PROGRAM
CONCEPTS AND APPROACHES FOR THE ROBOTIC EXPLORATION OF MARS
July 18-20, 2000 Lunar and Planetary Institute, Houston TX

Tuesday, July 18, 2000
OPENING PLENARY
8:00 a.m. Lecture Hall

David Black
Welcome and Opening Remarks

Scott Hubbard
Introduction to the Workshop Goals and the Charge to the Working Groups

James Garvin and Carl Pilcher
Mars Science Strategy

10:00 a.m. COFFEE BREAK

Tuesday, July 18, 2000
Working Group I
WHAT: BASIC MARS SCIENCE
10:20 a.m. Lecture Hall

Chairs: David Des Marais **Reportage: Marcus Murback**
Jean-Louis Counil

Overview: Exploration Strategy

Paige D. A. * Boynton W. V. Crisp D. DeJong E. Hansen C. J. Harri A. M. Keller H. U. Leshin L. A. May R. D. Smith P. H. Zurek R. W.
After the Mars Polar Lander: Where to Next?

Arvidson R. E. *
Vision 2020: A Proposed Program of Mars Exploration

Manhès G. * Birck J. L. Allègre C. J.
Returned Samples: The Expectations and Implications

Sotin C. *
What Scientific Objectives Have Been Defined by the French Scientific Community for Mars Exploration?

Blamont J.-E. * Counil J.-L.
Mars Micromissions Using the ASAP-5 Platform (Ariane 5)

Overview: Climate, Volatiles, Life

Economou T. E. Foley C. N. Clayton R. N. *
Geochemistry on Future Mars Missions

Bianchi R. *
Mars Mineralogy

Murchie S. L. * Bell J. F. III Morris R. V.
Visible Wavelength Spectroscopy of Ferric Minerals: A Key Tool for Identification of Ancient Martian Aqueous Environments

Westall F. *
Life on Mars: What and Where?

Bishop J. L. *
Mineral Identification as an Indicator of Water and Geochemical History on Mars

12:00 noon – 1:45 p.m. LUNCH

Dohm J. M. * Baker V. R. Anderson R. C. Ferris J. C. Hare T. M. Tanaka K. L. Klemaszewski J. E. Scott D. H. Skinner J. A.
Martian Magmatic-driven Hydrothermal Sites: Potential Sources of Energy, Water, and Life

Pope K. O. * Ames D. E. Kieffer S. W. Ocampo A. C.
Impact Crater Hydrothermal Niches for Life on Mars: A Question of Scale

Selected Orbital Instruments

Silverman S. Blasius K. R. * Christensen P. R.
Advanced THEMIS for Orbital and Landed IR Imaging

Christensen P. R. Mehall G. Silverman S. * Blasius K. R.
Infrared Imaging System for Orbital Reconnaissance of Martian Landing Sites

Bibring J-P. *
Global and High Resolution Surface Mineralogical Mapping: OMEGA/MarsExpress

Novel Concepts: Orbital Exploration

Izenberg N. R. * Murchie S. L. Fort D. E.
CRSIM — A Combined Remote Imager and Spectrometer for Mars

Hartogh P. *
Chirp Transform Spectrometer for the Exploration of the Mars Atmosphere

Mitrofanov I. G. * Anfimov D. S. Handorin S. P. Kondabarov A. A. Litvak M. L. Pikel'ner L. B. Popov Y. P. Shvetsov V. N. Strelkov A. V. Tonshev A. K.
Measurements of Water Ice from Martian Orbit and on the Surface

Sims M. H. * Greeley R. Cutts J. A. Yavrouian A. H. Murbach M.
TMBM: Tethered Micro-Balloons on Mars

Selected Surface Missions and Instruments

Squyres S. W. * Arvidson R. E. Bell J. F. III Carr M. Christensen P. Des Marais D. Economou T. Gorevan S. Haskin L. Herkenhoff K. Klingelhöfer G. Knoll A. Knudsen J. M. Lane A. L. Linkin V. Malin M. McSween H. Morris R. Rieder R. Sims M. Soderblom L. d'Uston C. Wänke H. Wdowiak T.
The Athena Mars Rover Investigation

Group 1, continued

Bell J. F. III* Herkenhoff K. E. Schwochert M. Morris R. V. Sullivan R. Athena Science Team
Athena Pancam and Color Microscopic Imager (CMI)

Rieder R. Brückner J. Klingelhöfer G. * Gellert R. Dreibus G. Lugmair G. Wänke H. Athena Science Team
The Athena Alpha Proton X-Ray Spectrometer (APXS)

Christensen P. R. Mehall G. L.* Gorelick N. Silverman S. Athena Science Team
The Athena Miniature Thermal Emission Spectrometer (Mini-TES)

Haskin L. A. * Wang A. Jolliff B. L. Kuebler K.
Why Send the Athena Raman Spectrometer to Mars?

Klingelhöfer G. * Bernhardt B. Gellert R. Foh J. Bonnes U. Kankeleit E. Linkin S. Evlanov E. Athena Science Team
Athena Miniature Mössbauer Spectrometer MIMOS II

Myrick T. M. Gorevan S. P * Batting C. Stroescu S. Ji J. Maksymuk M. Davis K. R. Ummy M. A. the Athena Science Team
The Athena Miniature Rock Coring and Rock Core Acquisition and Transfer System (Mini-Corer)

Ming D. W. * Boynton W. V. Musselwhite D. S. Bailey S. H. Bode R. C. Quadlander G. Kerry K. E. Ward M. G. Lorenz R. D. Pathare A. V. Kring D. A. Lauer H. V. Jr. Golden D. C. Lin I-C. Morris R. V.
The Search for Water and Other Volatiles in Martian Surface Materials: The Thermal Evolved Gas Analyzer (TEGA)

Costard F. * Berthelier J. J. Musmann G. Menvielle M. Lognonne P. Giardini D. Banerdt B. Harri A.-M. Forget F.
Detection and Characterization of Martian Volatile-rich Reservoirs: The Netlander Approach

Wednesday, July 19, 2000 8:00 a.m.
Group 1, continued

Mahaffy P. R. * Atreya S. K. Owen T. C. Niemann H. B. Jones J. Gorevan S.
Molecular and Higher Precision Isotopic Measurements of the Mars Atmosphere and Subsurface Volatiles

Novel Surface Exploration Concepts

Huntsberger T. * Hickey G. Kennedy B. Aghazarian H.
Task Adaptive Walking Robots for Mars Surface Exploration
Glenar D. A. * Blaney D. L.
Acousto-Optic Imaging Spectrometers for Mars Surface Science

Pike W. T. * Hecht M. H. Anderson M. S. Akiyama T. Gautsch S. de Rooj N. F. Staufer U. Neidermann Ph. Howald L. Müller D. Tonin A. Hidber H.-R.
Atomic Force Microscope for Imaging and Spectroscopy

Brinckerhoff W. B. * Cornish T. J.
Elemental, Isotopic, and Organic Analysis on Mars with Laser TOF-MS

Mukhin L. M. *
The Search of Carbonates in Martian Dust

Hoffman J. H. * McKay D. S. Ming D. Allen C. C. Hedgecock J. Nienaber T.
Regolith Evolved Gas Analyzer (REGA): An Instrument to Characterize the Martian Soil Mineralogy and Atmosphere Composition

Jambon A. * Quemerais E. Chassefière E. Berthelier J.-J. Agrinier P. Cartigny P. Javoy M. Moreira M. Pineau J.-F. Sabroux J.-C. Sarda P.
PALOMA: In Situ Measurement of the Isotopic Composition of Mars Atmosphere

Waite J. H. * Bass D. S. Young D. T. Miller G. P.
Potential Atmospheric and Biomarker Measurements Acquired by In Situ Instrumentation on Mars

Overview: Exploring for Subsurface Water/Organics/Life

Briggs G. * McKay C.
Mars Exploration 2003 to 2013 — An Integrated Perspective

Brack A. Commeyras A. Derenne S. Despois D. Dhamelincourt P. Dobrijevic M. Engrand C. * Geffard M. Grenier-Loustalot M. F. Largeau C. Marchon J. C. Matrajt G. Maurette M. Mustin C. Raulin F. Robert F. Rodier C. Sternberg R. Trambouze-Vandenabeele O. Trichet J.
Search for Organic Matter on Mars: Complementarity of In Situ Analyses and Laboratory Analyses of Martian Samples

Farmer J. *
Strategies for the Astrobiological Exploration of Mars

Novel Concepts: Subsurface Water/Organics/Life

Smith P. H. * Tomasko M. G. McEwen A. Rice J.
The Martian Oasis Detector

Campbell B. A. * Grant J. A.
Orbital SAR and Ground-Penetrating Radar for Mars: Complementary Tools in the Search for Water

Grimm R. E. *
Compact Electromagnetic Exploration for Water on Mars Using Natural Sources

Yen A. S. *
Subsurface Science from a Penetrator

Delory G. T. * Luhmann J. G. Mozer F. S. Curtis D. W. Friedman L. D. Berthelier J. J. Lognonne P.
An Acoustic Sensor for the Netlander Mission

Gan D. C. * Kuznetz L. Chu D. Chang V. Yamada M. Lee C. Lee R.
Exobiology Robotics Laboratory to Search for Life on Martian Subsurface Water and Permafrost

Mathies R. A. * Hutt L. D. Bada J. L. Glavin D. Grunthaner F. J. Grunthaner P. J.
The Next Generation MOD: A Microchip Amino Acid Analyzer for Detecting Extraterrestrial Life

McKay D. Steele A. * Allen C. Thomas-Keprta K. Schweitzer M. Priscu J. Sears J. Avci R. Firman K.
Mars Immunoassay Life Detection Instrument (MILDI)

Overview: Mars Chronology

Doran P. T. * Cerling T. E. Clifford S. M. Forman S. L. Nyquist L. Papanastassiou D. A. Stewart B. W. Sturchio N. C. Swindle T. D.
Martian Chronology: Goals for Investigations from a Recent Multidisciplinary Workshop

Novel Concepts: Chronology

Nishiizumi K. * Reedy R. C.
In-Situ Measurements of Cosmogenic Radionuclides on the Surface of Mars

Swindle T. D. *
In Situ Noble-Gas Based Chronology on Mars

Sears D. W. G. * Lepper K. McKeever S. W. S.
Optical Dating of Martian Eolian Sediments by Robotic Spacecraft

12:00 noon – 1:45 p.m. LUNCH

Mars Magnetic Field and Deep Structure

Cain J. C. * Ferguson B. Mozzoni D.
Magnetic Field of Mars

Raymond C. A. * Russell C. T. Purucker M. E. Smrekar S. E.
The Need for High-Resolution Crustal Magnetic Field Data on Mars

Lognonné P. * Giardini D. Banerdt B. Dehant V. Barriot J. P. Mussman G. Menvielle M. MAGNET Team
Deep Internal Structure of Mars and the Geophysical Package of NetLander

2:15 – 5:00 p.m. Discussion and Plan for Closing Plenary

Tuesday, July 18, 2000
Working Group 2
WHAT: BIOCOMPATIBILITY
10:20 a.m. Berkner ABC

Chairs: Peter Ahlf
Mike Duke

Biological Activity and Growth

Lewis B. G. *
Anaerobic Nitrogen Fixers on Mars

Maurel M.-C. *
Samples for Investigations on Past and/or Current Biological Activity on Mars

Méndez A. *
Planetary Microbial Ecology on Mars: Environmental Biophysics of Martian Microenvironments

MacCallum T. K. * Poynter J. E. McKay C. P.
Mars Greenhouse Experiment Module, An Experiment to Grow Flowers on Mars

Bada J. L. Blaney D. L. Grunthaner F. J. * McDonald G. D. Webster C. R. Duke M. Mathies R. A. McKay C. P. Paige D. A. Ride S. K. Wadhwa C. M.
MOD: An Instrument for the 2005 Mars Explorer Program HEDS Payload

Mars Environmental Properties

Hendrix A. R. * Pryor W. R. McClintock W. E. Esposito L. W. Stewart A. I. F.
An Ultraviolet-Visible Imaging Spectrometer for a Mars '05 Orbiter

Freund F. * Staple A. Gosling P. Belisle W. A.
Mars Oxidant: Proof of Concept and Quantitative Analysis

Crisp D. Wilson G. R. * Murphy J. R. Banfield D. Barnes J. R. Farrell W. M. Haberle R. M. Magalhaes J. Paige D. A. Tillman J. E.
In-Situ Environmental Measurements Needed for Future Mars Missions

Vaniman D. T. * Bish D. L. Blake D. F. Chipera S. J.
CCD-based XRD/XRF for Determining Environmental Mineralogy on Mars

England C. *
Martian Surface Boundary Layer Characterization: Enabling Environmental Data for Science, Engineering and Human Exploration

Colangeli L. * MAGO International Consortium
The Martian Atmospheric Grain Observer (MAGO) for In Situ Dust Analysis

Hecht M. H. * Meloy T. P. Marshall J. R.
The Mars Environmental Compatibility Assessment (MECA)

Landis G. A. * Jenkins P. Scheiman D. Baraona C.
MATE and DART: An Instrument Package for Characterizing Solar Energy and Atmospheric Dust on Mars

Farrell W. M. Desch M. D. * Marshall J. R. Delory G. T. Kolecki J . C. Hillard G. B. Kaiser M. L. Haberle R. M. Zent A. P. Luhmann J. G. Greeley R. Cummer S. A. Crisp D. Catling D. C. Buehler M. G. Thomas G. W. Sentman D. D.
Electrical Charging Hazards Originating from the Surface (ECHOS): Understanding the Martian Electro-Meteorological Environment

12:00 noon – 1:45 p.m. LUNCH BREAK

Turner R. E. *
Ensuring Radiation Safety for Mars-bound Astronauts

Cucinotta F. A. * Schimmerling W.
End-To-End Risk Assessment: From Genes and Protein to Acceptable Radiation Risks for Mars Exploration

Maurer R. H. * Roth D. R. Kinnison J. D. Goldsten J. O. Fainchtein R. Badhwar G.
Martian Energy Neutron Spectrometer (MANES)

McGown R. D. Walden B. E. Billings T. L. York C. L. Taylor A. G. Frederick R. D. *
Mars Meteor Survey

Resource Identification, Acquisition, and Utilization

Beaty D. W. Briggs G. Clifford S. M. *
Strategic Planning for Exploration of the Martian Subsurface

Sridhar K. R. * Finn J. E.
In Situ Resource Utilization Technologies for Enhancing and Expanding Mars Scientific and Exploration Missions

Kaplan D. I. *
In-Situ Resource Utilization: Laying the Foundation for "Living Off the Land"

Sanders G. B. * Trevathan J. R. Peters T. A. Baird R. S.
Common In-Situ Consumable Production Plant for Robotic Mars Exploration

Lobitz B. M. * Wood B. L. Averner M. McKay C.
A Remote Sensing/Geographic Information Systems Approach in the Selection of Mars Sites of Biological Interest

Barlow N. G. *
"Following the Water" on Mars: Where Is It, How Much Is There, and How Can We Access It?

Duke M. B. * Baldwin R. M. King R. H. Knecht R. D. Muff T. Holland B.
Extraction of Water from the Martian Regolith

Habitation

Frederick R. D. * Billings T. L. McGown R. D. Walden B. E.
Martian Ice Caves

Conkin J. *
Habitat Options to Protect Against Decompression Sickness on Mars

Huntsberger T. * Pirjanian P. Schenker P. S. Trebi-Ollennu A. Das H. Joshi S.
Robotic Precursor Mission for Mars Manned Habitats

5:00 p.m. Working Group 2 Adjourns until 3:30 p.m., Wednesday

Wednesday, July 19, 2000

Working Group 2
Discussion and Plan for Closing Plenary
Berkner ABC
3:30 p.m. – 5:00 p.m.

Tuesday, July 18, 2000
Working Group 3
HOW: MARS SURFACE EXPLORATION
10:20 a.m. Hess Room

Chairs: David Akin
David Glenar

Aerial Exploration

Lowrie J. W. *
Precision Navigation for a Mars Airplane

Jones J. A. * Cutts J. A. Kerzhanovich V. V. Yavrouian A. Hall J. L. Raque S. Fairbrother D. A.
Exploring Mars with Balloons and Inflatable Rovers

Greeley R. * Cutts J. A. Arvidson R. Blamont J. Blaney D. L. Cameron J. Kerzhanovich V. Smith I. S. Yavrouian A.
Mars Aerobot Missions

Rafeek S. * Stroescu S. Kong K. Y. Sadick S. Bartlett P. W. Davis K. R. Ummy M. A.
Mars Balloon Based Touch and Go Surface Sampler (TAGSS)

Fairbrother D. A. * Raque S. M. Smith I. S. Cutts J. A. Kerzhanovich V.
Exploration of Mars Using Aerial Platforms

Foch R. J. * Dahlburg J. P. MacKrell J. F. Page G. S.
Technologies and Their Integration for an Unmanned Aircraft for Mars Exploration

Young L. A. * Briggs G. A. Derby M. R. Aiken E. W.
Use of Vertical Lift Planetary Aerial Vehicles for the Exploration of Mars

Calvin W. M. * Miralles C. Clark B. C. Wilson G. R.
Mars Science with Small Aircraft

Landing Concepts

Klarquist W. N. * Wahl B. E. Lowrie J. W.
Precision Terminal Guidance for a Mars Lander

Rivellini T. * Ortiz G. Steltzner A.
Safe Landings in Extreme Terrain

12:00 noon – 1:30 p.m. LUNCH BREAK

Thurman S. W. *
Next-Generation Entry/Descent/Landing System for Mars Landers

Surface Exploration Technologies

Arvidson R. E. * Baumgartner E. T. Schenker P. Squyres S. W.
FIDO Field Trials in Preparation for Mars Rover Exploration and Discovery and Sample Return Missions

Hall D. S. * Pillinger C. T. Sims M. R. Pullan D. Whitehead S. Thatcher J. Clemmet J. Linguard S. Underwood J. Richter L.
Beagle 2

Britt D. T. *
The Mars Frisbee: A Small, Lightweight Deployment Mechanism for In-Situ Instruments on the Proposed Mars Scout Lander

Berthelier J. J. * Grard R. Laakso H. Parrot M.
ARES, An Electric Field Experiment for NETLANDER

Middleton J. A. * Sallaberger C. S. Reedman T. J.
Robotic Arms: A Critical Element of Any Mars Landed Mission

Seelos F. P. * Wiens R. C. Cremers D. A. Ferris M. Blacic J. D. Arvidson R. E.
Combined Remote Mineralogical and Elemental Measurements from Rovers

Boynton W. V. * Bailey S. H. Hamara D. K. Williams M. S. Bode R. C. Fitzgibbon M. R. Ko W. J. Ward M. G. Sridhar K. R. Blanchard J. A. Lorenz R. D. May R. D. Paige D. A. Pathare A. V. Kring D. A. Leshin L. A. Ming D. W. Zent A. P. Golden D. C. Kerry K. E. Vern Lauer H. Jr. Quinn R. C.
Applicability of the Mars Polar Lander TEGA Instrument to Future Mars Missions

Rafeek S. Myrick T. M. * Gorevan S. P. Kong K. Y. Singh S. Ji J. Batting C.
Sample Acquisition Systems for Sampling the Surface Down to 10 Meters Below the Surface for Mars Exploration

3:30 – 4:00 BREAK

Boucher D. S. *
The Adaptation of Terrestrial Mining Exploration Drilling Technology to Space

Blacic J. * Dreesen D. Mockler T. Briggs G.
How to Access and Sample the Deep Subsurface of Mars

Bartlett P. W. * Gorevan S. P. Kong K. Y. Myrick T. M. Singh S. Stroescu S. Roopnarine Rafeek S.
An Inchworm Deep Drilling System for Kilometer Scale Subsurface Exploration of Mars (IDDS)

Wilcox B. H. *
Nanorovers and Subsurface Explorers for Mars

Haas J. W. * Shinn J. D.
Miniature Cone Penetrometer for In Situ Characterization and Sampling of the Martian Subsurface

Lupisella M. L. *
Cooperative Robotics and the Search for Extraterrestrial Life

Bertrand R. Klingelhöfer G. * Rieder R. van Winnendael M. Zelikman M.
European Tracked Micro-Rovers for Planetary Surface Exploration

Blaney D. L. * Wilson G. R.
Scouts: Using Numbers to Explore Mars In Situ

Youk G. U. * Whittaker W. Volpe R.
Water-Searchers: Reconfigurable and Self Sustaining Army of Subsurface Exploration Robots Searching for Water/Ice Using Multiple Sensors

Science Applications

Schoen C. * Dickensheets D. L.
Tools for Robotic In Situ Optical Microscopy and Raman Spectroscopy on Mars

Wdowiak T. J. *
In-Situ Instrumentation for Exobiological Objectives on Mars: Devices, Protocols and Strategies

Wang A. * Haskin L. Jolliff B. Wdowiak T. Agresti D. Lane A. L. Athena Science Team
The Athena Raman Spectrometer

Cordier B. * Manhes G. Bianchi R. Di Lellis A. M. Masson P. Chambellan D. d'Uston C. Espinasse S. Federico C. Preite Martinez M.
Ma_Flux: The X-ray Fluorescence Experiment Inside the IPSE Laboratory

Wiens R. C. * Cremers D. A. Ferris M. Blacic J. D.
Rapid Elemental Analysis at Stand-Off Distances Using the LIBS Concept from the Mars Instrument Development Program

Angrilli F. Flamini E. Espinasse S. *
IPSE: Italian Package for Scientific Experiments

9:30 – 10:00 a.m. **BREAK**

Jolliff B. * Moersch J. Knoll A. Morris R. Arvidson R. Gilmore M. Greeley R. Herkenhoff K. McSween H. Squyres S.
Remotely-sensed Geology from Lander-based to Orbital Perspectives: Results of FIDO Rover Field Tests

Kounaves S. P. * Buehler M. G. Grannan S. M. Hecht M. H. Kuhlman K. R.
In-Situ Planetary Chemical Analysis

Crawford R. L. Paszczynski A. Lang Q. Cheng I. F. * Barnes B. Anderson T. J. Wells R. Wai C. Corti G. Allenbach L. Erwin D. Park J. Mojarradi M.
Describing and Measuring the Chemical Signatures of Life

Discussion

12:00 noon – 1:45 p.m. **LUNCH BREAK**

1:45 p.m. Discussion and Plan for Closing Plenary

Tuesday, July 18, 2000
Working Group 4
HOW: MISSIONS AND FUTURE PERSPECTIVES
10:20 a.m. Berkner DEF

Chairs: Mark Lupisella
Lewis Peach

Sample Return

Wood J. A. * Boynton W. V.
The Importance of Bringing Samples of Mars to Earth

Agee C. B. * Bogard D. D. Draper D. S. Jones J. H. Meyer C. Jr. Mittlefehldt D. W.
Proposed Science Requirements and Acquisition Priorities for the First Mars Sample Return

Dorsch M. * Patel B. Mauritz A.
Enabling Launch Vehicle Technology for Mars Sample Return Missions

Pieters C. * Cheng A. Clark B. Murchie S. Mustard J. Papike J. Zolensky M.
Aladdin: Exploration and Sample Return from the Moons of Mars

Cheng A. F. Barnouin-Jha O. S.* Pieters C. M.
Aladdin:Sample Collection from the Moons of Mars

Dolgin B. Yarbrough C. Carson J. * Troy R.
Mechanical Abrasion as a Low Cost Technique for Contamination-Free Sample Acquisition from a Category IVa Clean Platform

Allen C. C. * Agee C. B. Beer R. Cooper B. L.
Clean and Cold Sample Curation

Lam-Trong Th. * Cledassou R. Charbonnier J. M.
The Stakes of the Aerocapture for Missions to Mars

Marty B. * Chassefière E. Agrinier P. Jambon A. Javoy M. Lavielle B. Marti K. Moreira M. Pinti D. Robert F. Sano Y. Sarda P.
DREAM (Dispositif De Retour D'èchantillon D'atmosphère Martienne): Martian Atmosphere Sample Return

Braun R. * Killough B. Mitcheltree R. Carroll C.
A Reliable Earth Return System for Safe Recovery of Mars Samples

12:00 noon – 1:45 p.m. LUNCH BREAK

Gamber R. T. * Sutter B. M. Clark B. C. Faulconer C. E. Jolly S. D.
An Affordable Mars Sample Return Mission

Jurewicz A. J. G. * Jones S. M. Yen A. S.
Mars Sample Return Without Landing on the Surface

Kong K. Y. Rafeek S. * Sadick S. Porter C. C.
A Sample Return Container with Hermetic Seal

Mission Concepts

Chassefière E. * Dynamo Team
The DYNAMO Orbiter Project: High Resolution Mapping of Gravity/Magnetic Fields and In Situ Investigation of Mars Atmospheric Escape

Cabrol N. A. * Ori G. G. Grin E. A. Sims M. H. Marinangeli L. McKay C. Marshall J. Thomas H. Rabbette M. Landheim R.
Mars Scout: Micromissions to Investigate Martian Environments

Wright J. * Hartman F.
Immersive Environment Technologies for Mars Exploration

Budney C. J. * Miller S. L. Cutts J. A.
Mars Stratigraphy Mission

Bischof B. Hoffmann H. Zier M. *
Piggyback Missions to Mars — Potential and Constraints

Gibson E. K. Jr.* Pillinger C. T. Thatcher J. Westall F.
Beagle 2 and NASA's Mars 2003 Orbiter: A Unique Exobiology Opportunity with an Orbiter

3:00 – 3:30 p.m. BREAK

Counil J. L. * Marsal O. Rocard F. Lognonne Ph. Harri A. M. NETLANDER team
The NETLANDER Mission: A Geophysical Network on the MARS Surface

Haberle R. M. * Catling D. C. Chassefiere E. Forget F. Hourdin F. Leovy C. B. Magalhaes J. Mihalov J. Pommereau J. P. Murphy J. R. Schofield T. Smith P. Twiggs R.
The Pascal Discovery Mission: A Mars Climate Network Mission

Berthelier J. J. * Chassefière E. Duvet L. Forget F. Touboul P. Bougher S.
TERMOPAC: A Generic Experiment for the Long Term Monitoring of the Martian Thermosphere

Mukhin L. * Sagdeev R. Karavasili K. Zakharov A.
Phobos, Deimos Mission

Landis G. A. * Linne D.
Mars Exploration with a Self-Refueling Hopper

O'Toole J. A. * Wessel F. J. Rostoker N. Binderbauer M.
Colliding Beam Fusion Electric Power System for Mars Exploration

McCullough E. D. *
Autonomous Behavior Via Multi Parallax Biomimetic Vision Systems

Mauritz A. * Patel B.
Science-Enabling Microspacecraft Constellations for Mars

Strategies and Future Perspectives

Hecht M. H.* McKay C. Briggs G. Connolly J.
MarsLab: A HEDS Lander Concept

Dickerson P. W. * Muehlberger W. R.
On the Ground: Astronaut Training for Planetary Exploration

Eberspeaker P. J. *
Flight Validation of Mars Mission Technologies

Murray B. * Friedman L.
Robotic Outposts: The Missing Link in Mars Exploration Planning

Dickerson P. W. *
Exploration Strategies for Human Missions: Mars Field Geology, Biology and Paleontology Workshop

Friedman L. *
Connecting Robots and Human in Mars Exploration

Friedman L. *
Public Participation in Planetary Exploration

Shirley D. L. *
The Myths of Mars: Why We're Not There Yet, and How to Get There

9:40 – 10:30 a.m.	**BREAK**
10:30 a.m.	Discussion and Plan for Closing Plenary

Wednesday, July 19, 2000
Working Group 5
WHEN: ARCHITECTURE
8:00 a.m. Berkner ABC

Chairs: John Niehoff
Joe Burns

Outreach

Cowles D. J. * Trotter M. A.
Changing the Mars Education Paradigm

Remote Sensing

Chassefière E. * Dynamo Team Paloma Team
Deciphering the History of Martian Volatiles: A Multi-Component Space Exploration Program

Kirkland L. E. * Forney P. B. Herr K. C. Keim E. R.
Utilizing Thermal Infrared Spectra of Mars for Mission Planning

Networking

Banerdt W. B. *
A Network Mission: Completing the Scientific Foundation for the Exploration of Mars

Roving

Sabahi D. * Graf J. E
Mars Mobile Lander Systems for 2005 and 2007 Launch Opportunities

Stoker C. *
Field Experiments with Planetary Surface Rovers: Lessons for Mars Mission Architecture.

Returning Samples

Bibring J-P. * Counil J-L. Sotin C.
Let Mars Sample Return be Launched in 2007!

Carsey F. * Brophy J. Gilmore M. Rodgers D. Wilcox B.
A Review of New and Developing Technology to Significantly Improve Mars Sample-Return Missions

Mueller P. J. *
Designing a Mars Mission That Will Generate Public Excitement and Support: Sample Return Using In-Situ Propellant Production

Neal C. R. * Jolliff B. L. Papike J. J. MacPherson G.
Recommendations for Preserving the Integrity of Samples Collected on Mars and Returned to Earth for Analysis

Human Missions

Rice J. W. Jr.*
Mars Analog Field Training of Astronauts

Lupisella M. L. *
Mitigating Adverse Effects of a Human Mission on Possible Martian Indigenous Ecosystems

Blackmer R. *
Getting to Mars to Stay

Communications

Edwards C. D. * Adams J. T. Agre J. R. Bell D. J. Clare L. P. Durning J. F. Ely T. A. Hemmati H. Leung R. Y. McGraw C. A. Rosell S. N.
Mars Network: Strategies for Deploying Enabling Telecommunications Capabilities in Support of Mars Exploration

Horne W. * Adams J.
A New Generation of Telecommunications for Mars: The Reconfigurable Software Radio

Kazz G. J. * Greenberg E.
Mars Communication Protocols

Adams J. *
Phoning Home from Mars in 2025

Approaches

Golombek M. P. *
Strategy for the Exploration of Mars

Jakosky B. M. *
Constructing a Viable Mars Architecture: "Plans Are Worthless, Planning Is Essential"

Jolliff B. L. * Keller L. P. MacPherson G. J. Neal C. R. Papanastassiou D. A. Ryder G. Shearer C. K. Papike J. J.
A Balanced Model for Exploration of the Terrestrial Planets: Lessons from the Lunar Experience

Paige D. A. *
Mars Exploration Strategies: Forget About Sample Return and Think about a Mars Discovery Program!

Richardson M. I.* McEwan I. J. Pinder J. D. Vasavada A. R.
Changing the Definition of "Architecture": The Unique Challenges and Opportunities of the Mars Exploration Program, and a New Program Model

Richardson M. I. Gaidos E. J. *
The "Why" and the "What": The Science Focus of the Mars Exploration Program

12:00 – 1:45 p.m. **LUNCH**

A Plan

Briggs G. * McKay C.
Mars Exploration 2003 to 2013 — An Integrated Perspective: Time Sequencing the Missions

1:55 – 3:15 p.m. Discussion and Plan for Closing Plenary

Thursday, July 20, 2000
CLOSING PLENARY
8:00 a.m. Lecture Hall

Chair: Scott Hubbard

8:00 – 8:40 a.m.	David Des Marais and Jean-Louis Counil *Report from Working Group 1*
8:40 – 9:10 a.m.	Peter Ahlf and Michael Duke *Report from Working Group 2*
9:10 – 9:40 a.m.	David Akin and David Glenar *Report from Working Group 3*
9:40 – 10:00 a.m	BREAK
10:00 – 10:30 a.m.	Mark Lupisella and Lewis Peach *Report from Working Group 4*
.	
10:30 – 11:00 a.m.	John Niehoff and Joseph Burns *Report from Working Group 5*
11:00 – 12:00 noon	Discussion
12:00 noon	ADJOURN