PROGRAM
FORUM ON INNOVATIVE APPROACHES TO OUTER PLANETARY EXPLORATION 2001–2020

February 21–22, 2001 Lunar and Planetary Institute, Houston, Texas

To view a particular abstract, use the hand tool of your Reader to click on the title of a presentation.

Wednesday, February 21, 2001
OPENING PLENARY
9:00 a.m. Lecture Hall

Colleen Hartman, Director, Outer Planets Program Directorate, NASA Headquarters
Welcome and Opening Remarks

Eugene H. Levy, Provost, Rice University
Keynote Address

9:45 a.m. COFFEE BREAK

Wednesday, February 21, 2001
Focus 1: Strategic Objectives and Key Capabilities
EUROPA SURFACE AND SUBSURFACE EXPLORATION
10:00 a.m. Berkner DEF

Chairs: Michael J. Drake, University of Arizona
William B. McKinnon, Washington University

Cole T. D. * Reiter R. A. Paschalidis N. P. Cheng A. F. Domingue D.
Miniaturized, Low-Power Laser Altimeter (MLLA)

Banerdt W. B. * Pike W. T.
A Miniaturized Seismometer for Surface Measurements in the Outer Solar System

Tamppari L. * Zimmerman W. Green J.
Seismoball: A Small Europa Orbiter Drop-Off Probe for Early Exploration of the Europan Surface

French L. C. * Anderson F. S. Carsey F. D. Green J. R. Lane A. L. Zimmerman W. F.
Subsurface Exploration Technologies and Strategies for Europa

Focus 1, continued

Bartlett P. W.* Rafeek S. Gorevan S. P. Kong K. Y.
The Inchworm Deep Drilling System for Kilometer Scale Subsurface Exploration of Europa (IDDS)
AND
Subsurface Sample Acquisition and Transfer Systems (SSATS)

Izenberg N. R. * Uy O. M.
Molecularly Imprinted Polymer Geochemical Detectors for Outer Solar System Exploration

Livi S. A. * Domingue D. L. Brinckerhoff W. B. Wurz P.
ReMaSp: A Reflectron Time-of-Flight Mass Spectrometer

Wiens R. C. * Cremers D. A. Nordholt J. E. Blacic J. D.
Elemental Composition Measurements Using Laser-induced Breakdown Spectroscopy (LIBS)

12:30–2:00 p.m. LUNCH

Wednesday, February 21, 2001
Focus 1: Strategic Objectives and Key Capabilities
EUROPA SURFACE AND SUBSURFACE EXPLORATION
2:00 p.m. Berkner DEF

Chairs: Michael J. Drake, University of Arizona
William B. McKinnon, Washington University

Brinckerhoff W. B. * Cornish T. J. Cheng A. F. McEntire R. W.
Laser TOF-MS for In Situ Analysis of Outer Planetary Moons and Small Bodies

Swindle T. D. * Brown R. Greenberg R. Lunine J. McEwen A.
In Situ Chronology in the Outer Solar System

Patel J. U. * Blaes B. R. Mojarradi M. M.
Nonvolatile Memory Solution for Near-Term NASA Missions

Greenberg R. * Tufts B. R. Hoppa G. V. Geissler P.
A Need to Update the Exploration Strategy for Europa

McKinnon W. B. *
A Proposed Sequence of Exploration for Europa and the Other Galilean Satellites

Focus 1, continued

Thursday, February 22, 2001
Focus 1: Strategic Objectives and Key Capabilities
TITAN ATMOSPHERE AND SURFACE EXPLORATION
9:00 a.m. Berkner DEF

Chairs: Michael J. Drake, University of Arizona
William B. McKinnon, Washington University
Brad Parkinson, Stanford University

Jensen J. R. * Raney R. K.
Delay/Doppler Radar Altimetry for Outer Planet Applications

Beauchamp P. * Beauchamp J. Dougherty D. Raulin F. Smith M. Welch C. Shapiro R. Lunine J.
Approaches for Exploring the Organic Evolution of Titan's Surface

Sittler Jr. E. C. * Acuna M. Burchell M. J. Coates A. Farrell W. Flasar M. Goldstein B. E. Gorevan S. Hartle R. E. Johnson W. T. K. Kojiro D. R. Niemann H. Nilsen E. N. Nuth J. Smith D. Zarnecki J. C.
Titan Orbiter Aerorover Mission

Jones J. A. *
Inflatable Vehicles for In-Situ Exploration of Titan, Triton, Uranus, Neptune

Kerzhanovich V. * Yavrouian A. Cutts J. Colozza A. Fairbrother D.
Titan Airship Surveyor

Lorenz R. D. *
Flexibility for Titan Exploration: The Titan Helicopter

Young L. A. *
Exploration of Titan Using Vertical Lift Aerial Vehicles

Bartlett P. W.* Rafeek S. * Kong K. Y. Gorevan S. P. Ummy M. A.
A Balloon-delivered Subsurface Sample Acquisition and Transfer Mechanism
AND
Touch and Go Surface Sampler (TGSS)

11:15 a.m. COFFEE BREAK

Focus 1, continued

PLENARY SESSION
11:45 a.m. Lecture Hall

Tim Kreider
A Cartoonist in Space

12:30–2:00 p.m. LUNCH

Thursday, February 22, 2001
Focus 1: Strategic Objectives and Key Capabilities
COMET NUCLEUS SAMPLE ANALYSIS AND NEPTUNE/TRITON ENVIRONMENT
2:00 p.m. Berkner DEF

Chairs: Michael J. Drake
William B. McKinnon
Brad Parkinson, Stanford University

Weissman P. R. * Nilsen E. N. Smythe W. D. Marriott J. Reinert R.
Odyssey Comet Nucleus Orbiter: The Next Step in Cometary Exploration

Gefert L. P. Oleson S. R. * Patterson M. J. Schrieber J. McAdams J.
Sub-Kilowatt Radioisotope Electric Propulsion for Outer Solar System Exploration
AND
Pluto/Kuiper Missions with Advanced Electric Propulsion and Power

Lawrence D. J. * Barraclough B. L. Feldman W. C. Prettyman T. H. Wiens R. C.
A Combined Gamma-Ray and Neutron Detector for Measuring the Chemical Composition of Comets and Other Planetary Bodies

Rhodes E. * Goldsten J.
Miniature Neutron-Alpha Activation Spectrometer

Focus 1, continued

Reisenfeld D. B. Elphic R. C. McComas D. J. Nordholt J. E. Steinberg J. T. Wiens R. C. *

Ion Mass Spectroscopy for the Outer Solar System

Green J. R. *

The Extraterrestrial Materials Simulation Laboratory

Hammel H. B. * Porco C. C. Rages K.

The Case for a Neptune Orbiter/Multi-Probe Mission

4:00 p.m. ADJOURN

Wednesday, February 21, 2001
FOCUS 2: OTHER INVESTIGATIONS
10:00 a.m. Hess Room

Chairs: Jonathan Lunine, University of Arizona
Brad Parkinson, Stanford University

Spilker T. R. * Hubbard W. B. Ingersoll A. P.
Flyby Delivers Multiple Deep Jupiter Probes

Spilker T. R. *
Saturn Ring Observer
AND
Saturn Deep Atmospheric Entry Probes Delivered by INSIDE Jupiter Derivative Spacecraft

Freeman A. * Nilsen E.
Kuiper Belt Mapping Radar

Bolton S. J. * Owen T. Gautier D. Gulkis S. Janssen M. Atreya S. Guillot T. Anderson J. Allison M. Lunine J.
Jupiter: Atmospheric Sounding and Sensing of the Interior (JASSI)

Khurana K. K. * Banerdt W. B. Johnson T. V. Russell C. T. Kivelson M. G. Davis P. M. Vidale J. E.
Sounding of Icy Galilean Satellites by Surface Observatories

Rubincam D. P. *
Pluto and Triton: Interactions Between Volatiles and Dynamics

Pappalardo R. T. * Khurana K. K. Moore W. B.
The Grandeur of Ganymede: Suggested Goals for an Orbiter Mission

Horanyi M. * Lawrence G. Withnell P. Tuzzolino A. McKibben R. B. Auer S. Grun E. Schwehm G. Svedhem H.
DMOSS: Dust Measurements in the Outer Solar System

Spencer J. R. * Smythe W. D. Lopes-Gautier R. McEwen A. S.
A Return to Io: Science Goals and Implementation

12:30–2:00 p.m. LUNCH

Focus 2, continued

Wednesday, February 21, 2001
FOCUS 2: OTHER INVESTIGATIONS
2:00 p.m. Hess Room

Chairs: Jonathan Lunine, University of Arizona
Brad Parkinson, Stanford University

Maise G. * Powell J. Paniagua J.
A Nuclear Ramjet Flyer for Exploration of Jovian Atmosphere

Clark B. C. Gamber R. T. Faulconer C. E. * Sutter B. M.
Jovian Moon Sampler

Bérczi Sz. * Lukács B.
Search for Ammonia Containing Life Building Blocks in Outer Solar System

Granahan J. C. * Rupert S. T.
Hyperspectral Data Compression as an Enabling Technology for Deep Space Missions

Henshaw R. M. Darlington E. H. Hawkins S. E. III* Heffernan K. J. Humm D. C. Stohbehn K. Thompson P.
A Multifunctional, Multispectral, Outer Planetary Imager

Blasius K. R. * Silverman S. H. Christensen P. R.
Advanced THEMIS for Multispectral Thermal IR Imaging

Turner R. E. *
NIAC Support to Innovation in Outer Planet Exploration

Földi T. Bérczi Sz.*
Indicating the Deep Structure (Below the Icy and Liquid Layers) of Europa and Titan by Measurements with a Giant Solenoid System on Board of an Orbiting Space Probe

4:00 p.m. ADJOURN

Wednesday, February 21, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
"GETTING THERE" — PROPULSION AND TRAJECTORIES
10:00 a.m. Lecture Hall

Chairs: William A. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency

Lo M. W. *
Petit Grand Tour: Mission Concepts to Outer Planet Satellites Using Non-Conic Low Energy Trajectories

Borowski S. K. * Cataldo R. L.
Nuclear Thermal Rocket (NTR) Propulsion and Power Systems for Outer Planetary Exploration Missions

Noca M. * Polk J. E. Lenard R.
Nuclear Electric Propulsion for the Exploration of the Outer Planets

Houts M. * Van Dyke M. K. Godfroy T. J. Pedersen K. W. Martin J. J. Dickens R. Williams E. Harper R. Salvail P. Hrbud I. Kirkindall A. S. Sorensen K.
Space Fission Propulsion System Development Status

Powell J. * Maise G. Paniagua J.
MITEE: A Compact Ultralight Nuclear Thermal Propulsion Engine for Planetary Science Missions

Patterson M. J. Oleson S. R. *
Ion Propulsion Technology Programs at NASA Glenn Research Center

Taylor T. S. *
Concepts and Engineering Advances Required for Near-Term Solar Sail Propelled Outer Planet Probes

Nordley G. D. Forward R. L. * Hoyt R. P.
Application of Synergistic Multipayload Assistance with Rotating Tethers (SMART) Concept to Outer Planet Exploration

Van Cleve J. E. * Grillmair C. J.
Small Nuclear-powered Hot Air Balloons for the Exploration of the Deep Atmosphere of Uranus and Neptune

12:30–2:00 p.m. LUNCH

Focus 3, continued

Wednesday, February 21, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
BUS HARDWARE
2:00 p.m. Lecture Hall

Chairs: William A. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency

Wiberg D. V. * Challoner A. D. Shcheglov K. Hayworth K. Bae S. Yee K. Blaes B. D'Agostino S. Stock T.
A Highly Miniaturized Inertial Grade Gyroscope for Space Applications

Blaes B. R. * Chau S. N. Kia T.
Micro Navigator
AND
Micro-Avionics Node for Distributed Avionics System

Alkalai L. * Chau S. Tai A. T.
Highly Survivable Avionics Systems for Long-Term Deep Space Exploration

Hunter D. J. *
Integrated Avionics System (IAS), Integrating 3D Technology on a Spacecraft Panel

Reynolds E. L. *
Use of Hibernation Modes for Deep Space Missions as a Method to Lower Mission Operations Costs

3:30–3:45 p.m. COFFEE BREAK

Focus 3, continued

Wednesday, February 21, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
ELECTRONICS
3:45 p.m. Lecture Hall

Chairs: William A. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency

Patel J. U. * Cressler J. Li Y. Niu G.
Electronics for Extreme Environments

Schatzel D.V.* D'Agostino S.A. Del Castillo L. Graber R. W. Mottiwala A.
System Miniaturization Via Heterogeneous Integration of Electronic Devices for Deep Space Missions
AND
Heterogeneous Integration, an Approach to High Flexibility and High Density Electronic Packaging

Mojarradi M. M. * Blaes B. Blalock B. J. Brandon E. J. Buck K. Houge D. Kolawa E. A. Li H. W. Lieneweg U. Mantooth A. Ulrich R. Wasef M. Wesseling E. White V.
A Library of Rad Hard Mixed-Voltage/Mixed-Signal Building Blocks for Integration of Avionics Systems for Deep Space
AND
Integration of Passive Components for Spacecraft Avionics

Mojarradi M. M.* Blalock B. J. Boyd R. M. Jackson S. A. Kuhn W. B. Li H. W. McNutt T. Mantooth A. Shumaker E. A.
An Active Substrate Driver for Enabling Mixed-Voltage SOI Systems-On-A-Chip
AND
Electrically Isolating Subsystems in SOAC Technologies
AND
Electrically Isolating Thermally Coupled Device for Noise Suppression of Circuits in Deep Space

Dickman J. E. * Patterson R. L. Overton E. Hammoud A. N. Gerber S. S.
Low-Temperature Spacecraft: Challenges/Opportunities

Stoica A. * Thakoor A. Keymeulen D. Zebulum R. Daud T. Toomarian B.
Evolvable Hardware for Extreme Environments: "Hot or Cold, We Live Long"

Focus 3, continued

Thursday, February 22, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
POWER
9:00 a.m. Lecture Hall

Chairs: William A. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency
Jonathan Lunine, University of Arizona

Reitsema H. J. * Smith E. J. Spilker T. Reinert R.
Significant Science at Jupiter Using Solar Power

Gallagher D. L. * Garbe G. P. Talley C. Moore J.
Initial Results from the Jovian Electrodynamic Tether Systems (JETS) Study

Shaltens R. K. * Mason L. S. Schreiber J. G.
Stirling Radioisotope Power System as an Alternative for NASA's Deep Space Missions

Wahlquist E. J. *
Radioisotope Power Systems for Outer Planet Missions

West W. C. * Whitacre J. F. Bugga R. V. Brandon E. J. Studor G. F.
Micro-Power Sources Enabling Robotic Outpost Based Deep Space Exploration

Fleurial J.-P. * Patel J. Snyder G. J. Huang C.-K. Averback R. Hill C. Chen G.
Solid-State Power Generating Microdevices for Distributed Space System Architectures

10:45–11:00 a.m. COFFEE BREAK

Focus 3, continued

Thursday, February 22, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
INFRASTRUCTURE
11:00 a.m. Lecture Hall

Chairs: William B. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency
Jonathan Lunine, University of Arizona

Chau S. N. * Hunter D. J. Lang M.
A Multi-Mission Testbed for Advanced Technologies
AND
Challenging Technology, and Technology Infusion into the 21st Century

Jones D. L. * Weinreb S. Preston R. A.
A Large Array of Small Antennas to Support Future NASA Missions

Carsey F. D. * Anderson F. S. French L. C. Green J. R. Jones J. A. Lane A. L. Leger P. C. Zimmerman W. F.
Technologies for Icy Bodies' Access, Operations and Science

PLENARY SESSION
11:45 a.m. Lecture Hall

Tim Kreider
A Cartoonist in Space

12:30–2:00 p.m. LUNCH

Focus 3, continued

Thursday, February 22, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
SENSORS
2:00 p.m. Lecture Hall

Chairs: William A. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency
Jonathan Lunine, University of Arizona

Blaes B. R. * Eyre F. B.
Miniature Free-Flying Magnetometer Utilizing System-On-A-Chip Technology

Wiberg D. V. * Eyre F. B. Orient O. Chutjian A. Garkarian V.
Toward a Micro Gas Chromatograph/Mass Spectrometer (GC/MS) System

Fijany A. Klimeck G. Leon R. Qiu Y. Toomarian N. *
Quantum Dots Based Rad-Hard Computing and Sensors

Bell L. D. * Boer E. A. Ostraat M. L. Brongersma M. L. Flagan R. C. Atwater H. A. deBlauwe J. Green M. L.
A Radiation-Tolerant, Low-Power Non-Volatile Memory Based on Silicon Nanocrystal Quantum Dots

Noca F. * Hunt B. D. Hoenk M. E. Choi D. Kowalczyk R. Williams R. Xu J. Koumoutsakos P.
Nanotube-based Sensors and Systems for Outer Planetary Exploration

Chao T. H. * Reyes G. F. Zhou H.
Compact Holographic Data Storage

3:45–4:00 p.m. COFFEE BREAK

Focus 3, continued

Thursday, February 22, 2001
Focus 3: Infrastructure and Multi-Mission Technologies
COMMUNICATIONS
4:00 p.m. Lecture Hall

Chairs: William B. Jeffrey, Defense Advanced Research Projects Agency
Lisa Porter, Defense Advanced Research Projects Agency
Jonathan Lunine, University of Arizona

Herman M. I. * Valas S. Katehi L. P. B.
Advanced RF Front End Technology

Bokulic R. S. *
Enabling Technologies for High Science Return and Low-Power, Low-Mass Communications on Outer Planet Missions

Lay N. E. *
Ultra Low Power, Radiation Tolerant UHF Radio Technologies for In Situ Communication Applications

Bhasin K. Hayden J. L. *
Advanced Communication Architectures and Technologies for Missions to the Outer Planets

5:15 p.m. ADJOURN