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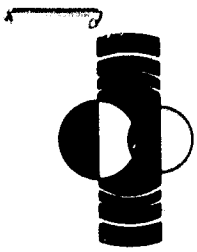

LUNAR AND PLANETARY INSTITUTE

Semi-Annual Status Report

under

Contract No. NASW-3389

1 July 1984 - 31 December 1983

USRA

UNIVERSITIES SPACE RESEARCH ASSOCIATION
The American City Building
Suite 311
10227 Wincopin Circle
Columbia, Maryland 21044

Respectfully submitted

Kevin Burke

23 April 1984
Date

Kevin Burke, Director
Lunar and Planetary Institute

April 28, 1984
Date

Paul J. Coleman, Jr., President
Universities Space Research Association

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INTRODUCTION

This report covers the scientific and administrative activities at the Lunar and Planetary Institute during the period 1 July 1983 through 31 December 1983.

During the period 1 July 1983 through 31 August 1983 the Institute was under the direction of Dr. Roger J. Phillips, Director, and Dr. Kevin Burke, Deputy Director. On 1 September 1983 Dr. Kevin Burke became the Director and Dr. Roger Phillips took up his position (full-time) at Southern Methodist University.

This report has been prepared and submitted by the Staff of the Office of the Director, LPI.

ACTIVITIES AT THE LUNAR AND PLANETARY INSTITUTE FOR PERIOD

1 JULY 1983 - 31 DECEMBER 1983

A. PLANETARY IMAGE CENTER (PIC)

The Planetary Image Center (PIC) is part of the Planetary Geology Program's network of Regional Planetary Image Facilities. As such, PIC maintains an up-to-date reference and working collection of planetary images and support data; disseminates information through an active interlibrary loan program; provides planetary slide sets at cost; conducts annual open houses; assists scientists, students, and educators in acquiring access to, or loan of, image products; and provides daily reference services to users both in house and throughout the country. Requests for materials were received from the scientific community and a variety of users, including publishers of textbooks, popular books, and magazines, film producers, planetarium and museum directors, students, and teachers.

The Library/Information Center and the Planetary Image Center hosted the Gifted Children Group from the Texas A&M University on July 12. This Group is under the director of Ms June Scobey. The Group was given introductory talks by Ron Weber/PIC and Stephen Tellier/L/IC, followed by tours of the Library/Information Center and the Planetary Image Center. The group also toured the Image Processing Facility and was given a demonstration of the Facility's capability.

Timothy Ferris, author of Galaxies and The Red Limit, and his associate, Carolyn Zecca, visited the Planetary Image Center on October 24 and 25 to select photos to be used in their forthcoming art book on space photographs; 125 photos were selected for inclusion in the book.

Other visitors to the Center were Robert Haney, Managing Editor of Geotimes (discussions with PIC staff on types of photos required for the Magazine); Eddie Figge, Swedish artist (seeking information and inspiration for her current work concerning the Voyager Missions); and Robert Mayfield of the JSC Education Department (discussions of types of materials and services available for his program).

On November 7-9 the Planetary Image Center (PIC) hosted a meeting of NASA's Regional Planetary Image Facilities Librarians. Eight Librarians attended, representing Brown Univ., Cornell Univ., Washington Univ., Jet Propulsion Laboratory, National Air & Space Museum, Arizona State Univ., Univ. of Hawaii, and the Univ. of Arizona. The main purpose of the meeting was to plan for the development of an On-Line Union Catalog. Mary Ann Hager demonstrated the on-line cataloging and retrieval capabilities being used by PIC. Fran Waranius gave a presentation on the Library Routine Management System (LRMS) currently in use at the Library/Information Center. On Wednesday (the 9th) the group visited several Departments at JSC, including Public Affairs, Education, Earth Observations, and the Lunar Laboratory. Also included was a tour of the Space Shuttle mockup used to train the Astronauts.

Materials on loan or purchased from the Image Center during this reporting period are as follows:

On Loan		Purchased	
Photographs	3110	Posters	291
Maps	164	Slide sets	8
Slides	586		
Movies	7		

New acquisitions included 153 maps and 243 slides.

Our darkroom facility continues to handle small-volume requests in a timely manner. In addition to providing custom prints for photo interpretation and routine prints for other departments at the Institute, the facility produces slides for the in-house scientific staff for use in lectures. Five work requests were processed by JSC, while 75 were handled in-house.

During this reporting period, approximately 200 visitors were received at PIC.

PIC's staffing consists of a full-time Data Manager, a half-time Special Assistant, and a half-time Darkroom Technician. A Senior Staff Scientist serves as Science Advisor to PIC.

B. LIBRARY/INFORMATION CENTER (L/IC)

The Library/Information Center continues to be an information resource for our staff, scientists at JSC and neighboring universities, and to the research community and public who utilize our services through letters and telephone calls.

There has been continued interest in the remote and personal access to the Lunar and Planetary Bibliography which has been made possible through the development of SEARCH. There is active use by the Planetary Materials Branch at JSC, students at University of Houston and Rice, as well as by users in the U.S. and foreign countries who query us by letter or telephone. During this period electronic bibliographic data bases were accessed a total of 109 times. The in-house data base was accessed 95 times; commercial data bases 14 times. This brings the total use for the calendar year to 236; 217 on the in-house data base. In fact, these figures count just the times that the bibliography was accessed. At this time we have no statistics for the number of searches run during each session. These figures also indicate a 5.5 month reporting period. Due to Hurricane Alicia, the LPI did not function for two weeks in August.

In addition, work on the LPB and the Antarctic Meteorites bibliography continues. Forty citations were added to the Antarctic Meteorite Bibliography and approximately 800 to the Lunar and Planetary bibliography during this period.

This brings the total number of citations in the Antarctic Meteorite Bibliography to over 400 and the total number of citations in the Lunar and Planetary bibliography to approximately 20,000.

To further the goal of making the library user-oriented and user-friendly, the L/IC staff has continued the implementation of a Library Routine Management System (LRMS). In PATRON, "HELP" files and a description of the services of the L/IC and PIC were added.

A number of the staff functions have also been completed for use through the LRMS. In addition to the ordering and cataloging routines that were implemented during the previous period, the inventory and circulation records are now searchable through the "question and answer" prompts routine. Information on 330 books in process (on order, not yet cataloged, etc.) and 200 fully cataloged books are now accessible through the on-line card catalog.

A demonstration of those staff portions of LRMS which would have the potential for use by other libraries was given to the the librarians of the Regional Planetary Image Facilities who met at the LPI in November.

Considerable interest in the LRMS has been demonstrated by the librarian at the Space Telescope Science Institute. Since this is a new library they are planning for all electronic operation from the start-up. We are in the process of building a mag tape of the core programs of LRMS for the STScI so that they may use the routines on their VAX.

Summer interns always increase the traffic in the L/IC. For example, although our average monthly circulation statistics are 462 items to 77 people, the June and July statistics were over 500 items to over 80 people.

In July, the L/IC and PIC hosted the Gifted Children Group from Texas A&M. After introductory talks by Ron Weber and Stephen Tellier the group toured the facilities.

The most memorable event in August was Hurricane Alicia. Due to the efforts of the staff, and the pre-planning done by our Hurricane Captain, Stephen Tellier, damage to the building was nominal. However due to power failures, the LPI did not operate for two weeks.

In December, Fran Waranius and Kin Leung were appointed a committee of two to review the telecommunication needs of the LPI and to meet with representatives of various companies and evaluate their proposals. It is hoped that this study will be concluded in February-March 1984.

Circulation records maintained for this reporting period show an average monthly circulation of 462 items to an average of 77 users.

With regard to the distribution of other publications which is handled by the L/IC, 276 requests for 287 reprints of LPI Contributions were filled. This is double the amount distributed in the previous reporting period. Requests for LPI Technical Reports and special Contributions, which are abstract volumes for topical conferences, totaled 65 requests for 118 publications.

During this period, 7 LPI Contributions and 2 Technical Report were processed for distribution. (See Appendix IV)

One issue of the Bulletin was published during this reporting period. The November issue, number 36, contained the first announcement for the 15th Lunar and Planetary Science Conference, report on Hurricane Alicia, and the announcement of our new director, Kevin Burke, as well as the continuation of the regular features of news items, new publications, calendar of events, and current awareness bibliography. Total circulation of the Bulletin now exceeds 4400.

From December 1982 to December 1983, 286 names were added to the mailing list. All additions and corrections to the LPI Mailing List are done by L/IC personnel.

C. COMPUTER CENTER

During this reporting period two existing facilities under the Computer Center, IPF and GDF, were organised to form the Computing Center for Planetary Data Analysis (C^2PDA).

Computing Center for Planetary Data Analysis (C^2PDA)

C^2PDA is a research branch at the LPI dedicated to the analysis of the extensive collections of image data and global datasets obtained by interplanetary probes and remoting sensing satellites. It serves as a focal point for remote sensing and geophysical research at the LPI. It was established to provide the scientific community access to the vast data collections obtained from missions ranging from Apollo, Pioneer, Viking, Voyager to LANDSAT, SEASAT and MAGSAT.

The first C^2PDA newsletter was published in November, in conjunction with the LPI Bulletin, to acquaint the scientific community with its facilities.

Image Processing Facility (IPF)

IPF provides facilities for research into and development of image processing, analysis and interpretive techniques of planetary images. It was designed around the DEC VAX 11/780 computer and the Gould/De Anza IP8500 Image Processing system. System capabilities include band rationing, histogram generation, destriping, density slicing, geometric correction, digital filtering, Fast Fourier Transform (FFT), contrast enhancement, edge enhancement, edge detection, principal component analysis, mosaicing, and classification on LANDSAT and other planetary images.

The software was built around the LIPS package, a FORTRAN-callable library of image processing software, developed and supported by Gould/De Anza, with additional routines converted from the VICAR package from JPL and the ELAS package from NASA Earth Resources Laboratory. Additional programming for specialized routines is provided by the in-house programming staff to offer a variety of ready-to-use, user-oriented image processing tools for both the sophisticated as well as the casual users.

The hardware features four 512 X 512 X 8 bit image channels that can be configured as three band true color (24 bits), four band multispectral (32 bits) or a single 1024 X 1024 X 8 bit channel viewed through a 512 X 512 window using real time zoom/pan. A high speed digital video array processor handles most of the image manipulation tasks. It is interfaced through the UNIBUS to the DEC VAX 11/780 computer system, 650 megabytes online disk storage and a 9 track 800/1600 bpi tape drive. The system is equipped with a 19 inch delta gun color display monitor, a joystick and a video scanner for analog inputs. The hardcopy unit is a Matrix Instrument model 3000 color graphic camera that provides full color, black and white, and color separation images on 4 X 5 film backs, and 35mm slides and prints.

Geophysical Data Facility (GDF)

GDF provides a set of research tools to analyze geophysical datasets such as gravity and magnetic data on a regional/global basis, to compare datasets of different geophysical phenonmenon over the same geographical area and to utilize iterative as well as image processing techniques for analysis of these datasets.

A user oriented package was developed to allow users to select a planet, have the global coverage of the desired dataset displayed graphically, and compile a dataset of a region of interest. Profiles and 3-D perspectives of the area of interest could then be displayed. Comprehensive modelling software is available to compare the observed data with the predicted data for further refinement of the model.

Capability for users with a DEC CT125 compatible graphic terminal to dial in through 1200 baud modems to analyze the datasets on a remote access basis was established.

The GDF dataset collections include Earth topography, SEASAT, MAGSAT, Venus topography and LOS gravity, Mars topography, LOS gravity, geology, thermal inertia and albedo and the Lunar Consortium datasets.

To meet the high demand on this new center, a second Gould/De Anza IP8500 Imaging Processing station was placed on order to be delivered in early 1984 to provide better on-line access to users of the IPF. An Analogic AP 500 32 bit floating point array processor with 2 mega bytes of memory was also ordered to be delivered in January 1984 to be used in conjuction with the DEC VAX 11/780 for fast complex calculation in the GDF.

Research Projects

Work was carried out at C^2PDA on planetary modelling, gravity and magnetic anomoly field data for the Earth and the terrestrial planets, mapping and analysis of volcanic terrains in Central Chile, Galapagos Island and Arizona, structural analysis of planetary satellites, analysis of Martian ridge systems and relation to global tectonics and basin-controlled tectonics, and analysis of ejecta trajectory in impact crater experiments under different atmospheric conditions.

Research-related Activities

The LPI computer system also provided computer and word processing support to various departments in research support areas and to Institute related administrative functions. In all, nine departments in the Institute utilized the VAX 11/780 computer system in various aspects of their operation. Complete on-line log-in process of the 14th Lunar and Planetary Science Conference Proceedings and the subsequent publication of the Proceedings volumes was performed on the LPI computer. The computer was used in the information on the LPI computer. The computer was used in the information retrieval in the Lunar and Planetary Bibliography search maintained by the Library; in BIRP, the on-line information retrieval of Viking images; in the computerized subject index search of the slides and maps collection of the Planetary Image Center; and in the Maintenance of the World Directory of Lunar and Planetary Scientists and Laboratories.

Staff

The Computer Center is operated with a tehnical staff under the Computer Systems Manager, with LPI scientists acting as scientific Advisors to different facilities within C^2PDA. They included the Computer Systems Manager, a Scientific Programmer/Analyst (IPF), a Scientific Programmer (GDF), a Programmer/User Support, with a Consultant to the Institute in the field of Geophysical Data Processing, a Scientific Advisor to IPF (planetary), and a Scientific Advisor to IPF (terrestrial).

D. PRODUCTION SERVICES

The department completed camera ready pages for Chondrules and Their Origins in October. (Production was delayed several weeks by Hurricane Alicia and her aftermath.) The volume appeared in print in January, 1984.

The typesetting and graphics offices designed and produced newsletters for C^2PDA and the Crustal Genesis Project; an issue of LPIB; a Summer Intern mailer; a brochure for PIC and presentation display for L/IC in connection with the RPIF meeting hosted by PIC; a program, field guide, badges, tickets and display art for the MESE meeting hosted by LPI; and miscellaneous ads, announcements, logos and illustrations as needed by other departments.

The typesetting office produced eleven camera ready papers for Institute and (on a non-interference basis) JSC scientists, in addition to two Technical Reports, a Shuttle Slide catalog and miscellaneous tables, equations and forms.

The Graphics Office produced 341 pieces of artwork for scientific staff during the reporting period.

Work was begun in December (on a charge-back, non-interference basis) on the Proceedings of the Space Adaptation Syndrome Drug Workshop for USRA's Division of Space Biomedicine. The volume will appear in Spring of 1984.

E. SCIENTIFIC STAFF

In addition to a Director and a Deputy Director, the in-house scientific staff (during this report period) consisted of five scientists working in different areas of lunar and planetary research and assisting in implementation of service functions of the Institute -- names and areas of activity are as follows:

Dr. Roger J. Phillips -- Geophysics -- Research in evolution and present state of planetary interiors from the study of gravity, heat flow, and topographic data; the relationship between surface tectonic features and interior processes; dynamics of planetary interiors. Served as Director through 31 August 1983.

Dr. Kevin Burke -- Geology -- Research in the application of the findings of plate tectonics to interpretation of the geological history of the earth. Currently pursuing research on the operation of the Wilson cycle of the opening and closing of oceans on earth, concentrating on: 1) Caribbean evolution over the last 200 my; 2) the way this cycle operated to make early crusting in the Archean; 3) preparation of a revised catalogue of rifts and sutures of the world. Served as Deputy Director through 31 August 1983; became Director 1 September 1983.

Dr. Lewis D. Ashwal -- Petrology/Geochemistry -- Origin and evolution of planetary crusts and mantles; Precambrian geologic history; petrology, mineralogy, and geochemistry of anorthosites and related rocks; origin of magmatic ore deposits; role of volatiles in igneous and metamorphic processes; Rb-Sr and Sm-Nd isotope geochronology; fluid inclusion studies; meteorites as possible martian samples. Serves as Project Scientist for the LPI project: Early Crustal Genesis of the Terrestrial Planets. On leave at Yale beginning September 1983 teaching.

Dr. Paul Morgan -- Geophysics -- Research in heat flow and seismic studies in active tectonic environments; the genesis, structure, and evolution of continental rifts, and geothermal systems. Served as Project Scientist for the LPI project on continental rifts. Chairman of the LPI Seminar Series.

Dr. Graham Ryder -- Geology -- Research in igneous and metamorphic petrology, planetology - petrographic, petrochemical, microprobe studies.

Dr. Peter H. Schultz -- Planetary Geology -- Problems in atmospheric effects of impact crater formation; emplacement mechanics of ejecta on the Moon and Mars; experimental impact cratering; structure and evolution of multi-ring impact basins; martian polar wandering; computer-code simulation of impact cratering. Serves as LPI Science Coordinator for the NASA/Ames Vertical Ballistic Gun Range. LPI representative on Regional Planetary-Image Facility Committee and serves as Science Advisor for Planetary Image Center at LPI. Chairman of the "Working Group for the Preservation of Planetary Products." Member of Lunar and Planetary Review Panel. Chairman of the in-house Visiting Scientist Review Panel.

Dr. Joseph L. Wooden -- Geochemistry/Geochronology -- Rb-Sr and Sm-Nd isotopic systematics; chronology and geochemistry of achondritic meteorites; chronology of lunar samples; chronology and geochemistry of the terrestrial Archean crust; geochemical evolution of planetary

crust-mantle systems; Sr and Nd isotopic systematics of terrestrial anorthosites; geochemistry and Sr-Nd isotopic systematics of terrestrial mafic rocks.

The in-house scientific staff members are of vital importance in their service roles in LPI programs and activities, and also as experienced lunar and planetary scientists who help in initiating and formulating new programs using their research experience. In this context, the resident staff and both long- and short-term visiting scientists have been jointly active in phases of program development and implementation requiring broad scientific expertise.

Further details on scientific staff and long-term visitor appointments and publications and on off-site scientific and/or programmatic activities (during the report period) are given in Appendices I.A. and I.C.

F. VISITOR PROGRAM

LPI visitors are classified into six major categories: Visiting Scientists (VS), Visiting Research Scientists (VRS), Visiting Post-Doctoral Fellows (VPDF), Visiting Graduate Fellows (VGF), Visiting Undergraduate Fellows (VUF), and Visiting Undergraduate Interns (VUI). At any one time the facility can accommodate approximately 25 visitors. During the period 1 July 1983 - 31 December 1983, 38 visitors will have been in residence at LPI for a combined total of about 5.50 man-years. The visitor group consisted of 12 Visiting Scientists, 1 Visiting Research Scientist , 1 Post-Doctoral Fellow , 9 Visiting Graduate Fellows, 2 Visiting Undergraduate Fellow, and 13 Visiting Undergraduate Interns. A summary of the level of effort, accomplishments, and costs for each category is shown in the Table that follows:

SUMMARY OF VISITOR PROGRAM*
July 1, 1983 - December 31, 1983

CATEGORY	NO. OF PERSONS	TOTAL MAN YRS.	COSTS		
			AVERAGE LENGTH OF STAY (WEEKS)	SALARY & BENEFITS	TRAVEL, RELOCATION & DISLOCATION EXPENSES
Domestic V.S.	7	.44	3.29	$19,890.37	$1,597.20
Foreign V.S.	5	1.12	11.68	20,051.92	80.00
V.R.S.	1	.27	14.00	9,110.00	748.84
V.P.D.F.	1	.09	4.43	1,338.43	-0-
V.G.F.	9	1.51	8.71	5,126.09	7,404.50
V.U.F.(Summer Fellows)	2	.23	5.93	-0-	3,884.00
V.U.I.(Summer Interns)	13	1.84	7.35	-0-	15,408.18
TOTALS	38	5.50		$55,516.81	$29,122.72

*See Appendix I.B for Visitor Roster

Summer Undergraduate Intern Program

In the summer of 1983, the Lunar and Planetary Institute offered students world-wide an opportunity to work closely with scientists active in lunar and planetary research. Out of 210 highly qualified applicants from throughout the United States, Canada, India, Italy and Puerto Rico, 13 undergraduate or newly-graduated students were chosen to take part in the seventh Summer Undergraduate Intern Program. Fifteen scientists from the Lunar and Planetary Institute and the Johnson Space Center are directing the interns in a variety of research projects. Interns will have opportunities to present a profile of their research to their colleagues and advisors, and to interact with scientists from JSC and LPI, and with visiting researchers from the lunar and planetary science community. It is anticipated that many of these projects and interactions will produce publishable results. A roster of students and their advisors is included in Appendix I.B.

G. SCIENTIFIC PROJECTS, CONFERENCES, WORKSHOPS, AND SEMINARS

1. Topical Conferences, Workshops, and Seminars

Conferences, workshops and special projects on various subjects are arranged and conducted in-house by LPI. Available facilities can accommodate approximately 75 participants for discussion conferences; however, LPI can accommodate larger groups through closed-circuit television. Television monitors and audio system in the Hess Room allow remote auditing of presentations (one sound and two video inputs) from the Berkner Room.

Summary tables of conferences, workshops and seminars are contained in Appendix II.

Early Crustal Genesis Project

Researchers interested in the Early Crustal Genesis (ECG) Project were mailed the second ECG Newsletter in November 1983. The newsletter is being used as a method of informing scientists interested in the project of conferences, workshops and other activities related to or supported by the ECG Project. A workshop on the "Early Earth: Interval from Accretion to the Older Archean" and a topical conference, "Origin of the Moon" are two ECG related meetings scheduled for 1984. Further details on these meeting are provided in this report.

Workshop on Lunar Surface Materials

A small group of scientists and engineers representing the disciplines and potential users of a book on Lunar Surface Materials will hold a workshop at LPI on February 14-15, 1984. The purpose of the workshop is to set out what information this book could provide and establish areas of needed research. Grant Heiken and David Vaniman of Los Alamos National Laboratory and Lawrence Taylor of the University of Tennessee are the conveners for the workshop. A second meeting encompassing additional scientists and engineers interested in the subject is planned to coincide with the 15th Lunar and Planetary Science Conference in March 1984. Funding, scheduling and writing assignments will be covered at the second meeting.

15th Lunar and Planetary Science Conference

The Fifteenth Lunar and Planetary Science Conference is being organized under the sponsorship of the NASA Johnson Space Center, the Lunar and Planetary Institute, The American Geophysical Union, the Division for Planetary Sciences of the American Astronomical Society, and the Meteoritical Society. The conference will be held March 12-16, 1984 at the NASA Johnson Space Center, Houston, Texas. Abstracts submitted for presentation and accepted by the program committee will be designated for oral or poster presentation or for print only in the abstract volumes published by LPI. The program committee is scheduled to meet in January 1984 to review contributions and to organize details of the conference program. During the four-and-a-half-day conference three sessions will run concurrently each half-day for oral presentation of contributions.

Workshop on the Early Earth: The Interval from Accretion to the Older Archean

As a contribution to NASA's current Early Crustal Genesis Project, a workshop on the Early Earth will be held at the Lunar and Planetary Institute on April 23-25, 1984. The goal of this workshop is to review current understanding of the processes of earth formation and that of the older Archean rocks. The program committee for the workshop is being chaired by Kevin Burke. Abstracts will be submitted to LPI on presentations scheduled for the workshop and a technical report including these abstracts will be produced following the meeting.

The 47th Annual Meteoritical Society Meeting

The 47th Annual Meeting of the Meteoritical Society will be held July 30 through August 2, 1984, at the University of New Mexico in Albuquerque, New Mexico. The Institute of Meteoritics and Department of Geology at the University of New Mexico and the Lunar and Planetary Institute will sponsor this year's meeting. Abstracts received for presentation at the meeting will be published by LPI and distributed to attendees.

Conference on the Origin of the Moon

The Lunar and Planetary Institute and the Division for Planetary Sciences (DPS) of the American Astronomical Society will co-sponsor a topical conference that will concentrate solely on how the Moon may have been formed. The conference will be held October 13-16, 1984, in Kona, Hawaii, following the 1984 DPS meeting at that location. Conference organizers are William Hartmann, Planetary Science Institute; Roger J. Phillips, Southern Methodist University; and G. Jeffrey Taylor, University of New Mexico. Abstracts are due at LPI by July 15, 1984 for publication in a volume to be distributed to conference attendees. The proceedings of the conference will be prepared and published in book form.

Conference on the Role of Heat and Decollement in Extensional Tectonism

A conference on "The Role of Heat and Decollement in Extensional Tectonism" is planned for April 1985. The location being considered for the conference is in the area north of Flagstaff, Arizona to make field work or a possible field trip in conjunction with the conference a possibility. The objective of the conference is to use the Basin and Range Province as a well-studied area to provide useful concepts and analogs for the study and interpretation of the rheology and genesis of suspected extensional terranes on the planets. Features on other planets would be considered as opportunities for testing, under conditions other than the terrestrial ones, the hypotheses developed from detailed work on the Earth. Conveners for the conference are Ivo Lucchitta and Laurence Soderblom, U.S. Geological Survey, Flagstaff, and Paul Morgan, Lunar and Planetary Institute.

The 1983 Archean Field Workshop "A Cross Section of Archean Crust"

The Geological Survey of Canada (GSC) and the Lunar and Planetary Institute sponsored a field workshop August 10-16, 1983. Additional sponsorship for the meeting was provided by The International Geologic Cooperation Project, the National Aeronautics and Space Administration, and the Ontario Geological Society. Forty-six scientist participated in the workshop which was convened by Lewis D. Ashwal, Lunar and Planetary Institute, and Kenneth D. Card, Geological Survey of Canada. An abstract volume and field guide were produced by LPI for the meeting participants. The field workshop included a day of presentations at the GSC facility in Ottawa followed by a six-day field trip between Wawa and Timmins, Ontario. A technical report on the workshop which includes extended abstracts, a guidebook to the field trip area, and a summary of group discussions on future activities, publications and research has been published by the LPI. The field workshop was part of the Early Crustal Genesis initiative.

Workshop on Past and Present Solar Radiation: The Record in Meteoritic and Lunar Regolith Materials

On September 3-4, 1983, a workshop in the continuing series of meetings concerning early crustal genesis of the earth and planets was sponsored by the LPI at the Max-Planck Institut fur Chemie in Mainz, West Germany. The informal workshop, attended by over sixty persons, addressed the extent to which asteroidal and lunar regoliths have collected and preserved (in meteoritic regolith breccias and in lunar soils and soil breccias) a record of the flux, energy, and compositional history of the solar wind and solar flares. A volume of pre-meeting abstracts was assembled, and a post-meeting technical report is being prepared. The meeting was convened by David McKay, NASA Johnson Space Center and Robert Pepin, University of Minnesota.

The 46th Annual Meeting of the Meteoritical Society

September 5-9, 1983, the 46th Annual Meeting of the Meteoritical Society was held in Mainz, West Germany. The meeting was sponsored by the Max-Planck-Institute fur Chemie and the Lunar and Planetary Institute. The meeting was attended by over 300 persons who heard 220 papers presented on topics concerning studies of meteoritics. The papers presented will be published in the December issue of Meteoritics.

Association of Earth Science Editors Annual Meeting

On October 9-12, 1983, the Lunar and Planetary Institute hosted the Annual Meeting of the Association of Earth Science Editors (AESE). An open house was held at the LPI on Sunday Evening, October 9, and the program sessions, October 10-12, were held at the Nassau Bay Hilton. The meeting was attended by 93 members, guests and staff. A field trip to Galveston preceded the annual dinner held in the Strand District aboard an 18th century sailing vessel. Russell Merrill, Program Chairman, and Rosanna Ridings, Host Committee Chairman, are former LPI staff members and were instrumental in having the meeting held in Houston and hosted by the LPI.

H. PUBLICATIONS AND COMMUNICATIONS

During this report period, the following projects were completed.

1. Proceedings of the Fourteenth Lunar and Planetary Science Conference

The Proceedings of the 14th Lunar and Planetary Science Conference (first supplement) was published in December by the American Geophysical Union. Published as a supplement to the Journal of Geophysical Research-Red, this first section of the Proceedings contained 392 pages and 34 papers.

2. Abstract Volumes

An abstract volume for the Workshop on Past and Present Solar Radiation: The Record in Meteoritic and Lunar Regolith Material was published in September. Approximately 50 copies of the volume were distributed at the workshop held in Mainz, Germany, on September 3 and 4.

A field guide and abstract volume was prepared by LPI Publications for the 1983 Archean Geochemistry Early Crustal Genesis Field Workshop held in Uttawa, Ontario, on August 10-16. Approximately 60 copies were distributed at the meeting.

3. Technical Reports

A technical report on the Workshop on a Cross Section of Archean Crust was published in December. This report was edited by L. D. Ashwal and K. D. Card and constitutes LPI Technical Report No. 83-03.

4. Lunar and Planetary Institute Contributions

To document the activities of the visiting and staff scientists and other work supported by the Institute, this formal series called "Lunar and Planetary Institute Contributions" was initiated in September 1969 while the Institute was under the auspices of the National Academy of Sciences.

The following table shows a periodic listing of the contributions since implementation of the program:

PERIOD	CONTRIBUTIONS	LPI NUMBERS
Prior to 11 December 1969	1	1
11 December to 31 May 1971	68*	2-69
1 June 1971 to 30 June 1972	34	70-103
1 July 1972 to 30 June 1973	49	104-152
1 July 1973 to 30 June 1974	32	153-184
1 July 1974 to 30 June 1975	32	185-216
1 July 1975 to 30 June 1976	30	217-246
1 July 1976 to 30 June 1977	33	247-279
1 July 1977 to 30 June 1978	48	280-327
1 July 1978 to 30 June 1979	54	328-382
1 July 1979 to 30 June 1980	27	383-409
1 July 1980 to 30 June 1981	31	410-440
1 July 1981 to 30 June 1982	39	441-479
1 July 1982 to 30 June 1983	39	480-518
1 July 1983 to 31 Dec 1983	7	519-525

*Includes 28 contributed papers to LPI's Meteorite Impact and Volcanism Conference

During the current period, of the 7 papers numbered in the series through 31 December 1983 3 were authored or co-authored by staff scientists or other staff members and 4 were by visiting scientists. (See Appendix IV for list of LPI Contributions for the period July to December 1983.)

5. Lunar and Planetary Information Bulletin

One issue of the Bulletin was published during this reporting period. The November issue, number 36, contained the first announcement for the 15th Lunar and Planetary Science Conference, report on Hurricane Alicia, and the announcement of our new director, Kevin Burke, as well as the continuation of the regular features of news items, new publications, calendar of events, and current awareness bibliography. Total circulation of the Bulletin now exceeds 4400.

I. PANELS, TEAMS, WORKING GROUPS, AND COMMITTEES

Planetary Geology Review Panel (PGRP)

The Planetary Geology Review Panel, chaired by Dr. Larry Soderblom, met at the Jet Propulsion Laboratory in Pasadena on September 1 and 2. The Panel reviewed and evaluated 35 proposals at this meeting.

Lunar and Planetary Review Panel (LPRP)

The New LPRP Chairman, Dr. G. J. Taylor, and the four Group Chiefs met on September 20 and 21 at the LPI. They discussed review assignments for all proposals received thus far by the Panel Office and made all other review assignments and changes to assignments deemed necessary. The LPRP budget also was discussed. The full Lunar and Planetary Review Panel, chaired by Dr. G. Jeffrey Taylor, met at the LPI October 23 through October 28. The Panel, divided into four groups, reviewed and evaluated 203 proposals at this annual meeting.

Mars Data Analysis Panel (MDAP)

The Mars Data Analysis Review Panel, chaired by Dr. Robert Pepin, met at the LPI October 14-15. This was the first meeting of the Panel. Twenty-seven proposals were reviewed and evaluated.

Crustal Genesis Review Panel (CGRP)

The Crustal Genesis Review Panel, chaired by the Director, held its first meeting at the LPI on November 7-9. Twenty-nine proposals were reviewed and evaluated.

Lunar and Planetary Sample Team (LAPST)

The Lunar and Planetary Sample Team met at the LPI on September 30, October 1 and 2, and on December 10-12. At the September-October meeting the Team acted on sample requests and drafted a Moon Base Outline as requested by NASA that consisted of scientific objectives, techniques, and equipment that should be involved in a Moon Base. At the December meeting, the Team considered 9 requests for samples and generated 4 memoranda to the Chief of the Solar System Exploration Division at NASA/JSC and 2 memoranda to NASA Headquarters' Solar System Exploration Division. Dr. Graham Ryder rejoined the Team at this meeting.

Meteorite Working Group (MWG)

The Meteorite Working Group met at the Smithsonian Institution on September 23-25. Dr. L. Rancitelli took over as Chairman at this meeting. The Group acted on 41 requests for samples. They also discussed plans for the coming season in Antarctica. The next meeting will be held April 6-8, 1984 at LPI.

Mission Operations and Information Systems Subcommittee of the Solar System Exploration Committee (MO&IS and SSEC)

The Mission Operations and Information Systems Subcommittee of the Solar System Exploration Committee met at the Jet Propulsion Laboratory July 28-29, October 11-12, and December 13-14, and at the Goddard Space Flight Center on September 21-22 to continue planning high quality planetary missions at low-to-moderate cost.

J. NASA-AMES VERTICAL GUN RANGE (AVGR)

The period July 1, 1983 to December 31, 1983 was relatively quiet at the AVGR since all barrels for the light-gas gun were inoperative. Delays in ordering replacements prevented a smooth transition after the last useable barrel had expired. Nevertheless, visits were arranged for Peter Tsou (JPL), Carol Polansky and Don Burnett (CalTech), and Peter Schultz (LPI). Also during this time period, the BBC aired a program (part of the Horizon series) that featured the NASA-Ames Gun and Dr. P. Schultz. New barrels now have arrived and a more active period of scheduling is anticipated.

K. LUNAR AND PLANETARY SCIENCE COUNCIL

The Lunar and Planetary Science Council reports directly to the USRA Board of Trustees. It has been charged with the responsibility for advising the Board on all matters relating to USRA activities in lunar and planetary science. Accordingly, it is the principal USRA group reviewing, in association with the Director, the programs of the LPI and making recommendations to the Board on policy matters relating to technical or scientific programs at the Institute.

Council members during this report period were:

Dr. Klaus Keil (Convener), Institute of Meteoritics, University of New Mexico, Albuquerque.

Dr. Albert W. Bally, Department of Geology, Rice University, Houston.

Dr. Alfred G. Duba, Lawrence Livermore Laboratory, University of California, Livermore.

Dr. Ronald Greeley, Department of Geology, Arizona State University, Tempe.

Dr. William M. Kaula, Department of Earth and Planetary Sciences, University of California, Los Angeles.

Dr. Thomas B. McCord, Planetary Geosciences, Hawaii Institute of Geophysics, Honolulu.

Dr. Richard O'Connell, Department of Geological Sciences, Harvard University, Cambridge.

ANTICIPATED EFFORT DURING NEXT REPORT PERIOD

1 January 1984 - 30 June 1984

Major efforts will be directed along the following lines:

- As implementation of the recommendations of the Solar System Exploration Committee (SSEC) of the NASA Advisory Council is beginning, the Institute is playing a characteristic scientific role complementary to that of mission dedicated scientific programs. For example: A Mars geoscience orbiter figures among early planetary explorer class missions. The new Mars Data Analysis program, for which the Institute is responsible, relates closely to the proposed mission.

- A workshop on lunar materials planned for February 1984 represents an initial involvement in the scientific aspects of early developments of a lunar science orbiter and of possible renewed lunar exploration; major topical conference, planned for October 1984, on the origin of the Moon constitutes a more substantial effort.

- The Institute has long provided a service for the SSED, and to a lesser extent for other branches of NASA, in organizing peer review panels, working groups, and teams. Plans for the coming year involve some restructuring of the existing panel organization in response to organizational changes within the SSED, but no radical change in proven procedures.

- Innovations in the Institute are anticipated that relate to the New Director's involvement in global geology and in the entire history of the Earth. Early completion of a technical report embodying a catalogue of rifts and sutures of the Earth represents a first step in this direction and it is hoped that these and related efforts might prove helpful to NASA in its current effort to define its overall role in the study of the Earth.

Ongoing activities managed by or connected with the LPI will include the Ames Verticle Gun Range, Lunar and Planetary Review Panel, Planetary Geology Review Panel, Meteorite Working Group, the Lunar and Planetary Sample Team, Planetary Cartography Working Group, Early Crustal Genesis Review Panel and Mars Data Analysis Panel.

- M O R E -

Workshops, Meetings, and Conferences (as of this date) for 1984 are:

Workshop on Lunar Surface Materials - 2/14-15/84

15th Lunar and Planetary Science Conference - 3/12-16/84

Workshop on Early Earth: The Interval from Accretion to the Older Archean - 4/23-25/84

47th Annual Meteoritical Society Meeting - 7/30-8/2/84

Conference on the Origin of the Moon - 10/13-16/84

For more information (conveners, locations, publications) on Workshops and Conferences, please see Summary Table in Appendix II, Part A.

APPENDIX I

PART A: SCIENTIFIC STAFF AND LONG-TERM VISITOR APPOINTMENTS AND PUBLICATIONS

PART B: VISITOR ROSTER

PART C: STAFF AND VISITOR OFF-SITE SCIENTIFIC ACTIVITIES

APPENDIX I*

SCIENTIFIC STAFF FY 1984

1 July 1983 - 31 December 1983

Ashwal, Lewis D. (Appointment: 3 September 1980 - 2 September 1985)
Field: PETROLOGY/GEOCHEMISTRY - origin and evolution of planetary crusts and mantles; Precambrian geologic history; petrology, mineralogy, and geochemistry of anorthosite and related rocks; origin of magmatic ore deposits; role of volatiles in igneous and metamorphic processes; Rb-Sr and Sm-Nd isotope geochronology; fluid inclusion studies; meteorites as possible martian samples.

Publications*

Ashwal, L. D. (with P. Morgan), 1983. Comment on "Uplift rate of Adirondack anorthosite measured by fission track analysis of apatite," by D. S. Miller and S. Lakatos, Geology 11, 284-286, 1983. Geology. (in review)

Ashwal, L. D. (with J. L. Wooden), 1983. Sr and Nd isotope geochronology, geologic history, and origin of the Adirondack anorthosite. Geochim. Cosmochim. Acta 47, 1875-1885.

Ashwal, L. D. (with J. L. Wooden), 1983. Isotopic evidence from the Eastern Canadian shield for a geochemical discontinuity in the Proterozoic mantle. Nature 306, 679-680.

Ashwal, L. D. (with K. D. Card), 1983. Workshop on a Cross Section of Archean Crust, 172 pp., LPI Tech. Rpt., Houston, Texas.

*Appendix I lists only those publications that have appeared in print or were in progress during the report period and which were not included in the previous report.

Burke, Kevin (Part-time 1 April 1982 - 31 August 1983; Director 1 September 1983)
Field: GEOLOGY - research in plate tectonics to interpret geological history of the earth; research on operation of Wilson cycle of the opening and closing of oceans on earth, concentrating on Caribbean evolution over the last 200 my and early crust in the Archean.

Publications

Burke, K. (with P. Mann, M. R. Hempton and D. C. Bradley), 1983. Development of pull-apart basins. Journal of Geology 92, 529-554.

Burke, K. (with S. L. Anderson), 1983. A Wilson Cycle approach to some Proterozoic problems in eastern North America. In Proterozoic Geology (L. G. Medaris, ed.), GSA Memoir 161, pp. 75-93.

Burke, K. (with G. Wadge), 1983. Neogene Caribbean plate rotation and associated Central American tectonic evolution. Tectonics 2, pp. 633-643.

Burke, K. (with P. Mann, F. W. Taylor and R. Kulstad), 1983. Subaerially exposed holocene coral reef, Enriquillo Valley, Dominican Republic. Geol. Soc. of Amer. Bull., in press.

Burke, K. (with C. Cooper, J. F. Dewey, W. P. Mann and J. L. Pindell), 1983. Caribbean Tectonics and Relative Plate Motions, edited by W. Bonini, GSA Memoir 162, Princeton.

Burke, K., 1983. Revised Catalogue of Rifts and Sutures of the World. (in preparation)

Morgan, Paul (Appointment: 2 September 1980 - 1 September 1984)
Field: GEOPHYSICS - heat flow and seismic studies in active tectonic environments, the genesis, structure and evolution of continental rifts, and geothermal systems.

Publications

Morgan, P., 1983. Uplift of the Colorado Plateau and its relationship to volcanism and rifting in the adjacent Basin and Range and Rio Grande rift. International Union of Geodesy and Geophysics XVIII General Assy., Hamburg, F.R.G., 15-27 Aug., 1983, IUGG Inter-disciplinary Symposia, Programme and Abstracts, 2, 576.

Morgan, P. (with F. K. Boulos, S. F. Hennin, A. A. El-Sherif, A. A. El-Sayed, N. Z. Basta and Y. S. Melek), 1983. Heat flow in eastern Egypt: the thermal signature of a continental breakup. International Union of Geodesy and Geophysics XVIII General Assy., Hamburg, F.R.G., 15-27 Aug., 1983, IUGG Inter-disciplinary Symposia, Programme and Abstracts, 1, 508.

Morgan, P. (with R. J. Phillips), 1983. Mechanisms and maintenance of epeirogenic continental uplift: Africa, Venus and Mars. International Union of Geodesy and Geophysics XVIII General Assy., Hamburg, F.R.G., 15-27 Aug., 1983, ICL Symposia, Programme and Abstracts, 46.

Morgan, P. (with T. H. Giordano), 1983. Heat, hydrocarbon degradation, and fluid flow in continental rift systems: applications to ore deposition, Geol. Soc. Am., Abstracts with Program, 15(6), 647.

Morgan, P., 1983. Continental lithosphere: thermal structure and evolution. EOS 64, 837.

Morgan, P. (with G. R. Keller, K. H. Olsen, J. N. Stewart, L. W. Braile and C. R. Daudt), 1983. A cooperative crustal structure study of the Rio Grande rift and Valles caldera. EOS 64, 752.

Morgan, P. (with V. Harder), 1983. Geothermal resources of the Rio Grande rift: a groundwater convection model. EOS 64, 753.

Morgan, P. (with L. D. Ashwal and W. W. Leslie), 1983. Thermal constraints on high-pressure granulite metamorphism of supracrustal rocks. In Workshop on Cross Section of Archean Crust (L. D. Ashwal and K. D. Card, eds.), p. 13-19. LPI Tech. Rpt. 83-03, LPI, Houston, Texas.

Morgan, P. (with I. B. Ramberg), 1983. Physical characteristics and evolutionary trends of continental rifts. Proceedings 27th International Geological Congress, VNU Science Press BV, Utrecht, in press.

Morgan, P. (with R. J. Phillips), 1983. Hot Spot Heat Transfer: Its

application to Venus and implications to Venus and the Earth. J. Geophys. Res. 88, 8305-8317.

Morgan, P., 1983. The thermal structure and thermal evolution of the continental lithosphere. Phys. Chem. Earth, in press.

Phillips, Roger J. (Appointment: 15 October 1979 - 1 September 1982 [full time]; part-time to 1 September 1983)
Field: GEOPHYSICS - research in evolution and present state of planetary interiors from the study of gravity, heat flow, and topographic data; the relationship between surface tectonic features and interior processes; dynamics of planetary interiors.

Publications

Phillips, R. J. (with P. Morgan), 1983. Hot Spot Heat Transfer: Its application to Venus and implications to Venus and Earth. J. Geophys. Res. 88, 8305-8317.

Phillips, R. J. (with M. Malin), 1983. Tectonics of Venus. Annual Reviews of Earth and Planetary Science (in press).

Phillips, R. J., 1983. Interrelatinships of Volatile History, Thermal Evolution and Tectonics in the Terrestrial Planets, in Conference on Planetary Volatiles, LPI Tech. Rpt., 83-01, Lunar and Planetary Institute, Houston.

Ryder, Graham (Appointment: 3 November 1983--)
Field: GEOLOGIST - igneous and metamorphic petrology, planetology. Petrographic, petrochemical, microprobe studies.

Publications

Ryder, G. (with R. Ostertag), 1983. ALHA 81005: Moon, Mars, petrography, and Giordana Bruno. Geophys. Res. Lett. 10, 791-794.

Ryder, G. (with J. Longhi), 1983. Workshop on Pristine Highlands Rocks and the Early History of the Moon, 92 pp. LPI Tech. Rpt. 83-02, LPI, Houston, Texas.

Ryder, G. (with R. Ostertag), 1983. ALHA 81005: Petrographic components of the target (Abs.). Meteorites from the Earth's Moon, pp. 29-30. Special Session Abstracts, Fourteenth Lunar and Planetary Science Conference, LPI, Houston, Texas.

Ryder, G. (with R. Ostertag), 1983. ALHA 81005: Petrography, shock, Moon, Mars, Giordano Bruno, and composition (Abs.) Meteorites from the Earth's Moon, pp. 23-24. Special Session Abstracts, Fourteenth Lunar and Planetary Science Conference, LPI, Houston, Texas.

Ryder, G., 1983. Nickel in olivines and parent magmas of lunar pristine rocks (Abs.). Workshop on Pristine Highlands Rocks and the Early History of the Moon, pp. 66-68. LPI Tech. Rpt. 83-02, LPI, Houston, Texas.

Ryder, G., 1983. The potential of lunar research in planetology (Abs.). European Union of Earth Sciences Abstracts (Strasbourg).

Ryder, G., 1983. Glass in ALHA 81005,8 and mare basalts in highlands breccias (Abs.). In Papers Presented to the 46th Annual Meteoritical Society Meeting (Mainz, W. Germany).

Ryder, G., 1983. Lunar breccias (Abs.). In Schlussbericht zum DFG-Kolloquium "Impaktprozesse auf Planetenoberflachen" (Munster), pp. 38-39. Deutsche Forschungsgemeinschaft, Bonn.

Schultz, Peter H. (Appointment: 1 September 1976 - 31 August 1985)
Field: PLANETARY GEOLOGY - atmospheric effects on impact crater formation; emplacement mechanics of ejecta on the Moon and Mars; experimental impact cratering; structure and evolution of multi-ring impact basins; Martian polar wandering; computer-code simulation of impact cratering.

Publications

Schultz, P. H. (with D. T. Eppler, R. Ehrlich, and D. Nummedal), 1983. Sources of shape variation in lunar impact craters--Fourier shape analysis. Bull. Geol. Soc. Amer. 94, p. 274-291.

Schultz, P. H. (with R. A. Arvidson, E. Levinthal and R. S. Saunders), 1983. Remote sensing of the surfaces of terrestrial moons and planets. In Manual of Remote Sensing, vol. II, second edition. (in press)

Schultz, P. H. (with J. Rogers), 1983. Erosional styles of impact basins and the climate history of Mars. (in preparation)

Schultz, P. H. (with T. Matsui), 1984. On the brittle-ductile behavior of iron meteorites: New experimental constraints. (in review)

Schultz, P. H. (with D. E. Gault), 1984. Clustered impacts: Experiments and implications. (in review)

Schultz, P. H. (with D. E. Gault), 1984. Atmospheric effects on ejecta emplacement II: experimental results. (in preparation)

Schultz, P. H. (with A. B. Lutz), 1984. Polar wandering on Mars. (in preparation)

Wooden, Joseph L. (Appointment: 6 December 1982-2 September 1983)
Field: GEOCHEMISTRY/GEOCHRONOLOGY- Rb-Sr and Sm-Nd isotopic systematics; chronology and geochemistry of achondritic meteorites; chronology of lunar samples; chronology and geochemistry of the terrestrial Archean crust; geochemical evolution of planetary crust-mantle systems; Sr and Nd isotopic systematics of terrestrial anorthosites; geochemistry and Sr-Nd isotopic systematics of terrestrial mafic rocks.

Publications

Wooden, J. L. (with C. -Y. Shih, L. E. Nyquist, D. D. Bogard, G. A. McKay, B. M. Bansal, and H. Wiesmann), 1983. Chronology and petrogenesis of young achrondrites, Shergotty, Zagami, and ALHA 77005: Late magmatism on a geologically active planet. Geochim. Cosmochim. Acta. (in press).

Wooden, J. L. (with W. U. Reimold, N. Reimold, B. M. Bansal, C.-Y. Shih, H. Wiesman, I. D.R. Mackinnon and L. E. Nyquist), 1983. Mineralogical, chemical and chronological characteristics of the crystalline Apollo 16 impact melt rocks. Fortschritte Mineralogischen (to be published).

Wooden, J. L. (with L. D. Ashwal), 1983. Sr and Nd isotope geochronology, geologic history, and origin of the Adirondack anorthosite. Geochimica et Cosmochimica Acta, 47, 1875-1885.

Wooden, J. L. (with L. D. Ashwal), 1983. Isotopic evidence from the eastern Canadian shield for a geochemical discontinuity in the proterozoic mantle. Nature 306, 679-680.

LONG TERM VISITORS, THEIR APPOINTMENTS AND PUBLICATIONS DURING THIS REPORT PERIOD

Cintala, Mark J., Visiting Post-Doctoral Fellow (Appointment: 1 December 1983 - 1 December 1984)
Field: GEOLOGY - Impact Cratering

Publications

Cintala, M. J., 1984. A method for evaluating shock propogation and its thermal effects during impact events. Submitted to Lunar and Planetary Science Conference XV.

Cintala, M. J. (with A. F. Grieve), 1984. Energy partitioning during terrestrial impact events: melt production and scaling laws. Submitted to Lunar and Planetary Science Conference XV.

Cintala, M. J.(with F. Horz), 1984. Catastrophic rupture experiments: Fragment-size analysis and energy considerations. Submitted to Lunar and Planetary Science XV.

Cintala, M. J. (with F. Horz, T. H. See, F. Cardenas and T. D. Thompson), 1984. Regolith evolution experiments I: Grain-size evolution. Submitted to Lunar and Planetary Science Conference XV.

Cintala, M. J.(with T. H. See and F. Horz), 1984. Regolith evolution experiments II: Modal and chemical analysis. Submitted to Lunar and Planetary Science Conference XV.

Cintala, M. J. (with P. D. Spudis and R. A. F. Grieve), 1984. The early Moon: Implications of a large impact into a hot target. Submitted to Lunar and Planetary Science Conference XV.

Cintala, M. J., 1984. A method for evaluating shock propagation and its thermal effects during impact events. Submitted to J. Geophys. Res.

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Croft, Steven, Visiting Scientist (Appointment: 19 November 1982 - 1 July 1983; formerly VPDF, 12 Sept. 1979 - 18 Nov. 1982)
Field: GEOPHYSICS - Planetary Cratering

Publications

Croft, S. K., 1983. Proposed origin for Palimpsests and anomalous pit craters on Ganymede and Callisto. Proc. Lunar Planet. Sci. Conf. 14th, in J. Geophys. Res. 88, pp. B71-B89.

Croft, S. K., 1983. Cratering on Ganymede: Comparisons with the terrestrial planets. Submitted to Icarus.

Croft, S. K., 1983. Effects of ice creep relations on thermal histories and viscous relaxation for icy satellites. Submitted to J. Geophys. Res.

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Francis, Peter, Visiting Senior Scientist (Appointment: 16 February 1981 - 16 February 1985)
Field: GEOLOGY - early crustal genesis on terrestrial planets.

Publications

Francis, P. W. (with R. S. Thorpe and L. J. O'Callaghan), 1983. Relative roles of source composition, fractional crystallization and crustal contamination in the petrogenesis of Andean volcanic rocks (Abs.). Phil. Trans. Roy. Soc. Lond., in press.

Francis, P. .W. (with C. Halls and M. C. W. Baker), 1983. Relationships between mineralisation and silicic volcanism in the Central Andes. In Arc Volcanism (S. Aramaki and I. Kushiro, eds.). J. Geotherm. Res. 18, 165-190.

Francis, P. W. (with G. Wadge), 1983. The Olympus Mons Aureole revisited: an origin by gravitational spreading. J. Geophys. Res. 88, p. 8333-8344.

Francis, P. W. (with R. S. Thorpe and L. O'Callaghan), 1983. Relative roles of source compositional fractional crystallization and crustal contamination in the petrogenesis of Andean volcanic rocks. Phil. Trans. Roy. Soc. Lond. A., in press.

Francis, P. W. (with C. A. Wood), 1983. Volcanism and the Greenland Ice Record. Geology, in press.

Francis, P. W. (with R. S. J. Sparks, L. J. O'Callaghan and R. S. Thorpe), 1983. Ignimbrites of the Cerro Galan Caldera, N. W. Argentina. J. Geophys. Res., in press.

Francis, P. W. (with S. Self), 1983. The 1883 eruption of Krakatau. Scientific American, 249, 172-187.

Francis, P. W., 1983. The origin of the 1883 Krakatau tsunamis. J. Volcanol. Res., in press.

Francis, P. W. (with W. McDonough, M. Hammill, L. J. O'Callaghan and R. S. J. Thorpe), 1983. The Cerro Purico Shield Complex, north Chile: chemical and isotopic variations in a single volcanic centre. In Chemical and Isotopic Constraints on Andean Magmatism (B. Barreiro and R. Harmon, eds.), Shiva Publications, in press.

Francis, P. W. (with R. S. Harmon, B. Barreiro, S. Moorbath, R. S. Thorpe, J. Hoefs and B. Deruelle), 1983. Regional O-, Sr- and Pb- isotope

relations in late cenozoic calc-alkaline lavas in the Andean cordillera. In Chemical and Isotopic Constraints on Andean Magmatism (B. Barreiro and R. Harmon, eds.), Shiva Publications, in press.

Francis, P. W., 1983. The Socompa volcano, north Chile and its avalanche deposits. J. Geophys. Res., in press.

Francis, P. W., 1983. Frost tree rings and the volcanic eruption record. Nature, Matters Arising, in press.

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Golombek, Matthew P., Visiting Scientist (Appointment: 1 September 1982 - 1 December 1983; formerly VPDF, 1 Sept. 1981 - 1 Sept. 1982)
Field: STRUCTURAL GEOLOGY - Tectonics (Grabens and Rifts on the Terrestrial Planets), Planetary Geology.

Publications

Golombek, M. P. (with C. J. Runyon), 1983. Simple grabens and ground-ice thickness on Mars, submitted to Proc. Lunar Plan. Sci. Conf. 14th, J. Geophys. Res.

Golombek, M. P. (with L. Brown), 1983. Paleomagnetic evidence for tectonic rotation of rocks within the Espanola basin of the Rio Grande rift, New Mexico. J. Geophys. Res. (in preparation).

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LUNAR AND PLANETARY INSTITUTE
DOMESTIC VISITING SCIENTIST (VS)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Croft, S.	11/19/82-07/01/83	07/01/83-07/01/83	.14	To continue work on planetary cratering studies.	Lunar and Planetary Institute (Interim)
Garihan, A.	01/01/83-01/01/84	-0-	-0-	To continue research on Mars geology in collaboration with Dr. P. Schultz.	Computer Sciences Corporation, Houston
Golombek, M.	09/01/82-8/31/84	07/01/83-12/02/83	22.14	To carry out studies related to Earth and Planetary structural geology.	Lunar and Planetary Institute (Interim)
Pepin, R.	03/06/82-03/07/84	07/16/83-07/18/83	.43	Discussions and interactions with LPI & JSC scientists on current research on the origin and history of the early Solar System; work related to co-convenership of Planetary Volatiles Conference.	University of Minnesota, Minneapolis
Pieters, C.	07/18/80-08/12/83	07/31/83-08/01/83	.29	For discussions and interaction with LPI & JSC scientists on current research on remote sensing and to participate in the continuing developing of the Reflectance Experiment Laboratory.	Brown University, Providence
Srnka, L.	10/01/79-10/02/84	-0-	-0-	To continue research on the origins of planetary magnetism.	EXXON Production Research Co., Houston
Wendlandt, R.	10/09/82-10/09/84	-0-	-0-	To continue research in the Effects of Volatiles of Magmatic Processes and Planetary Evolution: F, Cl, CH_4, and S.	EXXON Production Research Co., Houston

LUNAR AND PLANETARY INSTITUTE
FOREIGN VISITING SCIENTISTS (FVS)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Fitz-Gerald J.	07/25/83-08/05/83	Same	1.71	To collaborate with Drs. I. Mackinnon and D. McKay/JSC on the characterization of mineral structures by state-of-the-art electron microscope techniques.	Australian National University
Francis, P.	01/06/83-02/16/85	07/01/83-12/31/83	26.28	To conduct LPI related research in planetary and regional geology, and provide leadership and play key role in the organization and execution of the science project concerning Early Crustal Genesis on the Terrestrial Planets. Also, to make significat use of the Image Processing Facility.	The Open University, England
Rietmeijer, F.	05/09/83-12/30/83	07/01/83-12/30/83	26.28	To collaborate with Drs. McKay & Mackinnon/JSC on research dealing with contrast enhancement mechanisms in electron microscope photomicrographs.	Rijksuniversiteit-Utrecht, The Netherlands
Sengor, C.	11/21/83-12/04/83	Same	2.00	To collaborate with LPI Director on "Rifts and Sutures of the World".	Istanbul Technical University
Stoffler, D.	07/28/83-08/11/83	Same	2.14	To conduct literature studies on shock metamorphism and impact cratering and to study lunar rocks at the JSC.	Münster University

LUNAR AND PLANETARY INSTITUTE
VISITING RESEARCH SCIENTISTS (VRS)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Henry, D.	04/01/83-11/01/83	07/01/83-10/06/83	14.00	To work with Dr. Ashwal/LPI on fluid inclusions in meteorites and to continue ongoing research on Archean rocks and their relationship to Early Crustal Genesis.	Lunar and Planetary Institute (Interim)

LUNAR AND PLANETARY INSTITUTE
VISITING POST-DOCTORAL FELLOW (VPDF)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Cintala, M.	12/01/83-12/01/84	12/01/83-12/31/83	4.43	The primary purpose is to carry out theoretical and experimental research on impact cratering.	LPI (formerly JSC/NRC Fellow)

LUNAR AND PLANETARY INSTITUTE
VISITING GRADUATE FELLOWS (VGF)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Brown, C.	06/01/83- 09/01/83 10/10/83- 10/10/84	07/01/83- 09/02/83 -0-	9.14 -0-	To work with Dr. Phillips/LPI on the North African Lithosphere Project using the LPI Image Processing Facility.	Southern Methodist Univ. Dallas
Chicarro, A.	12/03/82- 08/01/83 12/01/83- 05/31/84	07/01/83- 08/05/83 12/01/83- 12/31/83	5.14 4.14	To select from a previous compilation of a massive computerized data set of ridges on Mars aspects suitable for publication.	University of Paris
McDonough, W.	06/01/82- 09/01/83	07/01/83- 07/29/83	4.14	To work with Dr. Wendlandt/LPI on problems of volatile-rich interactions.	Sul Ross State Univ., Alpine, Texas
Meier, T.	05/11/81- 05/11/84	07/14/83- 07/21/83 07/25/83 08/11/83 09/28/83	.71	To condust M.S. Thesis research on multispectral and geomorphic investigations of the surface of Europa.	University of Houston, Central Campus
Meloy, A. (Category wrongly reported last report)	04/04/83- 04/04/84	07/01/83- 12/31/83	26.28	To assist Dr. Schultz/LPI with a variety of projects involving image-processing applications, data reduction from impact experiments, and map digitizing.	LPI (formerly a Research Assoc., Hawaii Institute of Geophysics, Honolulu)
Rudnick, R.	12/27/82- 07/29/83	07/01/83- 07/29/83	4.14	To work with Dr. Ashwal/LPI on micro-thermometric analysis of fluid inclusions in meteorites.	Sul Ross State Univ., Alpine, Texas
Russell, W.	09/01/83- 02/29/84	-0-	-0-	To continue research on experimental and petrographic study of two lava flows from the Taas Plateau, under the direction of Dr. Lofgren/JSC.	University of Manitoba, Canada

LUNAR AND PLANETARY INSTITUTE
VISITING GRADUATE FELLOWS (VGF)
July 1, 1983 ——— December 31, 1983

VGF (Continued)

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Silver, L.	10/24/83- 03/31/84	10/24/83- 10/28/83	.71	To study the role of water in silicate magmas — a Ph. D. research project under the guidance of Prof. Stolper/ Cal Tech.	California Institute of Technology
Stam, M.	06/13/83- 09/06/83 09/07/83- 01/06/84	07/01/83- 09/06/83 09/07/83- 12/15/83	9.71 14.29	To work on the geomorphology of large Martian impact structures.	University of Massachusetts, Amherst

LUNAR AND PLANETARY INSTITUTE
VISITING UNDERGRADUATE FELLOWS (VUF)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PURPOSE OF VISIT	AFFILIATION
Moore, C.	07/11/83- 08/19/83	Same	5.71	To work with Dr. Wood/JSC on a project to compile data to correlate meteorites and near-Earth comets.	New Mexico Institute of Mining and Technology
Pflugrath, J.	05/23/83- 08/12/83	07/01/83- 8/12/83	6.14	To work with Drs. Morgan and Phillips/ LPI on problems in geophysics.	Rice University, Houston

LUNAR AND PLANETARY INSTITUTE
VISITING UNDERGRADUATE INTERNS (VUI)
July 1, 1983 ——— December 31, 1983

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PROJECT & ADVISOR	AFFILIATION
Anthony, M.	06/13/83-08/31/83	07/01/83-08/31/83	8.86	To develop numerical and analytical models to examine the dynamic response of the atmosphere to an impact event. (P. Schultz/LPI)	Carleton College, Northfield, Minnesota
Chaoka, T.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	To study petrologic-geochemical anorthosite dikes in the Shawmere Complex, Ontario. (W. Phinney/JSC)	University of Manitoba, Canada & Botswana, Africa
Hatfield, J.	06/13/83-08/26/83	07/01/83-08/26/83	8.14	To investigate water chemistry, and evaporite mineralogy of soils and core samples from cold, dry environments, which are analog processes of Martian surface processes. (D. Gibson/JSC)	Utah State University, Logan
Kring, D.	06/06/83-08/12/83	07/01/83-08/12/83	6.14	Microprobe and experimental study of concentration gradients in quenched experimental glasses. (G. McKay/JSC)	Indiana University, Bloomington
Leslie, W.	06/13/83-08/26/83	07/01/83-08/26/83	8.14	To investigate through thermal modeling of the conditions required to produce supracrustal granulites. (P. Morgan and L. Ashwal/LPI)	University of California, Los Anagles
Moberger, D.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	Photogeologic interpretation of volcano/tectonic structures of the Kamchatka Peninsula. (C. Woods/JSC)	University of Rhode Island, Kingston
Rashka, D.	07/13/83-08/19/83	07/01/83-08/19/83	7.14	Use of LANDSAT multispectral data and the LPI's Image Processing Facility to develop techniques to aid geologic mapping in archean and volcanic terrains. (P. Francis/LPI)	University of Wisconsin, River Falls
Russell, W.	06/13/83-08/26/83	07/01/83-08/26/83	8.14	Experimental and petrographic study of two lava flows from the Taas Plateau. (G. Lofgren/JSC)	University of Manitoba, Canada

LUNAR AND PLANETARY INSTITUTE
VISITING UNDERGRADUATE INTERNS (VUI)
July 1, 1983 ——— December 31, 1983

SUMMER INTERNS (Continued)

NAME	APPT. PERIOD	IN RESIDENCE (this period) DATES	NO. WKS.	PROJECT & ADVISOR	AFFILIATION
Trail, A.	06/06/83-08/12/83	07/01/83-08/12/83	6.14	Fluid inclusions in upper mantle xenoliths and lower crustal rocks derived from a subarc environment will be studied using petrographic, microthermometric and laser Raman techniques. (L.Ashwal & R.Rudnick/LPI)	University of Dayton, Ohio
Vang, K.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	To measure the apex angle of lunar herringbone patterns characteristic of secondary cratering. (F. Horz and M. Cintala/JSC)	Thiel College, Greenville, Pennsylvania
Varteresian, C.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	Project will consist of using the scanning electron microscope, the attached energy dispersive analyzer and the new computer program to acquire and reduce data on some small particles collected by high-flying NASA aircraft in the stratosphere. (D. McKay/JSC)	Rutgers University, New Brunswick, N. J.
Wheeler, D.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	Apollo Command Module Earthshine photography of the lunar surface will be analyzed at the LPI Image Processing Facility for evidence of luminescent phenomena. (W. Mendell/JSC)	Marquette University Milwaukee, Wisconsin
Williams, R.	06/13/83-08/19/83	07/01/83-08/19/83	7.14	Research, data processing, and sample preparation for isotopic analysis to evaluate the geochemical evolution of the upper mantle associated with Archean cratons and the interaction of mafic melts with the curst.(J. Wooden and D. Henry/LPI)	University of Connecticut, Stoors

APPENDIX I - PART C

STAFF & VISITOR OFF-SITE SCIENTIFIC ACTIVITIES

1 July 1983 - 31 December 1983

Dr. Paul Morgan conducted field work in Wyoming and Montana associated with NSF funded project "Heat Flow of the Yellowstone Intermountain Seismic belt region, Wyoming, Idaho, and Montana, July 1-10.

Ms. Karen Hrametz attended the Publishing Institute at the University of Denver in Colorado, July 10-August 5.

Dr. Paul Morgan visited with Dr. William Hinze, Department of Geosciences, Purdue University to work on the DOE Final Report on Midcontinent Geothermal Resources, West Lafayette, Indiana, July 17-19. (Visit was at no cost to LPI.)

Dr. Anne Lutz participated in Spaceweek '83 activities in Houston by showing Space Voyage films, with appropriate preambles, in the JSC Auditorium on the evening of July 22.

Ms. Roberta Rudnick visited Instruments, SA, Inc. in Metuchen, N. J. to use the Laser Raman microprobe in conjunction with her on-going research at the LPI/JSC, July 25-27. (Visit was at no cost to LPI.)

Ms. LeBecca Turner attended the Archean Field Workshop to provide logistical support, August 8-17, Ottawa and areas of northeastern Ontario.

The LPI Computer Staff -- Kin Leung, Rebecca McAllister, Brian Fessler, and Jackie Lyon -- attended a Houston Local Decus Symposium in Southwest Houston August 12 and/or 13.

Dr. Lew Ashwal convened and participated in the Archean Field Workshop in Ottawa, August 9-16.

Dr. Darrell Henry, Visiting Research Scientist, participated in the Archean Field Workshop in Ottawa, August 9-16.

Mr. William Leslie, Summer Intern, assisted Dr. Ashwal with field work and sample collecting in Superior Province, Timmins, Ontario, August 16-23.

Dr. Paul Morgan attended the 18th General Assembly of the International Union of Geodesy and Geophysics, Hamburg, F. D. R. August 15-27 and presented the following papers: "Mechanisms and Maintenance of Epeirogenic Continental Uplifts: Africa, Venus and Mars" (co-authored by R. J. Phillips); "Heat Flow in Eastern Egypt: The Thermal Signature of a Continental Breakup"; "Thermal Plumes Under Africa: Constraints on Lithospheric Thinning from Experimental Petrology; Heat Flow and Uplift" (co-authored by R. Wendlandt); and "Uplift of the Colorado Plateau and its Relationship to Volcanism and Rifting in the Adjacent Basin and Range and

Rio Grande Rift". He visited the Imperial College of London to work with Dr. Graham Evans on sedimentary and tectonic problems in the Cilician Basin, Northeastern Mediterranean, September 1-8.

Ms. LeBecca Turner attended a Fred Pryor Seminor "Winning through Negotiation" (communication skills) held in Houston on August 22.

Ms. Rebecca McAllister attended an ESL User Group meeting and toured the Exxon Image Processing Facility, Houston, September 1.

Ms. Lila Mager and Ms. Dory Brandt provided logistical support for the Planetary Geology Review Panel meeting at JPL on September 1 and 2.

Dr. Kevin Burke visited China, September 1-21, as a member of a Delegation of Petroleum Geologists. While in China he also took part in the International Symposium on Precambrian crustal evolution at Wofosi near Beijing. Crustal Genesis was the theme of this meeting and discussions were held with present and potential associates of the Early Crustal Genesis Project. (Funds for this visit were provided by other sources.)

Ms. Pam Jones conducted logistics support for the LPI Workshop on Solar Radiation in Mainz, FRG, September 3 and 4 (this portion funded by the LPI) and assisted with logistics for the 43rd Meteoritical Society on the co-sponsorship of the LPSC, Mainz, September 4-10 (expenses related to this portion of the trip were covered by the Otto Hahn Institut, Mainz on behalf of the Meteoritical Society).

Dr. Robert Pepin, LPI Visiting Staff Scientist, convened the workshop on Past and Present Solar Radiation in Mainz, September 3 and 4. (The University of Minnesota and the LPI shared the expenses for this trip.)

Mr. Carl Grossman met with AM International Programmers in East Hanover, N. J. on September 5 to discuss line tables and sector-repointing and to obtain information on hard- and soft-ware items available for upgrading the typesetting system. (This visit was cost-effective for the LPI as Mr. Grossman was already in the vicinity on personal business).

Dr. Peter Francis visited with Prof. G. P. L. Walker, University of Hawaii, to discuss caldera formation and joint papers, September 6 and 7. (This visit was at no cost to the LPI.)

Ms. Lila Mager provided logistical support for the Planetary Cartography Working Group Meeting in Flagstaff on September 8 and 9.

Dr. Matthew Golombek presented a paper entitled "Relationship of the Rio Grande Rift to Tectonics of the Western United States" at the University of Texas at Arlington and collaborated with Dr. Roger Phillips at SMU, Dallas, on Tharsis Tectonics research, September 22 and 23. (This visit was at no cost to the LPI.)

Ms. Lila Mager provided logistical support for the Meteorite Working Group

meeting at the Smithsonian Institution on September 23-25.

Dr. Kevin Burke attended a Geodynamics Review Board meeting at JPL on September 23. (This visit was at no cost to the LPI.)

Ms. Helene Thorson, at USRA's request and expense, attended the Hay Associates Compensation Conference in Pittsburgh on September 29.

Dr. Peter Francis attended a meeting of the Geological Society of London on "Magmatic Evolution of the Andes" and delivered an invited paper on the San Pedro Volcano, October 4 and 5; conducted field work at Socompa Volcano, north Chile (Santiago), October 12-31. (Chile field work financed by other sources.)

Dr. Kevin Burke attended the Fifth Crustal Dynamics Working Group Meeting at Goddard Space Flight Center, October 5-6.

Dr. Kevin Burke attended the fall meeting of the USRA Board of Trustees on October 12 at ICASE, NASA/Langley Research Center. Dr. Burke presented an LPI status report.

Dr. Matthew Golombek attended the New Mexico Geological Society Field Conference in the Albuquerque Basin, October 12-19.

Dr. Peter Schultz presented a talk to the Earth Science Teachers of the Alief Independent School District on October 13.

Dr. Kevin Burke attended a Committee Meeting of the Consortium for Continental Reflection Profiling (COCORP) at Cornell University, Ithaca on October 25; attended a Space and Earth Science Advisory Committee (SESAC) meeting in Washington, D. C., October 26; and attended the Annual Meeting of the Geological Society of America in Indianapolis, October 28 to November 2. (The COCORP and SESAC meetings were funded from other sources.)

Dr. Paul Morgan attended the Annual Meeting of the Geological Society of America in Indianapolis, October 31 to November 3. Dr. Morgan presented a paper entitled "Heat, Hydrocarbon Degradation, and Fluid Flow in Continental Rift Systems: Applications to Ore Deposition". The paper was co-authored by Thomas H. Giordan, New Mexico State University.

Dr. Lew Ashwal attended the annual meeting of the Geological Society of America in Indianapolis, October 31 to November 3. (Funds for this trip came from Dr. Ashwal's Grant.)

Mr. Stephen Tellier attended the National Federation of Abstracting and Information Services seminar on "Indexing in Perspective", Chicago, November 14-16.

Dr. Peter Schultz convened the Directors' meeting of the Planetary Image Facilities in Pasadena on November 14 and performed experiments at the NASA-Ames Vertical Gun Range in Mountain View, November 15-18.

Dr. Paul Morgan visited the U. S. Geological Survey, Flagstaff, Arizona, on November 14-18 to collaborate with J. H. Sass on a paper entitled "Thermal Regime of the Continental Lithosphere". He also presented a seminar on "The Colorado Plateau: Its Relationship to Volcanism and Rifting in the Adjacent Basin and Range and Colorado Plateau.

Mr. Ron Weber attended a seminar on "Planning for New Technology", presented by the School of Library Science at the University of Texas, Austin, on November 16.

Dr. Kevin Burke met in Washington, D. C. on November 21 with the Review Panel Leaders for a presentation to Dr. Quaide.

Dr. Peter Schultz participated in a Planetary Data Workshop at Goddard Space Flight Center, Maryland, November 29 - December 1.

Dr. Lew Ashwal, who is on leave at Yale University, attended the Geoscience Research Seminar and Open House of the Ontario Geological Survey as LPI's representative for the Early Crustal Genesis Program, Toronto, December 6 and 7.

Dr. Kevin Burke attended the American Geophysical Union meeting in San Francisco, December 5-9, where he delivered an invited talk on 4-billion years of allochthonous terrains and contributed a presentation (with Paul Mann) on the Neotectonics of Hispaniola.

Dr. Peter Francis attended the American Geophysical Union meeting in San Francisco, December 5-9. He delivered two presentations: "Tsunamis of the 1883 Eruption of Krakatau" (co-authored with S. Self) and "Space Shuttle Studies of Active Dust Storms in the Central Andes" (co-authored with C. A. Wood and D. A. Rashka).

Dr. Paul Morgan attended the American Geophysical Union meeting in San Francisco, December 5-9. He presented a paper entitled, "Continental Lithosphere: Thermal Structure and Evolution". He co-authored two poster papers, "A Cooperative Crustal Structure Study of the Rio Grande Rift and Valles Caldera" (with G. R. Keller, Y. A. Sinno, S. N. Harder, K. H. Olsen, J. N. Stewart, L. W. Braile, and C. R. Dandt) and "Geothermal Resources of the Rio Grande Rift: A Groundwater Convection Model" (with V. Harder) for presentation at the meeting.

Mr. Kin Leung, Mrs. Rebecca McAllister, and Mr. Brian Fessler attended a demonstration of new Gould/De Anza Image Processing hardware and software in downtown Houston on December 7.

Mrs. Karen Hrametz and Mrs. Tracy McCasey met with American Geophysical Union representatives and editors of the JGR-red to plan for the 15th Lunar and Planetary Science Conference Proceedings, San Francisco, December 8.

Dr. Mark Cintala collaborated with Dr. Richard Grieve, Brown University, Providence, December 27-29, on preparation of abstracts and papers for the 15th Lunar and Planetary Science Conference.

APPENDIX II

PART A: PROJECTS, CONFERENCES, AND WORKSHOPS

PART B: SEMINARS

APPENDIX II PART A

Lunar and Planetary Institute Workshops and Conferences
March 1981—April 1985

Topic	Dates	Conveners	Attendance—Sponsor	Publication
12th Lunar and Planetary Science Conference	3/16-20/81	M. Duke R. Phillips	600—LPI/JSC	Abstract Volumes Proceedings Volumes
Workshop on Magmatic Processes of Early Planetary Crusts	8/3-9/81	D. Walker S. McCallum	62—LPI in Billings & on the Stillwater Complex	Abstract Volumes LPI Tech. Rpt. 82-01
Third International Colloquium on Mars	8/31-9/2/81	A. Albee	215—LPI/JPL/ NASA/AAS hosted by JPL	Abstracts Proc.—*J. Geophy. Res.*
Conference on Large Body Impacts & Terrestrial Evolution: Geological, Climatological, and Biological Implications	10/19-22/81	L. Silver	116—LPI/NAS Snowbird Confer. Center, Utah	Abstracts GSA Special Paper
Workshop on Lunar and Meteorite Analogs	11/9-11/81	G. Taylor L. Wilkening	65—LPI	Abs.—LPI Tech. Rpt. 82-02
Early Crustal Genesis Project 8 Workshops/Project Group Meeting	11/12-16/81	R. Phillips	100—LPI in Warrenton, VA	Project Plan— LPI Tech. Rpt. 81-08
Conference on Processes of Planetary Rifting	12/3-6/81	P. Morgan B. Baker	71—LPI/AGU/NSF in St. Helena, CA	Abstracts Proc.—*Tectonophysics*
13th Lunar and Planetary Science Conference	3/15-19/82	M. Duke R. Phillips	557—LPI/JSC hosted by JSC	Abstract Volumes Proceedings Volumes
Workshop on Antarctic Glaciology and Meteorites	4/19-21/82	M. Lipschutz C. Bull	39—LPI	Abs.—LPI Tech. Rpt.
Workshop on Planetary Tectonics	4/19-21/82	R. Phillips	12—LPI in Burnet, TX.	
45th Annual Meeting of the Meteoritical Society	9/13-16/82	R. Walker G. Crozaz	210—LPI, Washington U. McDonnell Ctr. for the Space Sci.	Abstract Volume
Conference on Planetary Volatiles	10/9-12/82	R. Pepin R. O'Connell	100—LPI Arrowwood Conference Ctr. Alexandria, MN	Abstract Volume LPI Technical Report
Workshop on Pristine Lunar Highlands Rocks and the Early History of the Moon	10/15-17/82	J. Longhi G. Ryder	41 — LPI Travelodge New Orleans	Abstracts LPI Technical Report
Conference on Chondrules and their Origins	11/15-18/82	E. King	64—LPI	Abstract Volume Proceedings Volume
14th Lunar and Planetary Science Conference	3/14-18/83	M. Duke R. Phillips	525—LPI/AGU/ JSC -hosted by JSC	Abstract Volume Proceedings Volume
1983 Archean Geochemistry — Early Crustal Genesis Field Workshop	8/10-16/83	L. Ashwal K. Card	46 — LPI/Geol. Survey of Canada	Abstracts, Field Guide LPI Technical Report
Workshop on Past and Present Solar Radiation: Record in Meteoritic and Lunar Regolith Material	9/3-4/83	D. McKay R. Pepin	60 — LPI at Max-Planck-Inst. in Mainz, F.R.G.	Abstracts Volume Technical Report
46th Annual Meeting of the Meteoritical Society	9/5-9/83	F. Begemann H. Wänke	300—LPI, Max Planck Inst., in Mainz, F.R.G.	Abstracts *Meteoritics*
Annual Meeting of the Association of Science Editors	10/9-12/83	R. Ridings R. Merrill	93 — LPI/AESE hosted by LPI w/sessions at Nassau Bay Hilton Houston, TX.	
Workshop on Lunar Surface Materials	2/14-15/84	G. Heiken L. Taylor	~15—LPI	Book
15th Lunar and Planetary Science Conference	3/12-16/84	M. Duke K. Burke	~550—LPI/JSC/ AGU/DPS/Met. Soc. hosted by JSC	Abstract Volume Proceedings Volume
Workshop on Early Earth: The Interval from Accretion to the Older Archean	4/23-25/84	K. Burke	~80—LPI	Abstract Volume Technical Report
47th Annual Meteoritical Society Meeting	7/30-8/2/84	K. Keil	~300—LPI, Inst. Meteoritics & Dept. Geology at Univ. NM	Abstract Volume
Conference on the Origin of the Moon	10/13-16/84	R. Phillips J. Taylor	~120—LPI/DPS Kona, Hawaii	Abstract Volume Proceedings Volume
Conference on the Role of Head and Decollement in Extensional Tectonism	April 1985	I. Lucchitta P. Morgan	~120—LPI No. Arizona	Abstract Volume Proceedings Volume

APPENDIX II - PART B

SEMINAR SERIES

1 July 1983 - 31 December 1983

DATE	SPEAKER(S)	TOPIC
July 8	Dr. Ian MacKinnon, Microbeam, Inc./JSC	"Primitive Meteorites and Cometary Debris"
July 15	Dr. William Phinney JSC	"Petrogenesis of Archean Anorthosites"
July 20	Dr. G. Randy Keller Univ. Texas-El Paso	"Proterozoic and Phanerozoic Rifts in the Midcontinent of North America"
July 29	Dr. John D. Fitzgerald Australian National Univ./RSES	"Electron Microscopy of Feldspars"
August 5	Dr. Mike Zolensky JSC/NRC	"Fluid Inclusion Daughter Crystal Identification"
August 12	Dr. Sean Solomon MIT	"Mid-Ocean Ridges as Seen by Ocean Bottom Seismology: New Evidence for Episodic Magmatism"
August 26	Dr. A. Tsuchiyama JSC/NRC	"Melting Dissolution Kinetics of Plagioclase and Diopside"
September 9	Dr. Mike Helfert JSC/NOAA	"Non-Meteorological Applications of NOAA Polar Orbiter"
September 23	Dr. Stephen Barnes JSC/NRC	"Platinum in the Stillwater Complex"
September 27	Dr. Bruce Bills JPL	"Venus Gravity, Topography, and Rotation"
October 7	Dr. David Blackwell SMU	"Heat Flow and Volcanic Models for the Pacific Northwest"
October 14	Dr. William Bourcier JSC/NRC	"Hydrothermal Transport and Deposition of Sphalerites"

APPENDIX II - PART B (continued)

SEMINAR SERIES

1 July 1983 - 31 December 1983

DATE	SPEAKER(S)	TOPIC
November 4	Dr. Stephen Self Univ. Texas-Arlington	"Explosive Volcanism and Climate Change"
November 11	Dr. Paul Mann Univ. Texas-Austin	"Development of Pull-Apart Basins"
November 30	Dr. A.M. Celal Sengor Istanbul Tech. Univ.	"Origin of Collisional Plateaux"
December 2	Dr. Peter Francis LPI	"Krakatau, 100 Years on -- 1883-1983"
December 12	Dr. Stephen Clifford Univ. Mass.	"A Model for the Climatic Behavior of Water on Mars"
December 14	Dr. Janet Kotra Univ. Maryland	"Volcanoes as a Source of Volatile Trace Elements to the Atmosphere"

APPENDIX III

OTHER MEETINGS AND ACTIVITIES
(held at LPI)

APPENDIX III

OTHER SCIENCE RELATED MEETINGS AND ACTIVITIES HELD AT LPI

1 July 1983 - 31 December 1983

Brown Bag (lunch) seminars for the Summer Interns were held at the LPI on July 1, 15, 22, and 29.

The Spaceweek '83 staff held a meeting at the LPI on July 5.

The Association of Earth Science Editors held a Program Committee meeting at the LPI on July 6.

A Pharmacology Workshop, sponsored by JSC Life Sciences and USRA, was held at the LPI July 13-14.

The JSC Life Sciences Division held a Space Motion Sickness Steering Committee meeting at the LPI on July 15-16.

A conference on Emergency Treatment in Space (under the auspices of the JSC Life Sciences Division and USRA) was held at the LPI July 20-21.

A seminar on Decompression Sickness, sponsored by JSC Life Sciences and USRA, was held at the LPI on July 21 and 22.

Dr. Peter Francis delivered a lecture on "Remote Sensing and Image Processing" at the LPI on July 25. This lecture was attended by a class from the Univ. Houston, CLC. The lecture was followed with a demonstration by Tom Meier of the Image Processing Facility in McGetchin Hall. Mary Ann Hager provided the students with a tour of the Planetary Image Center, introducing them to the products and services available.

A Spaceweek '83 staff meeting was held at the LPI on August 2.

The JSC Life Sciences Division held an Environmental Science Review Committee meeting at the LPI on August 3-4. The topic of the meeting was "Space Cabin and Suit Atmospheres".

Brown Bag (lunch) seminars for the Summer Interns were held at the LPI on August 5 and 12; the seminar scheduled for the 19th was cancelled due to Hurricane Alicia.

Drs. Richard Williams and Michael Duke of the JSC Solar System Exploration Division held a Materials Processing Workshop at the LPI on August 9.

The JSC Life Sciences Division held a meeting at the LPI on August 31 to discuss Decompression Sickness.

The JSC Astronomical Society held a meeting at the LPI on September 6.

The Spaceweek '83 staff held meetings at the LPI on September 6 and 12.

The post-mission debriefing of STS-8 was held at the LPI on September 7-9.

The JSC Space and Life Sciences Directorate conducted a Space Adaptation Working Panel meeting at the LPI, September 28-30.

The Spaceweek '83 staff held a meeting at the LPI on October 4.

The JSC Life Sciences Division held a meeting on October 7 to report on the results of the detailed supplemental objectives of Missions STS 7 and 8.

Dr. Peter Schultz participated in the Mars Data Analysis Program Peer Review Panel and Steering Group meeting, October 14-16, at the LPI.

The Image Processing Facility and the Gould/De Anza co-sponsored a Digital Video Processor Intensive Seminar at the LPI on October 18 through 20. The seminar was attended by 15 image processing professionals from six states representing the academic community as well as industry. As a follow-up, on October 21, a Gould/De Anza Users Group Meeting was held at the LPI to explore common issues confronting the Gould/De Anza IP8500 Image Processing system users.

Dr. Peter Schultz participated in the annual Lunar and Planetary Review Panel meeting held at the LPI, October 23-28.

The JSC Astroraut Office held a Workshop at the LPI on October 27-29.

There were two Spaceweek '83 staff meetings held at the LPI - November 1 and 17.

The Institutional Data Systems Division/JSC held a Retreat at the LPI on November 3 and 4.

The Space and Life Sciences Directorate held a mini Retreat at the LPI on November 7.

The Program Committee for the Conference on the Origin of the Moon (to be held October 13-16, 1984 in Kona, Hawaii) met at the LPI on November 11.

The JSC Astronomical Society and the Association of International Occultation Timing held a joint meeting at the LPI on November 11.

The JSC Medical Sciences Division held a Performance Workshop for Flight Controllers at the LPI on November 15.

The JSC Medical Sciences Division held a Radio Biology Workshop at the LPI on November 16.

The Space and Life Sciences Directorate held a Space Motion Sickness Steering Committee meeting at the LPI on November 17 and 18.

The Universities Space Research Association held a Land Resources Pilot Workshop at the LPI on December 5-8.

APPENDIX IV

LPI CONTRIBUTIONS AND TECHNICAL REPORTS

APPENDIX IV

LUNAR AND PLANETARY INSTITUTE CONTRIBUTIONS
1 JULY 1983 TO 31 DECEMBER 1983

519 ASHWAL,L.D. + WOODEN,J.L
SR AND ND ISOTOPE GEOCHRONOLOGY, GEOLOGIC HISTORY, AND ORIGIN OF THE ADIRONDACK ANORTHOSITE
GEOCHIMICA ET COSMOCHIMICA ACTA 47, 1875-1885 (1983)

520 MORGAN,P.
THE THERMAL STRUCTURE AND THERMAL EVOLUTION OF THE CONTINENTAL LITHOSPHERE.
PHYSICS AND CHEMISTRY OF THE EARTH (TO BE PUBLISHED)

521 ASHWAL, L.D. + WOODEN, J.L.
ISOTOPIC EVIDENCE FROM THE EASTERN CANADIAN SHIELD FOR A GEOCHEMICAL DISCONTINUITY IN THE PROTEROZOIC MANTLE
NATURE 306, 679-680, DECEMBER 15, 1983

522 CROFT, S.
PROPOSED ORIGIN FOR PALIMPSESTS AND ANOMALOUS PIT CRATERS ON GANYMEDE AND CALLISTO
PROCEEDINGS XIVTH LUNAR AND PLANETARY SCIENCE CONFERENCE PART I JOURNAL OF GEOPHYSICAL RESEARCH V.88 SUPP. B71-B89, NOVEMBER 15, 1983.

523 HOOD, L.L. + SONETT, C.P. + SRNKA, L.J.
LUNAR MAGNETISM
NATURE (TO BE PUBLISHED)

524 FRANCIS, P. + SELF, S.
THE ERUPTION OF KRAKATAU
SCIENTIFIC AMERICAN 249, 172-187, 1983

525 IRVING, A.J. + FREY, F.A.
TRACE ELEMENT ABUNDANCES IN MEGACRYSTS AND THEIR HOST BASALTS: CONSTRAINTS ON PARTITION COEFFICIENTS AND MEGACRYST GENESIS
GEOCHIMICA ET COSMOCHIMICA ACTA (TO BE PUBLISHED)

LUNAR AND PLANETARY INSTITUTE
TECHNICAL REPORT SERIES
1 JULY 1983 TO 31 DECEMBER 1983

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