jones, Stapanian, Heuser, Burnett
Solar System Actinide Abundances

Pellas, Bourot-Oenise, Storzer
Shaw Revisited: Cooling History and U-Pu Distribution in Phosphates

Davis, Allen, Hutcheon, Grossman
A Hibonite-Rich Inclusion from Allende: Mineralogy, Texture and Trace Element Chemistry

Macdougall, Carlson
Refractory Element Rich Inclusions in C1 and C2 Meteorites

Monday, March 13, 1978

III-A GENESIS AND EVOLUTION DF BASALTS

Gilruth Center - 104
8:30 a.m.

Chairmen: E. Stolper
R. Warner

Takeda, Miyamoto, Ishii
Comparison of the Chemical Trends and Crystallography of Pyroxenes for KREEP Basalts With Those for Eucrites

Onorato, Uhlmann, Taylor, Coish
An Olivine Cooling Speedometer

Walker, Powell, Hays
Dynamic Crystallization of a Eucritic Basalt

Grove
Cooling Histories of Luna 24 Low-Ti Ferrobasalts and Ferrogabbros

Haskin, Lindstrom, Dungan
Trace-Element Fractionation During Crystallization of Thin Tholeiitic Lava Flows

Butler
Recognition of Lunar Glass Droplets Produced Directly from Endogenous Melts: The Evidence from S-Zn Coatings

Heiken, McKay, Gooley
Petrology of a Sequence of Pyroclastic Rocks from the Valley of Taurus-Littrow (Apollo 17 Landing Site)

Gibson, Andrawes
Nature of the Gas Phases Released from Lunar Rocks and Soils upon Crushing

Rhodes
Primary Mare Basalts and Green Glass

Taylor, Warner, Keil
Chemical Trends Among VLT Mare Basalts and Glasses: Clues to the Nature of Their Parent Magmas

Ma, Schmitt
Chemistry and Petrogenesis of Apollo 15 Basalts

Tarasov, Nazarov, Shevaleevsky, Gaverdovskaya, Korina
Petrological Peculiarities of Basaltic Rocks from Mare Crisium

Monday, March 13, 1978

I-A THERMAL AND TECTONIC ASPECTS

Gilruth Center - 206
8:30 a.m.

Chairmen: W. Kaula
J. D'Keefe

Turcotte, Ahern
Magma Production and Migration Within the Moon

Daly, Richter
Convection with Decaying Beat Sources: A Simple Thermal Evolution Model

Peale, Cassen
Contribution of Tidal Dissipation to Lunar Thermal History

Burns, Schultz
Tidal Heating of the Moon: A Reappraisal

Yoder, Sinclair, Williams
The Effects of Dissipation in the Moon on the Lunar Physical Librations

Lucchitta, Watkins
Large Grabens and Lunar Tectonism

Warner, Morrison
Planetary Tectonics I: The Role of Water

Frey
Rift Valleys of Mars and Earth: Structural Comparisons and Implications

Phillips, Maxwell
Lunar Sounder Revisited: Stratigraphic Correlations and Structural Inferences

Solomon, Head
Vertical Movement in Mare Basins: Relation to Mare Emplacement, Basin Tectonics, and Lunar Thermal History

Maxwell
A Finite-Element Model of Multi-Ring Basin Ridge Systems

Scott, Watkins, Diaz
Regional Deformation of Mare Surfaces

Monday, March 13, 1978

VII-B EARLY SOLAR SYSTEM DYNAMICS

Building 2 Auditorium
1:30 p.m.

Chairmen: G. Wetherill
A. Cameron

De, Arrhenius
Grain Temperature in Protoplanetary Dust Clouds

Alfvén
From Dark Clouds to Planets and Satellites

Taylor
Geochemical Evolution of the Moon: Th, U and K Abundances: Depth of Initial Melting and Pre-Accretion Element Fractionation

Smith
Possible Controls on the Bulk Composition and Origin of the Earth: Further Discussion

Ringwood
Origin of the Moon

Ransford, Kaula
Melting of the Moon by Beterogeneous Accretion

Kaula
Planetary Thermal Evolution During Accretion

Ward, Cameron
Disc Evolution Within the Roche Limit

Wetherill
Steady-State Populations of Apollo-Amor Objects

Davis
Dispersive Effects of Gravitational Encounters

Matsui
Collisional Evolution of Mass-Distribution Spectrum of Planetesimals

Greenberg, Wacker, Hartmann, Chapman
Growth of Planets from Planetesimals

Harris
The Formation of the Outer Planets

Monday, March 13, 1978

II-A MARS AND MERCURY

Gilruth Center - 104
1:30 p.m.

Chairmen: R. Saunders
R. Arvidson

Sjogren, Wimberly, Cain, Brenkle
Mars Gravity: Additional Resolution from Viking Orbit 1

Arvidson, Guinness, Carlston, Pidek, Jones, Sagan, Wall
Viking Lander Imaging During the Extended Mission

Jakosky
Modeling of the Martian Surface: Thermal Inertia and Related Characteristics

Clark, Baird, Toulmin, Rose, Keil
Martian Surface Materials: Sample Chemical Differences and the Trace Element Problem

McCord, Singer
Characterization of Mars Surface Units

Smyth, Huguenin, McGetchin
Composition of Martian Primary Lavas-Convergence of Model Results

Saunders, Roth, Elachi, Schubert
Topographic Control of Volcanism and Surface Morphology in the Arsia Mons Region of Mars

Schaber, Horstman, Dial
The Distribution and Eruptive History of Lava Flow Materials-Tharsis Region of Mars

Baker
A Preliminary Assessment of the Dynamic Erosional Processes that Shaped the Martian Outflow Channels

Cutts, Blasius, Roberts
Chaotic Terrain and Channels Associated with Chryse Planitia, Mars: An Alternative Erosional Model

Hodges, Moore
Tablemountains of Mars

Schultz, Gault
Impact Ejecta Emplacement on Mars

Roth, Elachi, Saunders, Schubert
Radar Depths of Large Martian Craters

Pike
Volcanism on Earth and Mars: Topographic Analogs of Large Central Edifices

Malin
Surface of Mercury: Evidence of Central Volcanism

Monday, March 13, 1978

III-B BASALTS - METEORITES AND MARIA

Gilruth Center - 206
1:30 p.m.

Chairmen: P. Butler
H. McSween

Binder, Lange
The Mare Basalt Magma Source Region

Schreiber, Thanyasiri, Legere, Lauer
A Medley of Redox States in Lunar Magmas

Thornber, Roeder
Effect of Compoeition on the Valence of Iron in Basaltic Liquide

Beaty, Albee
A Textural, Modal and Chemical Classification of the Apollo 11 Low-K Basalts

Gamble, Coish, Taylor
The Oldest Mare Basalts: Mineralogy and Petrology

Boyce, Johnson
Ages of Flow Units in the Eastern Maria and Mare Humorum Based on Crater Density

Nyquist, Wooden, Bansal, Wiesmann
A Shocking Rb-Sr Age for the Shergotty Achondrite

McSween, Stolper
Shergottite Meteorites, I: Mineralogy and Petrography

De Hon
Maximum Thickness of Materials in the Western Mare Basins

Hörz
How Thick are Lunar Mare Basalts?

Weiblen, Schulz
Lunar Maria and Terrestrial Greenstone-Granite Terranes: Significance of Similarities and Differences

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Monday, March 13, 1978

NINTH LUNAR AND PLANETARY SCIENCE CONFERENCE *SMOKER*

Nassau Bay Resort Motor Inn
1700 NASA Road One

8:00 p.m. - 11:00 p.m.

Tuesday, March 14, 1978

VII-C EARLY SOLAR SYSTEM III: ISOTOPE AND NUCLEAR EFFECTS

Building 2 Auditorium
8:30 a.m.

Chairmen: J. Reynolds
R. Pepin

Phinney, Whitehead
Light Elements in Minerals of an Allende Inclusion

Rajan, Brown, Whitford, Roberts, Tera
Lithium Isotopic Composition in Some Stone Meteorites

Yeh, Epstein
$^{29}Si/^{28}Si$ and $^{30}Si/^{28}Si$ of Meteorites and Allende Inclusions

Clayton, Mayeda, Epstein
Isotopic Fractionation of Silicon in Allende Inclusions

Steele, Smith, Hutcheon, Clayton
Allende Inclusions: Cathodoluminescence Petrography: Anorthite and Spinel Chemistry: Mg Isotopes

Lorin, Michel-Lévy
Heavy Rare Metals and Magnesium Isotopic Anomalies Studies in Allende and Leoville Calcium-Aluminum Rich Inclusions

Runcorn
Super Heavy Elements in the Primeval Moon?

Moniot
Noble-Gas-Rich Separates From H-Chondrites

Niemeyer
I-Xe Dating of Inclusions from IAB Iron Meteorites

Bernatowicz, Hohenberg, Hudson, Kennedy, Podosek
Excess Fission Xenon in Apollo 16 Samples

Lewis, Alaerts, Anders
Xenon in Primitive Chondrites: How Many Components?

Pepin, Phinney
Fission Xenon in Carbonaceous Meteorites

Heymann, Palma
Terrestrial Krypton and Xenon, are these Freaks?

Tuesday, March 14, 1978

IV-A KREEP AND MAGMA OCEANS

Gilruth Center - 104
8:30 a.m.

Chairmen: M. Drake
J. Minear

Spudis
Composition and Origin of the Apennine Bench Formation

Hawke, Head
Lunar KREEP Volcanism: Geologic Evidence for History and Mode of Emplacement

Lugmair, Carlson
Sm-Nd Systematics of "KREEP"

McKay, Wiesmann, Wooden, Bansal
Petrology, Trace Element Chemistry and Chronology of KREEP-Rich Melt Rock 14078

Meyer
Ion Microprobe Analyses of Aluminous Lunar Glasses

Campbell, Hess, Rutherford
Ilmenite Crystallization in Non-Mare Basalts

Jovanovic, Jensen, Reed
A Laterally Inhomogeneous Moon: Cl-P_2O_5, Rb-Sr Evidence

Minear, Fletcher
Crystallization of a Lunar Magma Ocean

Herbert, Drake, Sonett
Geophysical and Geochemical Evolution of the Lunar Magma Ocean

Warren, Wasson
urKREEP: The Last Dregs of the Lunar Magma Ocean

Longhi
Pyroxene Stability and the Composition of the Lunar Magma Ocean

Herzberg, Wood
Spinel Cataclasites as Samples of the Lower Crust of the Moon

Tuesday, March 14, 1978

I-B INTERIOR STRUCTURE

Gilruth Center - 206
8:30 a.m.

Chairmen: T. Shankland
P. Dyal

Latham, Dorman, Horvath, Ibrahim, Koyama, Nakamura
Passive Seismic Experiment: A Summary of Current Status

Anderson, Cook, Dainty, Duennebier, Goins, Kovach, Latham, Lazarewicz, Miller, Nakamura, Sutton, Toksöz
Viking Martian Seismology: A Summary of Current Status

Malin, Phinney
First Order Surface Wave Scattering Solution for Synthesizing Lunar Seismograms

Nakamura
A_1 Moonquakes: Source Distribution and Focal Mechanism

Goins, Töksoz, Dainty
Constraints on the Structure of the Lunar Upper Mantle

Thurber, Solomon
An Assessment of Crustal Thickness Variations on the Lunar Near Side: Models, Uncertainties, and Implications for Crustal Differentiation

Tittmann, Nadler, Curnow, Richardson
Internal Friction and Modulus Measurements In Lunar and Lunar Analog Rocks

Hood, Schubert
Deep Magnetic Sounding of the Moon in the Geomagnetic Tail and Plasma Sheet

Sato
A Possible Role of Carbon in Characterizing the Oxidation State of a Planetary Interior and Originating a Metallic Core

Goldstein, Hood, Russell
Time Dependent Electromagnetic Response of the Moon and Conical Plasma Cavity

Wiskerchen, Sonett
A Lunar Core and Other Matters: Fine Tuning of the Lunar Electromagnetic Gain

Huebner, Duba, Wiggins, Smith
Electrical Conductivity of Orthopyroxene; Measurements and Implications

Tuesday, March 14, 1978

VI-A COMPOSTION OF FLUX OF EXTRATERRESTRIAL MATERIAL

Gilruth Center - 206
1:30 p.m.

Chairmen: F. Hörz
A. El Goresy

Hartung, El Goresy, Nagel
Chemical Composition Variations in Lunar Microcrater Pit Glasses

Takahashi, Yokoyama, Fireman, Lorius
Iridium Content of Polar Ice and Accretion Rate of Cosmic Matter

Brownlee, Hodge, Blanchard, Bunch, Kyte
Chondritic Meteor Debris in Abyssal Sediments

Flynn, Fraundorf, Shirch, Walker
Chemical and Structural Studies of "Brownlee" Particles

Bibring, Brownlee, Hodge, Blanchard, Bunch, Kyte
Chondritic Meteor Debris in Abyssal Sediments

Kothari
Constraints Imposed on the Cooling History of a Nebula by the Growth of Graine

Tuesday, March 14, 1978

SPECIAL SESSIONS

Afternoon

A portion of the afternoon schedule has been left free to accommodate special informal sessions which consider subjects that do not fit readily within the topical framework of the Conference. Descriptions of these sessions are included in your registration packet.

Tuesday, March 14, 1978

"IN THE BEGINNING....."*

Building 2 Auditorium
8:00 p.m.

Chairman: J. Wood

Papanastassiou, Huneke, Esat, Wasserburg
Pandora's Box of the Nuclides

Lugmair, Marti, Scheinin
Incomplete Mixing of Products from R-, P-, and S-Process Nucleosynthesis: Sm-Nd Systematics in Allende Inclusion EK 1-04-1

Falk, Lattimer, Margolis, Schramm
Grain Formation in Supernovae and Isotopic Anomalies in the Early Solar System

Clayton
Nucleosynthetic Origin of ^{41}K Excess in Soil Agglutinates

Cameron, Cowan, Truran
The Triggering Supernova and Isotopic Anomalies in Meteorites

*Bible, Genesis 1:1

Wednesday, March 15, 1978

I-C PLANETARY MAGNETISM: SAMPLES AND SURVEYS

Building 2 Auditorium
8:30 a.m.

Chairmen: C. Sonett
W. Gose

Fielder, Brecher
The Magnetic Properties of Lunar Soils and Soil-Breccias Analogs: To $\vec{B}$ or not to $\vec{B}$?

Nagata
Thermal Bietory of Some Lunar Materials and Chondritic Meteorites-Magnetic Metallography for Lunar Materials and Meteorites

Larson
Degradation of Lunar Basalts During Thermal Heating in Vacuum and its Relation to Paleointensity Measuremente

Sugiura, Strangway, Pearce
Lunar Sample Palsointsnsity Experiment Undsr Controlled Oxygen Fugacity

Srnka, Martelli, Cisowski, Fuller
Magnetic Field Effects and Remanent Magnetization in a Hypervelocity Impact Experiment

Dolginov, Zhuzgov, Sharova, Buzin, Yeroshenko
The Magnetosphere of Venus

Russell
Does Mars Have an Active Magnetic Dynamo?

Hood, Russell, Coleman
The Magnetization of the Lunar Crust as Deduced from Orbital Surveys

Anderson
Distribution of Lunar Surface Magnetic Fields

Lin
A Search for Impact Crater-Associated Surface Magnetic Fields in Mare Regions

Lichtenstein, Coleman, Russell
A Comparison of Independent Methods of Measuring Lunar Magnetic Fields

Dyal, Daily
Crustal Magnetic Scale Sizes Measured at Apollo Landing Sites

Wednesday, March 15, 1978

II-B REGOLITH I - EVOLUTION

Gilruth Center - 104
8:30 a.m.

Chairmen: J. Papike
C. Chapman

Housen, Wilkening, Greenberg, Chapman
Regolith Evolution on Small Bodies

Zook, Hartung, Hauser
Loosely Bound Dust, Impact Pits, and Accreta on Lunar Rock 12054, 54.

Crozaz
History of Regolith Deposition at the Apollo 17 and Luna 24 Landing Sites and at Shorty Crater

Criswell, Basu
Rosiwal Principle and Surface Exposure of Lunar Soil Grains

Morris
In Situ *Reworking (Gardening) of the Lunar Surface: Evidence From the Apollo Cores*

Nagle
The Authigenic Component in Lunar Cores

Fruchter, Evans, Rancitelli, Perkins
Lunar Surface Processes and Cosmic Ray Histories Over the Past Several Million Years

Eugster, Eberhardt, Geiss, Grögler
The Solar Wind and Cosmic-Ray Exposure History of Soil From Drive Tube 74001, an Unmixed Lunar Regolith

Eugster
A Refined Method for the Calculation of Residence Times and Shielding Depths for Two-Stage Irradiation Models and the Determination of the Depth Dependency of Cosmogenic $^{131}Xe/^{126}Xe$ and $^{83}Kr/^{78}Kr$

Florensky, Basilevsky, Bobina, Burba, Grebennik, Kuzmin, Polosukhin, Popovich, Pronin, Ronca
The Floor of Crater Le Monier: A Study of Lunokhod 2 Data

Papike, Vaniman, Schweitzer, Baldwin
Apollo 16 Drive Tube 60009/60010. Part III: Total Major Element Partitioning Among the Regolith Components or Chemical Mixing Models with Petrologic Credibility

Laul
Chemical Study of Size Fractions of Apollo 17 Deep Drill Cores 70009-70006

Wednesday, March 15, 1978

II-C PHYSICAL PROPERTIES OF LUNAR SOIL - LABORATORY AND REMOTE OBSERVATIONS

Gilruth Center - 206
8:30 a.m.

Chairmen: P. Bell
H. Moore

Hazen, Bell, Mao
Effects of Compositional Variation on Absorption Spectra of Lunar Pyroxenes

Osborne, Parkin, Burns
Effects of Temperature on the Electronic Spectra of Minerals: Applications to Heated Planetary Surfaces

Fountain, West
Thermal Conductivity, Thermal Diffusivity, and Specific Heat of Lunar Sample 15031,38

Hapke, Wagner, Cohen, Partlow
Reflectance Measurements of Lunar Materials in the Vacuum Ultraviolet

Schaal, Hörz, Bauer
Shock Experiments on Particulate Lunar Basalt - A Regolith Analogue

Stesky
Compressional Wave Velocity in Compacting Fine-Grained Powders Under High Vacuum

Moore, Arthur, Schaber
Yield Strengths of Flows on the Earth, Moon, and Mars

Thompson, Johnson, Matson, Saunders, Shorthill, Zisk, Moore, Schaber
Unusual Remote Sensing Signatures of Montee Jura and Crater Plato

Thompson
High Resolution Radar Map at 7.5M Wavelength

Gary, Keihm
Interpretation of Ground-Based Microwave Measurements of the Moon Using a Detailed Regolith Properties Model

Wednesday, March 15, 1978

IV-B BRECCIAS AND SIDEROPHILES

Building 2 Auditorium
1:30 p.m.

Chairmen: R. Grieve
S. Winzer

Winzer, Breen, Ritter, Meyerhoff, Schuhmann
A Study of Glass Coatings From Some Apollo 15 Breccias

Delano, Ringwood
Indigenous Siderophile Element Component of the Lunar Highlands and its Significance

Wänke, Dreibus, Palme
Are the Siderophile Elements Found in the Lunar Highlands of Truly Meteoritic Origin?

Lofgren, Smith
Dynamic Melting and Crystallization Studies on a Lunar Soil

Uhlmann, Handwerker, Goncz, Onorato
The Formation Kinetics of Lunar Glasses

Stöffler, Knöll, Stähle, Ottemann
Textural Variations of the Crystalline Matrix of Fra Mauro Breccias and a Model of Breccia Formation

Ostertag, Stöffler, Hörz, Oberbeck
Clast Populations and Sedimentological Studies in the Continuous Deposits of the Ries Crater

Basilevsky, Granovsky, Ivanov
Grain-Size Distribution and Relative Length of Fragments in Allogene Breccias of the Meteoritic Craters Janisjarvi, Karelia and Kara, the Polar Ural

Simonds, Phinney, McGee, Cochran
Geology of the West Clearwater, Quebec Impact Structure, Part I: Structure and Field Geology

Simonds, Phinney, McGee, Cochran
Geology of West Clearwater Impact Structure, Quebec, Part II: Petrology

James, Hedenquist
Consortium Breccia 73255: Petrology of Aphanitic Lithologies

Nord, James
Consortium Breccia 73255: Electron Petrography of Aphanitic Lithologies and Anorthite Clasts

Blanchard, Budahn, Kerridge, Compston
Consortium Breccia 73255: Rare-Earth-Element, Light-Element, and Rb-Sr Chemistry of Aphanitic Lithologies

Staudacher, Dominik, Jessberger, Kirsten
Consortium Breccia 73255: ^{40}Ar-^{39}Ar Dating

Eichhorn, James, Schaeffer, Müller
Laser-Probe ^{39}Ar-^{40}Ar Dating of Two Clasts from Consortium Breccia 73215

Wednesday, March 15, 1978

II-D REGOLITH II - VOLATILES AND CORE STUDIES

Gilruth Center - 104
1:30 p.m.

Chairmen: R. Clayton
A. Walker

McKay, Waits
Grain Size Distribution of Samples From Core 74001 and 74002

Morris, Gose, Lauer
Depositional and Reworking History of Core 74001/2

Bogard, Hirsch
Noble Gas Contents and Irradiation History of Orange-Black Glass in the 74001-74002 Core

Becker, Clayton
Nitrogen Isotopes in Some Exceptional Apollo 12 and Apollo 17 Soils

Blanford, Wood
Irradiation Stratigraphy in Apollo 16 Cores

Ray, Dziczkaniec, Walker, Heymann
Stratigraphy in Apollo Drill Core Segment 60003

Schultz, Weber, Spettel, Hintenberger, Wänke
Noble Gas and Element Distribution in Agglutinates of Different Densities

Etique, Baur, Derksen, Funk, Horn, Signer, Wieler
Light Noble Gases in Agglutinates: A Record of Their Evolution?

Cirlin, Housley
Flameless Atomic Absorption Studies of Volatile Trace Metals in Apollo 17 Samples

Des Marais
Carbon Isotopes, Nitrogen and Sulfur in Lunar Rocks

Pillinger, Jull
Carbon Chemistry Studies of Agglutinate Separates From Soil 12023

Wednesday, March 15, 1978

VI-B SOLAR AND GALACTIC COSMIC RAYS AND SOLAR WIND EFFECTS IN LUNAR MATERIALS

Gilruth Center - 206
1:30 p.m.

Chiarmen: R. Perkins
J. Kerridge

Reedy, Herzog, Jessberger
Depth Variations of Spallogenic Nuclides in Meteorites

Rancitelli, Evans, Fruchter, Perkins
Galactic Cosmic Ray Variations During the Period 1967 to 1977; Cosmogenic Radionuclide Production in Meteorites

Russ, Kohl, Murrell, Arnold
An Experiment on the Constancy of the SCR Flux Over the Past Two Million Years

Lorin, Poupeau
Cosmic-Ray Tracks-Spallogenic ^{22}Ne Correlation in Chondrites: Pre-Atmospheric Size and Pre-Irradiation Effects

Gopalan, Goswami, Rao, Venkatesan
Solar Cosmic Ray Produced Noble Gases and Tracks in Mineral Separates from Lunar Fines

Dartyge, Duraud, Langevin, Maurette
Past Activity of Ancient Solar Flare

Bull, Green, Durrani
The Energy S trum of the VVH Cosmic Rays Averaged Over the Last 19 MYr.

Flynn, Fraundorf, Shirck, Walker
An Evaluation of Evidence for Superheavy Elements in Nature

Kerridge, Kaplan, Petrowski
Carbon Isotope Systematics in the Apollo 16 Regolith

Filleux, Spear, Tombrello, Burnett
Carbon Depth Distributions for Soil Breccias

Fireman, DeFelice, D'Amico
Carbon-14 in Lunar Soil

Zinner, Dust, Chaumont, Dran
Ion Probe Measurements of Mg, Ti and Fe Surface Concentrations in Plagioclase Crystals from Lunar Soil Samples

Kiko, Kirsten, Ries
Peculiarities of Solar Wind in Lunar Olivines

Wednesday, March 15, 1978

LOOKING FORWARD
A Session Looking at Plans and Opportunities in Planetary and Earth Sciences During the Next Few Years

Gilruth Center - 104
8:00 p.m.

Chairman: C. Kraft

Hinners
Challenges for Planetary Science in the 1980's

Masursky
Microwaves as an Exploration Tool for Planetary Geology

Albee
Toward a Strategy for the Exploration of Mars

Johnson
The Jupiter Orbiter Probe Mission: A Close Look at Satellites

Rasool
Building a Program of Earth Applications: Plans and Opportunities

Silver
Mineral Resources Exploration From a Platform in Space

Thursday, March 16, 1978

II-E REGOLITH III - WEATHERING

Building 2 Auditorium
8:30 a.m.

Chairmen: B. Hapke
R. Morris

Griffith, Papanastassiou, Russell, Tombrello, Weller
Simulation Experiments and Solar Wind Sputtering

Paruso, Cassidy, Hapke
An Experimental Investigation of Fractionation by Sputter Deposition

Carey, McDonnell
The Role of Diffusion and Heterogeneous Target Characteristics in the Sputter Mechanism; Monte Carlo Simulations and Laboratory He^+ Ion Sputter Measurements

Dikov, Bogatikov, Barsukov, Florensky, Ivanov, Nemoshkalenko, Alyoshin
Reduced Forms of Elements in the Surface Parts of Regolith Particles: ESCA Studies

Kashkarov, Genaeva, Lavrukhina
Track Studies in Four Samples of Luna 24 Core

Goswami, Lal
Particle Tracks and Microcraters in Luna-24 Drill Core Samples

Comstock
How Dusty are Lunar Rocks? Evidence from Track Profiles

LeBertre, Zellner
The Surface Texture of Vesta

Degewij, Zellner
Asteroid Surface Variegation

Dollfus, Mandeville, Geake
The Unsymmetrical Bombardment of Callisto

Hodges
Gravitational and Radiative Effects on the Thermal Escape of Gases from the Moon

Thursday, March 16, 1978

V-A MECHANICS OF IMPACT CRATERING

Gilruth Center - 104
8:30 a.m.

Chairmen: P. Schultz
T. Ahrens

Juda, Ahrens
Jetting in Silicates for Low Velocity Oblique Impacts

Gault, Wedekind
Experimental Studies of Oblique Impact

Schmidt
Centrifuge Simulation of a 500 Ton Cratering Event

Gaffney
Effects of Gravity on Explosion Cratere

Sauer
The Influence of Target Material Strength on the Scaling of Cratering and Ejecta Data

Oberbeck, Morrison
Emplacement of Lunar Crater Deposits

Bryan, Burton, Cunningham, Lettis
A Two-Dimensional Computer Simulation of Hypervelocity Impact Cratering: Some Preliminary Results for Meteor Crater, Arizona

Roddy
Cratering Motions for Bowl-Shaped Impact Craters: A Phenomenological Sequence of Evente

Cintala, Head, Veverka
Characteristics of the Cratering Proceee on Small Bodies: Phobos and Deimos

McKinnon, Melosh
Further Investigation into the Role of Plastic Failure in Crater Modification

Settle, Head
Rim Slumping Modification of Lunar Craters: Implications for the Depth of Excavation of Basin-Sized Impacte

Eppler, Nummedal, Ehrlich
Structural Implications of Lunar Crater Elongation

Thursday, March 16, 1978

IV-C ORBITAL OBSERVATIONS AND MARE VOLCANISM

Gilruth Center - 206
8:30 a.m.

Chairmen: C. Pieters
R. Greeley

Clark, Adler
Lunar X-Ray Fluorescence Al/Si and Mg/Si Geochemical Maps with Corrections for Variations in Solar Activity

Haines, Metzger
High Resolution Thorium Maps by Means of Spatial Deconvolution as Applied to the Aristarchus Plateau

Head, Hess, McCord
Geologic Characteristics of Lunar Highland Volcanic Domes (Gruithuisen and Mairan Region) and Possible Eruption Conditions

Aronson, Smith
Mid Infrared Spectra of Lunar and Analog Soils

Seeger, Potter, Wolfe
Geologic Interpretation of the Skylab II S-192 Multispectral Scanner Lunar Images

Arnold, Davis, Reedy
Gamma Ray Maps of Lunar Titanium and Iron

Pieters, McCord
Distribution of Basalt Types on the Front Side of the Moon

Schonfeld, Bielefeld
Orbital Geochemistry (X-Ray) of Dark Mantle Deposits and Some Mare Basalt Units

Greeley, Spudis
Mare Volcanism in the Herigonius Region of the Moon

Whitford-Stark, Head
Oceanus Procellarum: Preliminary Basalt Stratigraphy and Emplacement History

Housley
Modeling Lunar Volcanic Eruptions

Pai, Hsu, O'Keefe
Similar Flows of Lunar and Terrestrial Volcanoes

Thursday, March 16, 1978

V-B NATURE AND EFFECT OF IMPACT PROCESSES AND CRATER STATISTICS

Building 2 Auditorium
1:30 p.m.

Chairmen: J. Boyce
D. Roddy

Woronow
The Expected Frequency of Random Doublet Craters

Wilhelms, Oberbeck, Aggarwal
Size-Frequency Distributions of Primary and Secondary Lunar Impact Craters

Croft
Lunar Crustal Structure as Indicated by Ejected Crater Volumes

Dvorak, Phillips
Lunar Bouguer Gravity Anomalies: Imbrian Age Craters

Orphal, Schultz
An Alternative Model for the Manicouagan Impact Structure

Laney, Van Schmus
A Structural Study of the Kentland, Indiana Impact Site

Padovani, Batzle, Simmons
Characteristics of Microcracks in Samples From the Drill Hole Nördlingen 1973 in the Ries Crater, Germany

Jeanloz, Ahrens
Anorthite and Lunar Anorthosite Compressed to High Pressures

von Engelhardt
Textural Characterization of Impact Melt Rocks

Grieve, Dence
Principal Characteristics of the Impactites at Brent Crater, Ontario, Canada

Morgan
Siderophile and Volatile Trace Elements in High-Magnesium Australites and in Glasses from Lonar Crater, India

Nagel, Fechtig, El Goresy, Grögler
Chemical Investigations of Impact Features on Sample 12001,220 and Microcrater Simulation Experiments

Thursday, March 16, 1978

VII-O ISOTOPE CHRONOMETRY

Gilruth Center - 104
1:30 p.m.

Chairmen: G. Turner
C. Hohenberg

Turner, Enright, Hennessy
Argon Ages: From Primitive Planetesimals to Differentiated Moon

Schaeffer, Bence, Eichhorn
Ancient Clasts in a 4.0 G.y. Breccia: Laser ^{39}Ar - ^{40}Ar Analysis of 65015

Chen, Mattinson, Tilton, Vidal
Lead Isotope Systematics of Mare Basalt 75075

Oberli, McCulloch, Tera, Papanastassiou, Wasserburg
Early Lunar Differentiation Constraints from U-Th-Pb, Sm-Nd and Rb-Sr Model Ages

Stettler, Eberhardt, Geiss, Grögler, Guggisberg
Chronology of the Apollo 17 Station 7 Boulder and the South Serenitatis Impact

Huneke, Wasserburg
^{40}Ar - ^{39}Ar Ages of Single Orange Glass Balls and Highland Breccia Phenocrysts

Alexander, Coscio, Dragon, Saito
^{40}Ar - ^{39}Ar Studies of Glasses From Lunar Soils

El Goresy, Nagel, Ramdohr
The Allende Meteorite: Fremdlings and Their Noble Relatives

Jessberger, Dominik, Staudacher, Nagel, El Goresy
Geochemistry and Dating of a New Type White Inclusion of Allende

Unruh, Hamet, Tatsumoto
Chronology of the Adcumulate Eucrite, Moama

Murthy, Alexander, Saito
Rb-Sr and ^{40}Ar - ^{39}Ar Syetematics of the Estherville Mesosiderite

Turner
The Lunar Cataclysm: Energy Influx Inferred from Argon Age Data

Thursday, March 16, 1978

VI-C METEORITE STUDIES

Gilruth Center - 206
1:30 p.m.

Chairmen: J. Wood
L. Wilkening

Drake, Bild, Hostetler
Experimental Investigation of Trace Element Fractionation in Iron Meteorites I: Preliminary Results for Cr

Goldstein, Friel
Fractional Crystallization of a Liquid Iron Core, An Experimental Study

Wood
Pallasites and the Growth of Parent Metsorite Planets

Floran, Prinz
Silicate Petrography and Classification of the Mesosiderites

Berkley, Taylor, Keil
Ureilites: Origin as Related Magmatic Cumulates

Hewins, Klein
Provenance of Metal and Melt Rock Textures in the Malvern Howardite

O'Nions, Carter, Evensen, Hamilton, Ridley
Chemical-Petrological Studies of Individual Chondrules from the Richardton Meteorite

Grossman, Kracher, Kallemeyn, Wasson
Chemical-Petrographic Study of Chondrules

Matza, Lipschutz
Mineralogic/Petrologic Study of Murchison C2 Chondrits Heated from 400-1400°C

Woolum, Mascitelli, Burnett, August
Bi and ^{208}Pb Microdistributions in Ordinary Chondrites

Fruland
SEM Study of Allende Dark Inclusions

Thursday, March 16, 1978

LUNAR AND PLANETARY INSTITUTE *OPEN HOUSE*

Lunar and Planetary Institute
3303 NASA Road One

6:00 p.m. - 7:30 p.m.

Friday, March 17, 1978

SUMMARY SESSION

Building 2 Auditorium
8:30 a.m.

Chairmen: M. Duke
T. McGetchin

PLANETARY INTERIORS
Summarizer: C. Sonett

THE LUNAR SURFACE/REGOLITH AND REMOTE SENSING
Summarizer: D. Heymann

LUNAR PETROGENESIS AND VOLCANISM
Summarizer: J. Longhi

PLANETARY IMPACT PROCESSES AND THEIR PRODUCTS
Summarizer: C. Moore

EXTRATERRESTRIAL MATERIALS AS SOLAR-STELLAR PROBES
Summarizer: L. Wilkening

IN THE BEGINNING....
Summarizer: G. Wasserburg

MARS
Summarizer: R. Greeley

PLANETARY EXPLORATION
--PROGRESS AND PROMISE

CONTENTS:

compiled by
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LUNAR SCIENCE INSTITUTE
3303 NASA Road One
Houston, TX 77058

September 1977

LUNAR SCIENCE INSTITUTE CONTRIBUTION No. 297

Lunar and Planetary Information Bulletin No. 15
Enclosure

PLANETARY EXPLORATION PROGRESS - 1977

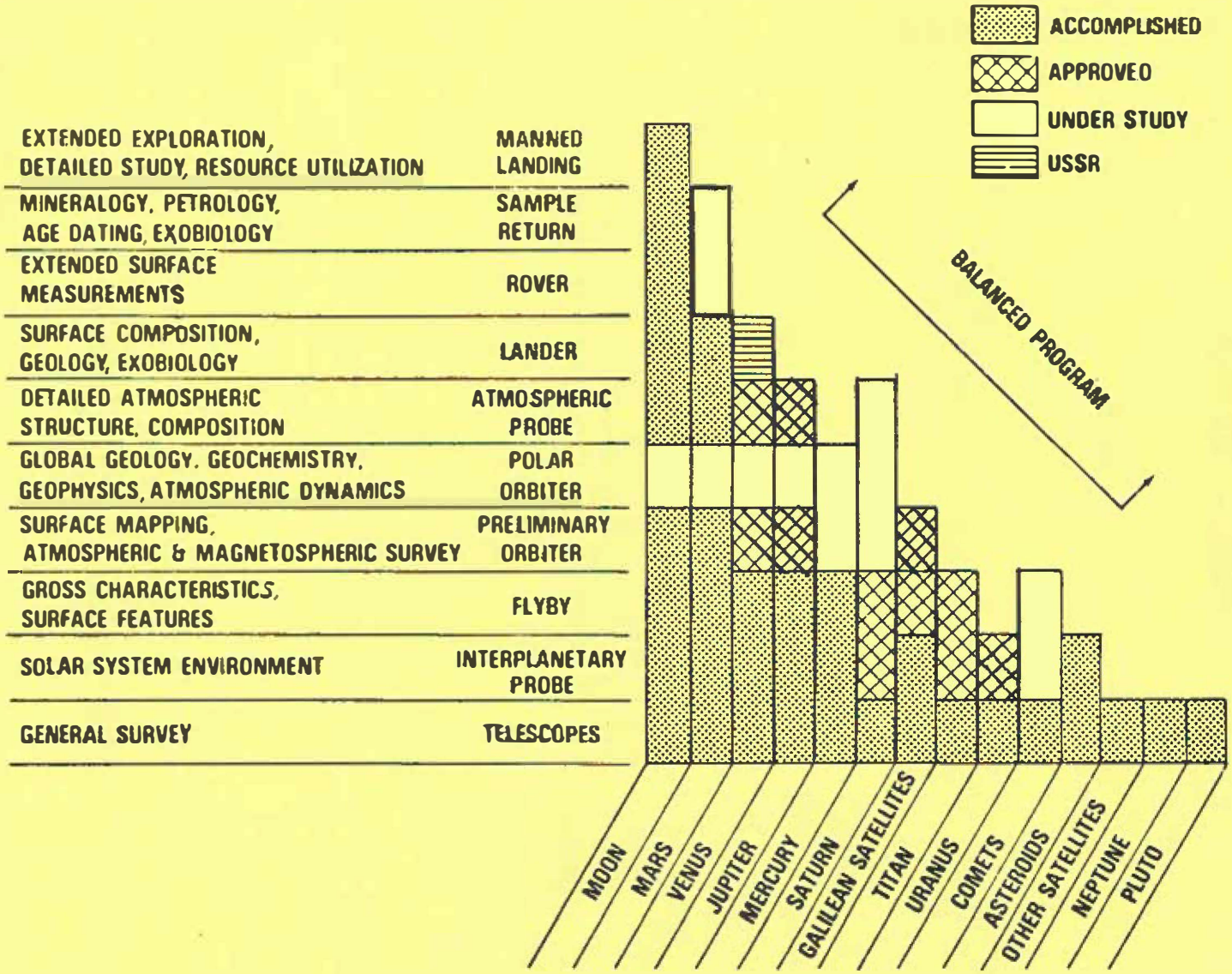

fig. 1

THE FUTURE

RECONNAISSANCE	**COMETS**	**ASTEROIDS**	**URANUS**
	HALLEY RENDEZVOUS	MULTIPLE ASTERIOD RENDEZVOUS	VOYAGER EXTENDED MISSION
EXPLORATION	**VENUS**	**SATURN**	**MERCURY**
	VOIR	SOP²	MeO
INTENSIVE STUDY		**MARS**	**MOON**
		MARS 84 / MSR	LPO
SPACE UTILIZATION		**MOON**	
		LPO	

fig. 2

INNER PLANETS PLAN

CURRENT PROGRAMS

VIKING

PIONEER VENUS

FY 79-83 NEW STARTS

MARS1984

VENUS ORB. IMAG. RADAR

LUNAR POLAR ORBITER

MERCURY ORBITER

MARS SAMPLE RETURN

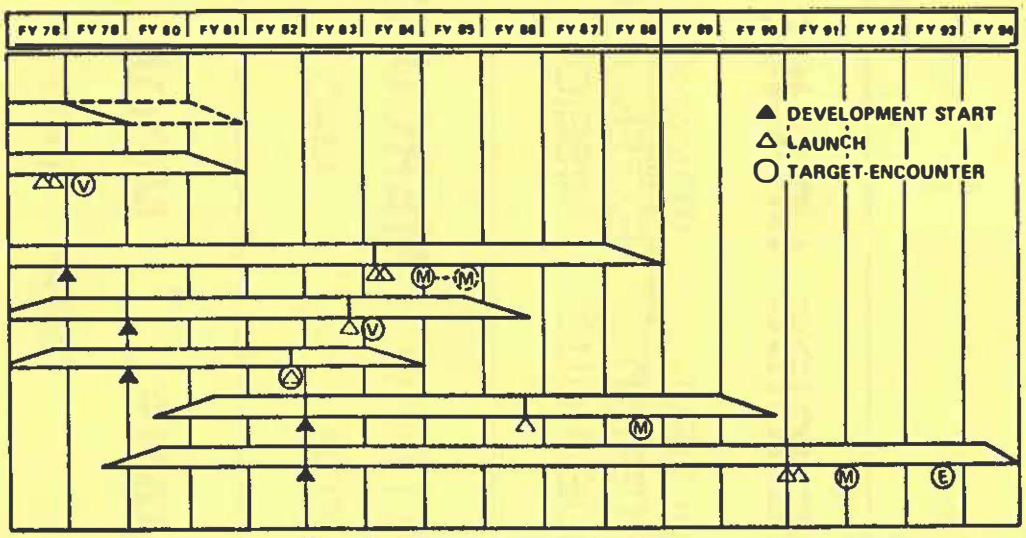

fig. 3

OUTER PLANETS PLAN

CURRENT PROGRAMS

PIONEER 10 & 11

VOYAGER

JUPITER ORBITER/PROBE

FY 79-83 NEW STARTS

SATURN ORB/DUAL PROBE

VOYAGER - URANUS

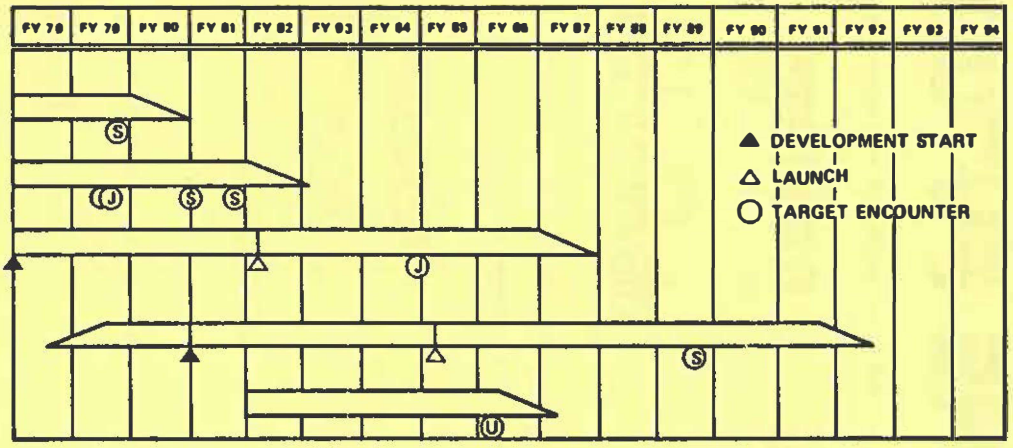

fig. 4

SMALL BODIES PLAN

CURRENT PROGRAMS

NONE

FY 79-83 NEW STARTS

HALLEY RENDEZVOUS

ASTEROID MULT. REND

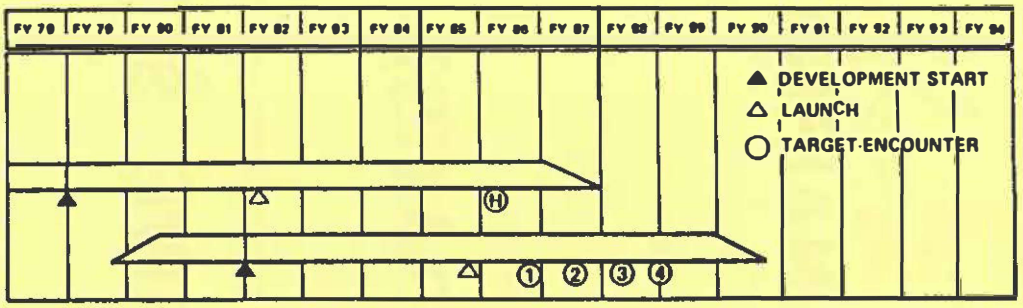

fig. 5