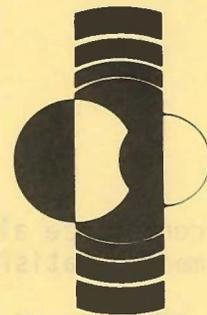


LUNAR AND PLANETARY INSTITUTE

3303 NASA ROAD 1 HOUSTON, TEXAS 77058 CABLE ADDRESS: LUNSI



PROJECTS OFFICE
(713) 486-2150

CONFERENCE ON THE ORIGIN OF THE MOON

October 12-16, 1984

FIRST ANNOUNCEMENT

November 29, 1983

A major unsolved problem in planetary science is the origin of the Moon. The hope of solving this problem was one of the major scientific justifications for the Apollo program. Although several new models for lunar origin have been proposed since the return of Apollo and Luna samples, there has never been a conference devoted exclusively to this fascinating topic. Ironically, the arrival of a sample data base has not resulted in an increase of published information on the topic.

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 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 Phillips, Southern Methodist University; and G. Jeffrey Taylor, University of New Mexico.

We know more about the early evolution of the Moon than about any other planetary body. This knowledge derives from the lunar research program, which includes lunar sample, experimental, geophysical, remote-sensing, and theoretical studies, and it allows us to place constraints on how the Moon formed. For example, isotopic studies have demonstrated that the Moon experienced a major differentiation prior to 4.4 billion years ago. If the Moon formed by fission from Earth, it follows that the fission must have taken place before 4.4 billion years ago. Further, meteorite research, missions to other planets, and theoretical studies of planet formation have sharpened our understanding of processes operating during the earliest stages of solar system history.

We envisage that the conference will deal with both constraints and origins. Under constraints, for example, it seems fairly certain that the Moon is depleted in volatile elements compared to either Earth or chondrites. Any model for lunar origin must explain this. But how sure are we that the Moon is also depleted in siderophile elements and enriched in refractory elements?

The conference also will focus on specific models for lunar origin, on how well the models satisfy the constraints, and on how we might test the models.

The goal of the conference is not to determine once and for all how the Moon formed (that's a dream, not a goal!), but to assess our present understanding of lunar (and hence planetary) formation, and to reveal where our knowledge is too meager. We hope to determine how well hypotheses for lunar origin are constrained. We expect the conference to lead to research designed to test specific models and possibly to help in planning new planetary exploration missions.

Some speakers will be invited to summarize certain areas (see enclosed list), but contributed talks will make up the bulk of the program. The Program Committee will accept only papers that directly address the topic of the conference. The program will be organized in three parts: invited review talks, contributed talks, and summary talks. A list of reviewers and of summarizers is enclosed. Tentative session topics for contributed talks include:

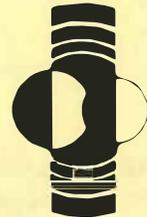
1. What chemical and petrologic constraints can be placed on the origin of the Moon?
2. What geophysical constraints can be placed on the origin of the Moon?
3. What dynamical constraints can be placed on the origin of the Moon?
4. When we return to the Moon, what new experiments and observations could help constrain the origin of the Moon?
5. How did the Moon form?

Abstracts will be due July 15, 1984. The proceedings of the conference will be published in book form, with papers due December 15, 1984. We intend this book to be comprehensive and up-to-date in its coverage. If you are interested in participating in the conference, please respond by filling out the enclosed indication of interest form and mailing it to the LPI Projects Office.

The second circular for this meeting, which will include forms and instructions for preparing abstracts, will be sent to all those who return the form. If you have colleagues who may be interested in the topic of the conference but who may not have received this mailing, please feel free to copy and distribute this announcement. Questions pertaining to the meeting may be directed to any of the conveners, or to Pam Jones, LPI Projects Office, 713-486-2150,

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CONFERENCE ON THE ORIGIN OF THE MOON
Kona, Hawaii October 14-16, 1984

F I N A L A N N O U N C E M E N T
August 27, 1984

Dear Colleague:

We are looking forward to your participation in the LPI topical conference on the "Origin of the Moon," which will be held October 14-16 at the King Kamehameha Hotel, Kona, Hawaii. The hotel reservations people tell us that over 100 rooms have been booked by our group so far, so we are anticipating a good attendance. This will be the final announcement concerning this meeting.

SCIENTIFIC PROGRAM

You will find the program for the meeting enclosed with this letter. As you can see, 54 talks have been scheduled for presentation. Ample time has been allotted for discussion, so all who are interested in the topics are encouraged to attend and to participate, regardless of whether you have submitted an abstract or have a talk scheduled.

MEETING PUBLICATIONS

Abstract volumes will be sent in advance to correspondence authors, and available to other participants at the meeting. A hard-bound, typeset volume entitled ORIGIN OF THE MOON, will be published by the LPI in late 1985. Researchers are encouraged to submit papers to this volume. Manuscripts are due at the LPI Publications Office on December 14, 1984, but invited reviews may be submitted as late as January 20, 1985. Page charges are estimated at \$62/page, with limited funds available for financial assistance to those contributing review papers. If you are interested in submitting a paper to this volume, please complete and return the enclosed questionnaire per directions given on the form. Questions pertaining to the volume may be directed to any of the conveners (who will also serve as editors for the book), or to Karen Hrametz, LPI Publications, (713) 486-2143.

AUDIO-VISUAL AIDS

Dual screen projection of 35mm slides and single screen projection of overheads will be possible during oral presentations. Speakers should complete the enclosed cue sheet and give it together with presentation materials to the projectionist 30 minutes prior to the start of the session. If you have special requirements, please let me know.

REGISTRATION

For those people who are attending the DPS meeting and/or planning to participate in the October 13th field trip to volcano areas, our registration desk will be open from 3:00p to 5:00p on Friday, October 12th. It will also be open from 6:00p to 10:00p on Saturday, October 13th, and beginning at 8:00a each day of the meeting. A form to pre-register is enclosed. Please note that the fee includes lunches for all three days of the meeting. Guests are welcome to participate in these lunches and the social events, providing they register. Pre-registering will greatly help us with advance planning and also save you \$5 on each fee.

ARRIVALS/DEPARTURES

Let me repeat some the information from the last announcement concerning the logistics of arrivals and departures. Most flights will arrive in Honolulu and will require a short flight (approximately 30 minutes) from Oahu to the big island. Three or four carriers provide this service and flights are frequent and efficient. Upon landing at the Kona airport, you may take a taxi to the King Kamehameha Hotel, or you may rent a car and drive there. The hotel is about eight miles away and taxi fare is about \$6.00. The hotel is located within walking distance of the shopping district and restaurants, so a car is not a necessity. The meeting rooms and the registration area are located in the wing to the right of the hotel desk. Because of the length of the program on Tuesday, departures should not be scheduled out of Kona before 6:00p that evening.

MESSAGES

The telephone number for the King Kamehameha Hotel is 808-329-2911. The address is 75-5660 Palani Road, Kailua-Kona, Hawaii, 96740. Messages will be taken by the hotel switchboard and placed in guest's boxes.

LUAU

On Friday evening, October 12, we have been invited to join participants of the DPS meeting in a luau on the hotel grounds that includes an open bar, dinner and entertainment. Tickets are \$27 per person; advance reservations are required. You may reserve your tickets on the enclosed pre-registration form, and pick them up either at our registration desk (3:00 - 5:00p) October 12, or at the DPS registration desk during the DPS meeting.

FIELD TRIP

Members of the DPS are organizing the field trip to the volcano areas on Saturday, October 13th. They tell me that buses will leave the hotel at 7:30a, and will not return until 5:00p or 6:00p that evening. The trip will include a lengthy stop at the Hawaii Volcanoes National Park, as well as other points of interest around the island. For the sake of convenience, you may include the \$30 fee with our pre-registration form, and we will see that it gets to the proper DPS people. It is my understanding that you must register in advance. Questions concerning the field trip should be directed to Dr. David Morrison, chairman of the local organizing committee (808-948-7651).

WEATHER

Since this is Hawaii, we expect, of course, beautiful warm weather. The King Kamehameha Hotel is a first-class resort, but the rule of the island is casual, so plan to be comfortable, and pack accordingly. Don't forget your swimsuit!

Please give me a call if I can answer questions concerning the conference program or meeting logistics. I hope to see you at the meeting.

Sincerely,



Pamela Jones
for the Organizing Committee

P R O G R A M
LPI TOPICAL CONFERENCE ON THE ORIGIN OF THE MOON

Sunday, October 14, 1984

- 8:00 - 9:00 a.m. Registration
8:45 a.m. Opening Remarks

INVITED REVIEWS

9:00 a.m. - 12:00 noon

Chairman: Michael B. Duke

() Minutes for presentation

- (30) Wood J. A.
Review of theories of lunar origin.
- (30) Larimer J.
How does lunar bulk material relate to the solar nebula condensation sequence?
- (30) Wetherill G. W.
What were lunar accretion dynamics and early cratering history?
- (30) Drake M. J.
Is lunar bulk material similar to Earth's mantle?

LUNCH

INVITED REVIEWS - CONTINUED

1:00 - 3:15 p.m.

Chairman: Robert O. Pepin

- (30) Taylor G. J.
What were the earliest lunar differentiation events?
- (30) Hood L. L.
Is there a lunar iron core?
- (30) Burns J.
What was the Moon's ancient orbital history?

COFFEE BREAK

Sunday, October 14, 1984

GEOPHYSICAL CONSTRAINTS

3:30 - 5:30 p.m.

Chairman: Roger J. Phillips

- (10) Turcotte D. L.
Geophysical and geochemical constraints favoring the capture hypothesis.
- (6) Matsui T. Abe Y.
Lunar magma ocean and its implication for origin of the moon.
- (6) Binder A. B.
The initial thermal state of the moon.
- (6) Yoder C. F.
The size of the lunar core.
- (6) Russell C. T.
On the Apollo subsatellite evidence for a lunar core.
- (10) Cisowski S. M. Fuller M.
Lunar magnetic history.
- (10) Banerjee S. K.
Magnetic constraints of early lunar evolution revisited: Limits on accuracy imposed by methods of paleointensity measurements.
- (6) Runcorn S. K.
Implications of lunar palaeomagnetism for the origin of the moon.

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

Monday, October 15, 1984

CHEMICAL AND PETROLOGICAL CONSTRAINTS

8:00 - 11:30 a.m.

Chairman: John T. Wasson

- (10) Newsom H. E.
Constraints on the origin of the moon from molybdenum and other siderophile elements.
- (10) Ringwood A. E. Seifert S.
Nickel-cobalt systematics and their bearing on lunar origin.
- (10) Delano J. W.
Abundances of Ni, Cr, Co, and major elements in the silicate portion of the moon: Constraints from primary lunar magmas.
- (10) Dickinson T. Newsom H.
Ge abundances in the lunar mantle and implications for the origin of the moon.
- (10) Goodrich C. A. Barnes S.
Ia phosphorus predictably incompatible in igneous processes?
- (14) Warren P. H. Rasmussen K. L.
Megaregolith thickness, heat flow, and the bulk composition of the moon.
- Warren P. H.
The bulk-moon MgO/FeO ratio: A highlands perspective.
- (6) Goettel K. A.
Bulk composition of the moon in the context of models for condensation in the solar nebula.

COFFEE BREAK

- (6) Shervais J. W. Taylor L. A.
Petrologic constraints on the origin of the moon: Evidence from Apollo 14.
- (10) Kreuzberger M. E. Drake M. J. Jones J. H.
Origin of the moon: Constraints from volatile elements.
- (10) Koeberl C.
Volatile elements in and on lunar volcanic glasses: What do they tell us about lunar genesis?
- (10) Swindle T. D. Caffee M. W. Hohenberg C. M.
The I-Pu-Xe age of the moon.
- (10) Taylor S. R.
Tests of the lunar fission hypothesis.

LUNCH

Monday, October 15, 1984

DYNAMICAL CONSTRAINTS

1:00 - 3:15 p.m.

Chairman: Alan Harris

- (10) Vanyo J. P.
Constraints on lunar origin: Evidence preserved in precambrian stromatolites.
- (6) VanArsdale W. E.
Constraints on the origin of viscoelastic bodies.
- (6) Yoder C. F. Williams J. G. Dickey J. O. Newhall X. X.
Tidal dissipation in the earth and moon from lunar laser ranging.
- (6) Hartung J. B.
Two lunar global asymmetries.
- (6) Conway B. A.
The moon's orbit history and inferences on its origin.
- (10) McKinnon W. B. Mueller S. W.
A reappraisal of Darwin's fission hypothesis and a possible limit to the primordial angular momentum of the earth.
- (6) Durisen R. H. Gingold R. A. Scott E. H.
Numerical simulations of fission.
- (14) Boss A. P. Mizuno H.
The dynamic fission instability and the origin of the moon.
- Mizuno H. Boss A. P.
Tidal disruption and the origin of the moon.
- (10) Cox L. P.
A numerical investigation of planetesimal collision trajectories with a moon accumulating in earth orbit.
- (6) Hartmann W. K.
Stochastic ≠ ad hoc.

COFFEE BREAK

Monday, October 15, 1984

MY MODEL OF LUNAR ORIGIN I

3:30 - 5:15 p.m.

Chairman: G. Jeffrey Taylor

- (6) { Malcuit R. J. Winters R. R. Mickelson M. E.
A testable gravitational capture model for the origin of the earth's moon.
- { Malcuit R. J. Winters R. R. Mickelson M. E.
Directional properties of "circular" maria: Interpretation in the context of a testable gravitational capture model for lunar origin.
- (10) Cassidy W. A.
The "problem" of iron partition between earth and moon during simultaneous formation as a double planet system.
- (10) Ringwood A. E.
Origin of the moon.
- (14) Binder A. B.
On the origin of the moon by rotational fission.
- (10) Wänke H. Dreibus G.
Geochemical evidence for the formation of the moon by impact induced fission of the proto-earth.

Tuesday, October 16, 1984

MY MODEL OF LUNAR ORIGIN II

9:00 a.m. - 12:00 noon

Chairman: Torrence V. Johnson

- (6) Greenberg R. Chapman C. R. Davis D. R. Drake M. J. Hartmann W. K. Herbert F. L. Jones J. Weidenschilling S. J.
An integrated dynamical and geochemical approach to lunar origin modelling.
- (10) Hartmann W. K.
Lunar origin: The role of giant impacts.
- (10) Herbert F. Davis D. R.
Models of angular momentum input to a circumterrestrial swarm from encounters with heliocentric planetesimals.

- (10) { Weidenschilling S. J.
Capture of planetesimals into a circumterrestrial swarm.
- { Weidenschilling S. J.
The lunar angular momentum problem.

- (10) Chapman C. R. Greenberg R.
A circumterrestrial compositional filter.

COFFEE BREAK

- (10) Wasson J. T. Warren P. H.
The origin of the moon.
- (10) Cameron A. G. W.
Formation of the prelunar accretion disk.
- (10) Kaula W. M. Beachey A. E.
Mechanical models of close approaches and collisions of large protoplanets.
- (10) Stevenson D. J.
Lunar origin from impact on the earth: Is it possible?

LUNCH

SUMMARY AND OPEN DISCUSSION

2:00 - 5:00 p.m.

Chairman: William K. Hartmann

- (30) Sean C. Solomon
Summary: Geophysical perspective.
- (30) John Longhi
Summary: Geochemical perspective.
- (30) Stanton Peale
Summary: Dynamical perspective.