

File

UNITED STATES
DEPARTMENT OF THE INTERIOR
BRANCH OF ASTROGEOLOGY
GEOLOGICAL SURVEY
Box 1906
Flagstaff, Arizona

October 31, 1963

MEMORANDUM

To: V. R. Wilmarth
From: E. M. Shoemaker
Subject: Monthly report for Director and Secretary

1. Highlights and noteworthy results:

E. C. T. Chao and Janet Marteka have found a large number of nickel-iron spherules containing either schreibersite or troilite, or both, in tektites from two new sites: the Ortigas site near Manilla, Phillippines, and the Dalat site of south Viet Nam. This is the first time that nickel-iron spherules have been discovered in Indochina tektites. Electron probe analysis by E. J. Dwornik shows that the nickel contents of kamacite of the Ortigas site spherules range from 2.2 to 4.5 percent, whereas those from Dalat range from 4.7 to 12.9 percent. On the basis of texture, mineral assemblage and chemical composition, the new nickel-iron spherule data strongly indicates that the spherules are molten relicts of an impacting body, instrumental in the formation of the tektite glass.

Metallic iron from the Johnstown, Petersburg, Juvinas, Sioux County and Nuevo Laredo achondrite meteorites was found by Michael Duke to contain from 0.2% to about 3.5% nickel by electron probe analysis. This substantiates and extends previous X-ray fluorescence data showing the metallic iron of achondrites to have substantially lower nickel contents than metallic iron in chondritic meteorites. The lower nickel contents are possibly related to the removal of a metallic phase (mostly metallic iron) during magmatic differentiation of the achondrites from undifferentiated chondrite-like parental material. This view is consistent with the low to negligible metallic iron content of these achondrites compared to chondrites.

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The Branch of Astrogeology staff at Houston has completed a preliminary detailed draft of a long range training program in geology for astronauts. Formal instruction will begin early in February 1964 to a class of 30 men, including the 14 new astronauts selected this month.

Illustrations and a short text on Lunar Mapping were prepared by Harold Masursky for an article to appear in the November issue of Fortune Magazine.

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2. Significant Changes in Status of Projects

A regular Branch observing schedule for lunar geologic mapping has been instituted for the 60-inch McMath solar telescope at Kitt Peak Observatory, near Tucson, Arizona.

Daniel J. Milton has completed geologic mapping of the Henbury craters of central Australia and has returned to the United State.

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5. Personnel

Don E. Wilhelms and Martin F. Kane reported to Houston on their change of headquarters to Project Apollo.

Mrs. Irma DeArman entered on duty as Clerk-Typist for the Flagstaff Office.

Richard A. Laidley, headquartered at Tucson, Arizona, entered on duty as a WAE Physical Science Technician, and is conducting field studies in the Hopi Buttes, Arizona.

Kenneth Watson entered on duty at Flagstaff; Watson is conducting lunar research in the infra-red region.

Callie H. Lukerman, Scientific editor, resigned to accept a position with the Itek Corporation at Palo Alto.

Donald Cox has joined the Branch on a WAE basis to assist Michael Carr on his shock equation of state work.

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6. Conferences and scientific meetings.

E. C. T. Chao, Frank Cuttitta, and M. C. Carron attended the International tektite symposium held in Pittsburgh, Pa., Sept. 4-7.

Robert J. Hackman attended a conference held at the University of Michigan, on the possible use of remote sensors in the Manned Orbiting Laboratory and Gemini programs.

Ray Barnett attended the S.P.O.E. Symposium in Los Angeles, Aug. 9-12, 1963.

M. F. Kane attended the SEG meeting, New Orleans, Oct. 22, 1963.

E. M. Shoemaker and E. C. T. Chao attended the 26th Annual Meeting of the Meteoritical Society in Ottawa, Canada, on Oct. 7 and 8, 1963, sponsored by the Associate Committee on Meteorites of the National Research Council of Canada, and the Geological Survey of Canada.

E. M. Shoemaker, D. P. Elston, J. F. McCauley, and E. C. Morris, attended the Second Annual Meeting of the Working Group on Extraterrestrial Resources, held October 23-25 at Holloman Air Force Base, Alamogordo, New Mexico.

Frank Cuttitta attended an analytical chemical colloquium held at the Bureau of Standards, the first of a series dealing with the application of neutron activation analysis and the analyses of trace elements.

Robert J. Hackman attended the September meeting of the Washington Chapter of the Society of Photographic Scientists and Engineers.

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6. Conferences (con't)

E. D. Jackson, A. H. Chidester,
M. F. Kane, D. E. Wilhelms

Professors Adams, Rogers and
Donnelley, Rice University -
Use of library and other facilities
at Rice.

A. H. Chidester

G. D. Robinson and J. F. Smith,
USGS Field conference at Philmont
Ranch area N. M.; selection of
Astronaut training sites.

D. E. Wilhelms

G. P. Kuiper, T. Gehrels,
W. K. Hartmann at Lunar and
Planetary Laboratory, Tucson.
Polarimetry, lunar mapping, lunar
surface structure.

D. E. Wilhelms

S. Titley and R. Eggleton,
Geology Dept., Univ. of Arizona,
Tucson. Lunar mapping.

D. E. Wilhelms

C. W. Tombaugh, New Mexico State
University, Las Cruces. Geology
of Mars and the Moon.

W. E. Davis, Regional Geophysics
Branch, USGS

M. F. Kane, Seismic instrumentation.

A. H. Chidester, M. F. Kane,
E. D. Jackson

E. M. Shoemaker - Field confer-
ence on astronaut training sites
in the Flagstaff area.

A. H. Chidester, D. E. Wilhelms,
E. D. Jackson

USGS Staff at Nevada Test Site,
Field conference on suitability
of NTS for astronaut training area.

Frank Cuttitta and Frank Senftle

Mr. Smathers and Major Uhrig of
the Walter Reed Institute of
Research relative to our use of
their radioactivation facilities.

E. M. Shoemaker, E. C. Morris,
R. Batson

Attended meetings with members of
Jet Propulsion Laboratory at Hughes
Aircraft, El Segundo, Calif.,
concerning the TV mirror assembly
for the Surveyor spacecraft.

E. M. Shoemaker, E. C. Morris,
R. Batson

Met with representatives of Jet
Propulsion Laboratory at Pasadena,
Calif., to discuss the scientific
objectives of the Surveyor space-
craft and the responsibilities
of the USGS in this unmanned lunar
landing program.

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6. Conferences (con't)

Harold Masursky

Conferred with Robert Westbrecht on addition of lunar shutter to Lick Observatory astrometric camera on 36 refracting telescope.

Harold Masursky

Conferred with A. E. Whitford, Director of Lick Observatory on installation of auxiliary instruments on the Lick telescopes for visual and photographic work to be used in the lunar mapping program.

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7. Talks or papers presented at meetings.

E. C. T. Chao presented two papers at the International tektite symposium in Pittsburgh. These papers were coauthored with E. J. Dwornik and Janet Littler: 1) Geological occurrences of some Austral-Asian tektites. 2) New data on the nickel-iron spherules from Southeast Asian tektites and their implications.

Russel Wahmann presented talks on the Geological Survey's lunar mapping program to the Flagstaff Rotary Club, the Winslow Rotary Club, the Sedona (Arizona) Masonic Club, and to the Phi Delta Kappa, an educational professional fraternity, Arizona State College, Flagstaff.

John F. McCauley presented a talk at the Flagstaff Rotary Club entitled "From Meteor Crater to the Moon", Sept. 24, 1963. He also spoke to the Flagstaff Evening Lions Club, on "Geologic Mapping of the Moon".

E. M. Shoemaker presented a talk on "The Geology of the Meteor Crater" to the AAUW on Oct. 15, 1963.

Harold Masursky with Dr. Stanley Vasilevskis of Lick Observatory, appeared on a half hour TV presentation entitled "Mapping the Moon" presented by station KRON.

E. C. T. Chao presented a paper entitled "The petrographic evidence of impact metamorphism" at the Cratering Symposium of the 26th Annual Meeting of the Meteoritical Society held at Ottawa, Canada, Oct. 7 and 8, 1963.

Robert J. Hackman gave a talk on "The Interpretation of lunar photography" at the September meeting of the Washington Chapter of the Society of Photographic Scientists and Engineers.

D. J. Milton spoke on the geology of the Henbury Craters and on geologic mapping of the Moon at: a. Geological Society of Australia, New South Wales Branch, Sydney, Australia; b. University of Adelaide; c. University of New South Wales, Sydney, Australia; d. Geological Survey of South Africa, Pretoria.

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8. Visitors

Visitor and Affiliation

Professor Theodore Monod
Dept. Geology, University of DaKar
Senegal, Africa

Dr. J. D. H. Wiseman
British Museum of Natural History
London, England

Dr. Joseph Zahringer
Max Planck Institute of Nuclear Physics
Heidelberg, Germany

Dr. Ross S. Taylor
National University of Australia
Canberra, Australia

Don Beattie, Charles Stuart, and
Paul Lowman, Jr., NASA

H. Goudy, American Exploration Co.

Carl Irving of the Oakland Tribune

John Casey (Ass't Chief)
Douglas Guppy, Joyce Tomlinson,
Alistair Stewart, Bureau of Mineral
Resources

A. W. G. Whittle, Dept. of Economic Geology,
University of Adelaide

J. C. Braithwaite, Geologist,
Lime and Marble Ltd., New Zealand
Also the Central Australian Tours
(busload every Saturday)

D. E. Wilhelms Branch of Astrogeology, with
J. E. Dornbach, U. S. Clanton, E. A. King,
T. H. Foss, all of Manned Spacecraft Center,
Houston, Texas

Visited and Purpose

E. C. T. Chao, African craters
and ivory coast tektite.

E. C. T. Chao, Metallic spherules
in tektites and other cosmic
particulate matter

E. C. T. Chao, Tektite and
meteorite ages

E. C. T. Chao and F. Cuttitta,
tektites, and chemical lab.

Robert J. Hackman to discuss lunar
geologic mapping and landing sites
on the lunar surface where maximum
geologic intelligence could be
obtained.

Harold Masursky to discuss drilling
program in progress at the Cortez
Mining District, Nevada.

Interviewed Harold Masursky,
Michael Carr, and Don Wilhelms on
the Lunar Mapping program of the
Geological Survey.

Daniel J. Milton, at Henbury Craters,
Northern Territories, Australia,
to discuss the crater investigations.

Staff at Kitt Peak National
Observatory near Tucson, Arizona,
to examine telescopes to be used
in lunar mapping.

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8. Visitors (con't)

Visitor and Affiliation

Robin Brett, Carnegie Institution
Geophysical Laboratory

Howard R. Cramer, Department of Geology,
Emory University, Atlanta, Georgia

Col. John G. Erickson, Robert W. Carder,
St. Louis, and William D. Cannell,
Flagstaff USAF Aeronautical Chart and
Information Center

William P. Healey, Lytten Systems

Ladoo Muhlstein, Ames Research Center,
NASA

Visited and Purpose

Mike Duke, relative to a proposed
collaborative electron probe and
experimental study of metallic
copper in meteorites.

Robert J. Hackman to discuss lunar
geologic studies being undertaken
by the U. S. Geological Survey.

Branch headquarters in Flagstaff
to discuss lunar mapping program

Michael H. Carr, discuss collection
of micrometeorites on balloons.

R. V. Lugn, photogrammetric procedures
for small cratering experiments

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General Information

Michael Duke was named co-recipient of the annual Nininger Meteorite Award, sponsored by H. H. Nininger and the Arizona State University. A cash prize of \$500 accompanied the Award, which is made for the best meteorite research paper by a graduate student. The paper, "Petrology of the Basaltic Achondrite Meteorites", was submitted while Duke was a graduate student at the California Institute of Technology.

C. H. Marshall suggests that regional correlations on the moon can be made by the use of the regional materials around the 12 lunar basins mentioned by Hartmann in Lunar and Planetary Communication Vol. 1, Nos. 12-13. These regional materials are analagous to the Apenninian Series but appear to be of different ages as judged by the crater populations on the surfaces of the outer slopes of the basins. The extent of these deposits will be sufficient to virtually cover the earthside hemisphere as well as to extend to much of the backside of the moon.

C. H. Marshall has noticed a dark tone "varnish" near Schickard which is associated with maria "flows" but which extends beyond their edges and covers features that have considerable relief.

A rather elaborate tektite and meteorite impact exhibit is being prepared by E. C. T. Chao and Janet Marteka, with the aid of Dick Kenah and his Assistants of the exhibits group. The exhibit will be located in the Department of the Interior Museum. It is expected to be completed in 2 or 3 weeks. The public will be informed about this exhibit when it is completed.

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General information (con't)

Construction on the darkroom adjacent to the microfocuss x-ray unit in Room 1241-I, GSA Building in Washington was scheduled to begin on September 23, 1963.

The Branch and the Geological Survey exhibits committee have supplied several displays for a major exhibit on lunar geologic and topographic mapping that is being held at the Museum of Northern Arizona at Flagstaff from October 1 to November 30.

Two new sets of vertical aerial photography covering approximately 70 square miles surrounding Meteor Crater, Arizona have recently been flown. The flight plan used for both sets was designed by Ray Batson of the Branch. The flight height was at an altitude of 7500 feet above mean ground elevation; a six inch lens on a nine-by-nine inch format was used. One set, flown by the U. S. Air Force, has very high contrast, and will be used for the detailed plotting of geology. The other set, flown under contract by Mark Hurd Aerial Surveys, has lower contrast and will be used to prepare a highly detailed topographic base for the geology.