LUNAR SCIENCE INFORMATION BULLETIN

NUMBER 4

The Lunar Science Institute
3303 NASA Road #1
Houston, TX 77058

NOVEMBER 22, 1974 713/488-5200

SIXTH LUNAR SCIENCE CONFERENCE

The Sixth Lunar Science Conference, jointly sponsored by the Johnson Space Center and The Lunar Science Institute, will be held March 17-21, 1975, at the NASA/Johnson Space Center, Houston, Texas.

The Sixth Conference, organized along lines similar to the Fifth Conference, will again consider the following broad, problem-oriented topics, to one of which each Abstract submitted to the Conference must be addressed:

- 1. Constraints on structure and composition of the deep interior
- 2. Characteristics and movement of materials in the lunar regolith
- 3. Characterization and evolution of the mare basins
- 4. Characterization and evolution of the lunar crust
- 5. Nature of impact processes and their effects on lunar materials
- 6. The Moon as an interplanetary/interstellar probe

Each team of investigators may submit up to three abstracts for inclusion in the Abstracts volume, but must designate one abstract as intended for oral presentation. Abstract forms and detailed instructions for their preparation will be distributed to Principal Investigators in mid-November. Co-investigators should co-ordinate submission of abstracts with their Principal Investigators. Individuals who wish to submit abstracts, but who are not associated with a Principal Investigator, should write the Conference Office, Lunar Scinece Institute, for further information.

Deadline for Abstract Submission 14 January 1975

Deadline for submission of manuscripts to Proceedings of the Sixth Lunar

Science Conference 21 April 1975

NEW DIRECTOR SELECTED FOR LUNAR PROGRAMS OFFICE

In early January Dr. Edward A. Flinn will assume the duties of Director of the Lunar Programs Office, NASA Headquarters. Dr. Flinn, who received his Ph.D. in Geophysics from CalTech in 1960, is currently Associate Director of the Alexandria [Va.] Laboratories of Teledyne Geotech. Mr. Floyd I. Roberson, who has been Acting Deputy Director since Dr. Noel Hinners' appointment as Associate Administrator for Space Science, will continue in this position in the Lunar Programs Office.

SOVIETS LAUNCH LUNA-23

Luna-23 was launched from Tyuratam on October 28, with arrival at the Moon planned for November 1. The Soviet Tass news agency reports that on November 6 at 8:38 a.m. (12:37 a.m. CST) the station landed in the southern part of the Sea of Crises in an area with an unfavorable surface. As a result, the device for taking samples of Moon rocks from depths of up to 8 feet, was damaged. The station's work was stopped Saturday (November 9) after carrying on work for three days "under a new and curtailed program."

CONFERENCE: RECENT ACTIVITY WITHIN THE MOON

This conference, scheduled for April 14-16, 1975, will be held at the Lunar Science Institute, Houston, Texas. Evidence for present-day lunar activity will be discussed including moonquakes, orbital and surface measurements of gaseous emissions from the Moon, lunar transient phenomena, photo-geologic evidence regarding possible recent reactivation of ancient lines of weakness in the lunar crust. Particular emphasis will be upon physiochemical mechanisms of these phenomena. For further details contact the Conference Office at the LSI, 3303 NASA Road #1, Houston, TX 77058, 713/488-5200.

CONFERENCE: SYMPOSIUM ON PLANETARY EXPLORATION, DECEMBER 13, SAN FRANCISCO

This one-day meeting sponsored by the American Geophysical Union and the American Institute of Aeronautics and Astronautics, is being held in conjunction with the Fall Annual Meeting of the AGU. The morning session, chaired by Harold Masursky, will be devoted to reviews of our present understanding of the planets and minor bodies, and to identifying key questions which should motivate the future program. The afternoon session, chaired by James A. Van Allen, concerns the development of the U. S. Program for planetary exploration during the next decade and the possible utilization of a number of new techniques. The General Chairman is Dr. Bruce Whitehead, Space Sciences Division, Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91103.

"LUNAR INTERACTIONS" POST-CONFERENCE NOTES

The conference on "Interactions Between the Solar Plasma and the Ancient and Modern Moon," was held September 30-October 4, 1974, at the Lake Geneva Campus of George Williams College in Williams Bay, Wisconsin. The conference sponsored by the National Science Foundation, Rice University, and National Aeronautics and Space Administration through the Lunar Science Institute, was organized by John W. Freeman, Jr. (Rice University) and David R. Criswell (LSI). Approximately 60 scientists participated and were generally very satisfied, and in many instances enthusiastic with the scientific content and informal style of the meeting.

A 140-page, indexed, abstracts volume was printed prior to the conference for distribution to all contributors. Copies are available from the LSI for printing and mailing costs. (Send order and check for \$10.00 to Mrs. C. Watkins, LSI). A summary of the Interactions Conference was distributed at the Regolith Conference, Houston, TX, (November 13-15), and is available from Dr. Criswell at the LSI.

CONSORTIUM INDOMITABILE PUBLISHES VOLUME 2

"Interdisciplinary Studies of Samples from Boulder 1, Station 2, Apollo 17, Volume 2" has just recently been published by the Consortium Indomitabile, John Wood, Leader. Copies of this new volume as well as volume 1, which was distributed in March 1974, are available from Ms. Karen Motylewski, Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138.

PRICE CHANGE - LUNAR SCIENCE III, LUNAR SCIENCE IV, APOLLO 15 LUNAR SAMPLES

These abstract volumes will now be available for the following prices:

U. S. Mailing
Foreign Mailing

\$1.00 per volume \$6.00 per volume

Orders MUST be prepaid. Please send check (payable to Lunar Science Institute) and order to: Mrs. C. Watkins, Lunar Science Institute, 3303 NASA Road #1, Houston, TX 77058. The price for LUNAR SCIENCE V remains unchanged: (\$1.00 U.S. mailing; \$6.00 foreign mailing).

CORRECTION - LUNAR ORBITAL DATA POSTER

The Lunar Orbital Data Posters reprinted from the 4th Lunar Science Conference have a typographical error. The caption for Plate IV, Lunar Gravity Anomalies should read as follows: "The mascons, the red circular areas, have mass excesses of 800 kilogram/cm² and are near surface, disk shaped features . . . " Also, the source note should be "Reprinted from the Proceedings of the Fourth Lunar Science Conference."

PREPRINTS - SOVIET-AMERICAN CONFERENCE ON COSMOCHEMISTRY OF THE MOON AND PLANETS (For details of the conference, see LSIB #1)

To make the papers from this conference available to lunar scientists as quickly as possible, preprints are being readied for distribution. A list of the preprints and a request form are included with this Bulletin. This is a preliminary list and does not contain all the papers submitted to the conference. Additions to this list including the translations of the Russian papers, will be published as they become available. If you are interested in receiving any of these papers, please use the request form.

OPENING AND DISPLAY OF APOLLO 16 SURFACE SAMPLERS

Final preparations are being made in the Curatorial Facility to open and inspect the Apollo 16 Lunar Surface Samplers. These were devices used to obtain samples by pressing a cloth surface (one a velvet pile, the other a teflonized fiberglass) against the lunar surface. Colin Pillinger (Bristol, England), in conjunction with the Curator, has designed the apparatus and procedures to open and inspect these samples. Descriptions of the samples, including descriptions of individual particles, will be made and a plan for further study will be designed in early December. For information, contact the Curator, NASA/JSC, Code: TL, Houston, TX 77058

CALENDAR OF EVENTS

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Dec. 12-17	American Geophysical Union Tar Hotel, San Francisco, Program Chairman) For information contact:	AT A SECOND PROPERTY OF THE SECOND PROPERTY O
Dec. 13	Symposium on Planetary Exp For information contact:	ploration, San Francisco, CA Dr. Bruce Whitehead Space Sciences Division Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, CA 91103
1975 Jan. 6-9	Historical and Present Day Observations of Lunar and Planetary Orbitsgeophysical and cosmological implications, University of Newcastle-upon-Tyne. (Conference described in LSIB #3)	
	For information contact:	Mr. W. F. Mavor School of Physics University of Newcastle-upon-Tyne NEl 7RU, England
Jan. 14	Deadline for submission of abstracts to the 6th Lunar Science Conference	
March 17-21	SIXTH LUNAR SCIENCE CONFE	
April 14-16	Recent activity within the MoonSee page 2 this Bulletin for information.	
April 21	Deadline for submission of manuscripts to 6th Lunar Science Conference Proceedings	
May 29-June 7	Eighteenth Plenary Meetin Symposia, Golden Sands, B For information contact:	
June 9-11	The Moon: A New Appraisa Laboratory Analyses. Roy described in LSIB #3) For information contact:	
June 16-20	Fifth-Sixth Annual Meetin Union, Washington, D. C. For information contact:	g of the American Geophysical American Geophysical Union

CURRENT LUNAR ARTICLES RECEIVED IN LSI LIBRARY, AUGUST-OCTOBER, 1974 (Address of first author appears, as published)

- Adam, I. (Institute of Nuclear Physics,
 Czechoslovakia Academy of Sciences, Rzes
 near Praha, Czech.), Frana, J., Mastalka,
 A., Tsimbal'nikova, A., Palicova, M.:
 Determination of contents of major and
 minor elements in the lunar regolith returned
 by the automatic probe Luna-16. GEOCHEMISTRY
 INTERNATIONAL 10, 968-973. (1973). [Translated from Geokhimiya No. 9, 1287-1293, 1973]
- Alexander, E. C., Jr. (Dept. of Physics, University of California, Berkeley, CA 94720), Davis, P. K.: "Ar-3" Ar ages and trace element contents of Apollo 14 breccias; an interlaboratory cross-calibration of "Ar-1" Ar standards. GEOCHIMICA ET COSMOCHIMICA ACTA 38, 911-928. (1974)
- Banerjee, S. K. (Dept. of Geology & Geophysics, University of Minnesota, Minneapolis, Minn.), Mellema, J. P.: Lunar paleointensity from three Apollo 15 crystalline rocks using an A.R.M. method. EARTH & PLANETARY SCIENCE LETTERS 23, 185-188. (1974)
- Bastin, J. A. (Queen Mary College, University of London, England): A new theory for the formation of the Maria and Cayley type lunar regions. THE MOON 10, 143-162. (1974)
- Bursa, M. (Dept. of Theoretical Geodesy, Research Institute of Geodesy, Drazickeho nam, 7 11800, Prague 1, Czech.): The derivatives of the lunar disturbing potential harmonics with respect to Euler's angles. STUDIA GEOPHYSICA ET GEODAETICA 18, 103-119. (1974)
- Bursa, M. (Research Institute of Geodesy, Prague):

 Tidal potential due to a non-spherical lunar
 body, STUDIA GEOPHYSICA ET GEODAETICA 18,
 1-7. (1974)
- Cadogan, P. H. (Dept. of Physics, The University, Sheffield, UK): Oldest and largest lunar basin. NATURE 250, 315-316. (1974)
- Carrier, W. D., III (NASA/JSC, Houston, TX 77058):
 Apollo drill core depth relationships. THE
 MOON 10, 183-194. (1974)
- Cassen, P. (NASA Ames Research Center, Moffett Field, CA 94035): Convection in the Moon: effect of variable viscosity. JOURNAL OF GEOPHYSICAL RESEARCH 79, 2937-2944. (1974)
- Chang, S. (NASA Ames Research Center, Moffett Field, CA 94035), Lawless, J., Romiez, M., Kaplan, I. R., Petrowski, C., Sakai, H., Smith, J. W.: Carbon, nitrogen and sulfur in lunar fines 15012 and 15013: abundances, distributions, and isotopic compositions.

 GEOCHIMICA ET COSMOCHIMICA ACTA 38, 853-872. (1974)
- Classen, J. (Astronomical Observatory of Pulsnitz, German Democratic Republic): Degassing of the Moon. II. Degassing at present and in the past. SOLAR SYSTEM RESEARCH 8, 25-29. (1974). (Translated from Astron. Vest. 8, 29-34, 1974)
- Cooper, M. R. (Dept. of Geophysics, Stanford University, Stanford, CA 94305), Kovach, R. L., Watkins, J. S.: Lunar near-surface structure. REVIEWS OF GEOPHYSICS & SPACE PHYSICS 12, 291-308. (1974)
- Evayukov, N. N.: The two-parametric division into districts of the lunar surface.

 ASTRONOMICHESKII ZHURNAL 51, 611-616. (1974)
- Gibb, T. C. (Dept. of Inorganic and Structural Chemistry, University of Leeds, Leeds LS29JT England), Greatrex, R., Greenwood, N. N.:
 Mossbauer studies of Apollo 14 and Apollo 15

 Tunar soils. JOURNAL OF THE CHEMICAL SOCIETY no. 11, 1148-1155. (1974)

- Earrington, T. M. (MDG Industries, Inc., Pasadena, CA 91107), Marshall, J. H., Arnold, J. R., Peterson, L. E., Trombka, J. I., Metzger, A. B.: The Apollo gamma ray spectrometer. NUCLEAR INSTRUMENTS AND METHODS 118, 401-441. (1974)
- Bast, N. (RSM Research Laboratory, Engelbrektsgatan 16, 114 32 Stockholm Sweden): Existence of horizontal stress fields and orthogonal fracture systems in the Moon's crust. MODERN GEOLOGY 4, 73-84. (1973)
- Heymann, D. (Rice University, Dept. of Geology, Houston, TX 77001), Hübner, W.: Origin of inert gases in "Rusty Rock" 66095. EARTH & PLANETARY SCIENCE LETTERS 22, 423-426. (1974)
- Horn, P. (Max-Planck-Institut fur Kernphysik, Heidelberg, Germany): Our present picture of the Moon. DIE NATURWISSENSCHAFTEN 61, 329-336. (1974) In German, English abstract.
- Howard, K. A. (U.S. Geological Survey, Menlo Park, CA 94025), Wilhelms, D. E., Scott, D.H.:

 Lunar basin formation and highland stratigraphy. REVIEWS OF GEOPHYSICS & SPACE PHYSICS 12, 309-328. (1974)
- Hughes, D. W.: Radar mapping of the Moon, NATURE 250, 375-376. (1974)
- Hulme, G. (Lunar and Planetary Unit, Dept. of Environmental Sciences, University of Lancaster, England): Turbulent lava flow and the formation of lunar sinuous rilles.

 MODERN GEOLOGY 4, 107-117. (1973)
- Keays, R. R. (Enrico Fermi Institute & Dept. of Chemistry, University of Chicago, Chicago, Ill. 60637), Ganapathy, R., Laul, J. C., Krahenbuhl, U., Morgan, J. W.: The simultaneous determination of 20 trace elements in terrestrial, lunar and meteoritic material by radiochemical neutron activation analysis.

 ANALYTICA CHIMICA ACTA 72, 1-30. (1974)
- Kimura, R. (Enrico Fermi Institute & Dept. of Chemistry, University of Chicago, Chicago, Ill. 60637), Lewis, R. S., Anders, E.: Distribution of gold and rhenium between nickel-iron and silicate melts: implications for the abundance of siderophile elements on the earth and Moon. GEOCHIMICA ET COSMO-CHIMICA ACTA 38, 683-701. (1974)
- Kunze, A. W. B. (Johnson Space Center, Code: TN2, NASA, Houston, TX 77058): Creep response of the lunar crust in mare regions from an analysis of crater deformation. PHYSICS OF THE EARTH & PLANETARY INTERIORS 8, 375-387. (1974)
- Laul, J. C. (Dept. of Chemistry and the Radiation Center, Oregon State University, Corvallis, Oreg.): Chemical composition of Boulder-2 mocks and Soils, Apollo 17, Station 2. EARTH 6 PLANETARY SCIENCE LETTERS 23, 206-219. (1974)
- Leavy, D. (Dept. of Earth & Planetary Sciences, MIT, Cambridge, Mass. 02139), Madden, T. R.:
 Lunar electrical conductivity. NATURE 250, 553-555. (1974)
- Malysheva, T. V. (Vernadskiy Institute of Geochemistry and Analytical Chemistry, Academy of Sciences of the USSR, Moscow): Mossbauer spectroscopy of lunar soil from the Luna-20 probe. GEOCHEMISTRY INTERNATIONAL 10, 824-829. (1974)
- Muller, O. (Max-Planck-Institut fur Kernphysik, Heidelberg, Germany): Chemical aspects of meteorologic and lunar matter. CHEMIKER-ZEITUNG 98, 281-287. (1974) (In German, English abstract)
- Muller, P. M. (Jet Propulsion Laboratory, Pasadena, CA), Sjogren, W. L., Wollenhaupt, W. R.: Lunar gravity: Apollo 15 doppler radio tracking. THE MOON 10, 195-205. (1974)

- No author cited: Signs of rust on the Moon. NEW SCIENTIST 63, 230. (1974)
- Olsen, E. J. (Field Museum of Natural History, Chicago, Ill. 60605), Grossman, L.: A scanning electron microscope study of olivine crystal surfaces. METEORITICS 2, 243-254. (1974)
- Page, T. (NASA/Johnson Space Center, Houston, TX 77058): Notes on lunar research. SKY 48, 88-90. (1974)
- Parkinson, R. C. (Rocket Propulsion Establishment, Westcott, Bucks, England): Take-off point for a lunar colony. SPACEFLIGHT 16, 322-326. (1974)
- Pearce, G. W. (University of Toronto, Toronto, Ontario, Canada), Simonds, C. H.: Magnetic properties of Apollo 16 samples and implications for their mode of formation. JOURNAL OF GEOPHYSICAL RESEARCH 79, 2953-2959. (1974)
- Polanuer, M. D. (Dept. of Mechanics and Astronomy, Tiraspol' Pedagogical Institute, USSR): Automatic observations on the Moon's surface for the study of its rotation. SOVIET ASTRONOMY 18, 248-251. (1974). (Translated from Astronomicheskii Zhurnal 51, 425-430, 1974)
- Porcello, L. J. (Environmental Research Institute of Michigan, Ann Arbor, Mich. 48107), Jordan, R. L., Zelenka, J. S., Adams, G. F., Phillips, R. J., Brown, W. E., Jr., Ward, S..H., Jackson, P. L.: The Apollo lunar sounder radar system. PROCEEDINGS OF THE IEEE 62, 769-783. (1974)
- Raheim, A. (Mineralogisk-Geologisk Museum, Sars' Gate-1, Oslo 5, Norway), Green, D. H.: Experimental petrology of lunar highland basalt composition and applications to models for the lunar interior. JOURNAL OF GEOLOGY 82, 607-622. (1974)
- Rennilson, J. J. (Division of Geological & Planetary Sciences, California Institute of Technology, Pasadena, Calif), Criswell, D. R.: Surveyor observations of lunar horizon-glow. THE MOON 10, 121-142. (1974)
- Ringwood, A. E. (Research School of Earth Sciences,
 Australian National University, Canberra, A.C.T.
 2600 Australia): Heterogeneous accretion and
 the lunar crust. GEOCHIMICA ET COSMOCHIMICA
 ACTA 38, 983-984. (1974)
- Sabu, D. D. (Dept. of Chemistry, Grambling College, Grambling, LA 71254), Hennecke, E.W., Manuel, O. K.: <u>Trapped xenon in meteorites</u>, NATURE <u>251</u>, 21-24. (1974)
- Sandqvist, Aa. (Stockholm Observatory): Lunar occultations of the galactic center region in H I, OH, and H₂CO lines. ASTRONOMY AND ASTROPHYSICS 33, 413-424. (1974)
- Sassoon, G.: Correlation of long-delay radio echoes and the Moon's orbit. SPACEFLIGHT 16, 258-264. (1974)
- Smith, E. I. (Division of Science, University of Wisconsin-Parkside, Kenosha. Wi): Rümker
 Hills: A lunar volcanic dome complex. THE
 MOON 10, 175-181. (1974)
- Smith, J. V. (Dept. of the Geophysical Sciences, University of Chicago, Chicago, Ill. 60637), Steele, I. M.: Intergrowths in lunar and terrestrial anorthosites with implications for lunar differentiation. AMERICAN MINER-ALOGIST 59, 673-680. (1974)
- Steele, I. M. (Dept. of the Geophysical Sciences, University of Chicago, Chicago, Ill. 60637): Ilmenite and armalcolite in Apollo 17 breccias. AMERICAN MINERALOGIST 59, 681-689. (1974)

- Stephenson, A. (Dept. of Geophysics & Planetary Physics, School of Physics, University of Mewcastle-upon-Tyne, England), Collinson, D.W.:

 Lunar magnetic field palaeointensities
 determined by an anhysteretic remanent
 magnetization method. EARTH & PLANETARY
 SCIENCE LETTERS 23, 220-228. (1974)
- Storey, W. C. (Grant Institute of Geology,
 University of Edinburgh, West Mains Road,
 Edinburgh EH9 3JW, UK): Anomalous lunar
 plagioclase composition and the composition
 of coexiating melt. NATURE 251, 403-405. (1974)
- Symposium on the Particle Exposure Record of Lunar Materials: Interaction of solar wind and lunar materials. ABSTRACTS OF PAPERS, AMERICAN CHEMICAL SOCIETY 168th NATIONAL MEETING. NUCL-11 to NUCL-25. (1974)
- Tarasov, L. S. (V. I. Vernadskiy Institute of
 Geochemistry & Analytical Chemistry, Academy
 of Sciences USSR, Moscow), Florenskiy, K. P.,
 Ivanov, A. V., Rode, O. D.: Morphological
 characteristics and types of regolith particles
 returned by the automatic Probe Luna-20 from
 a highland region of the Moon. GEOCHEMISTRY
 INTERNATIONAL 10, 957-967. (1973)
 [Translated from Geokhimiya No. 9, 1275-1286, 1973]
- Taylor, L. A. (Dept. of Geology, University of Tennessee, Knoxville, Tenn. 37916), Mao, H. K., Bell, P. M.: Identification of the hydrated iron oxide mineral akaganeite in Apollo 16 Iunar rocks. GEOLOGY 2, 429-432. (1974)
- Tsimbalnikova, A. (Geological Institute of the Czechoslovakian Academy of Sciences, Praha, Czech.), Palivtsova, M.: Structures of microbreccias from the regolith sample returned by the automatic station (Luna-16). GEOKHIMIYA No. 8, 1132-1142. (1974) in Russian.
- Turcotte, D. L. (Dept. of Geological Sciences, Cornell University, Ithaca, N. Y. 18450), Nordmann, J. C., Cisne, J. L.: <u>Evolution</u> of the Moon's orbit and the origin of life. NATURE <u>251</u>, 124-125. (1974)
- Ulich, B. L. (Millimeter Wave Observatory, University of Texas, Austin, TX), Cogdell, J. H., Davis, J. H., Calvert, T. A.: Observations and analysis of lunar radio emission at 3.05 mm wavelength. THE MOON 10, 163-174. (1974)
- Vasil'ev, M. B., Vyshlow, A. N., Kolosov, M. A., et al.: Investigation of the integral characteristics of the earth's ionosphere by means of a dispersion interferometer during the flight of Luna-19 space station. COSMIC RESEARCH 12, 78-81. (1974)
 [Translated from Kosmicheskie Issledovaniya 12, 87-91, 1974]
- Vasil'ev, M. B., Vinogradov, V. A., Vyshlow, A. E., et al.: Radio transparency of circumlunar space using the Luna-19 station.

 COSMIC RESEARCH 12, 102-107. (1974) Translated from Kosmicheskie Issledovaniya 12, 115-121, 1974
- Wilhelms, D. E. (U.S. Geological Survey, Menlo Park, CA 94025): Comparison of martian and lunar geologic provinces. JOURNAL OF GEO-PHYSICAL RESEARCH 79, 3933-3941. (1974)
- Wilshire, H. G. (U.S. Geological Survey, Menlo Park, CA), Moore, H. J.: Glass-coated lunar rock fragments. JOURNAL OF GEOLOGY 82, 403-417. (1974)
- Wood, C. A. (Geophysical Observatory, Haile Sellassie 1 University, Addis Ababa, Ethiopia): External origin for lunar rilled craters and the mare basins. NATURE 251, 166. (1974)
- Wrixon, G. T. (University College, Cork, Ireland), Schneider, M. V.: Ratio of the temperature of the quiet sun and the centre of the new moon at \(\lambda=1.3\) mm. NATURE \(\frac{250}{314}\), \(\frac{2574}{314}\)
- Zemchik, T., Ratslavsky, K.: Mossbauer spectroscopy on the iron core of lunar regolith from Luna-15. GEOKHIMIYA, no. 7, 1084-1089. (1974)