

PI-Team Masters Forum 5

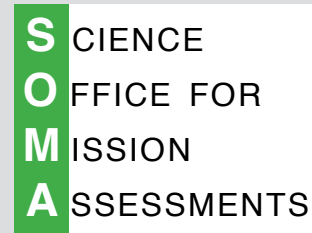
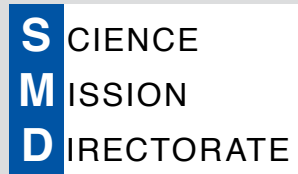
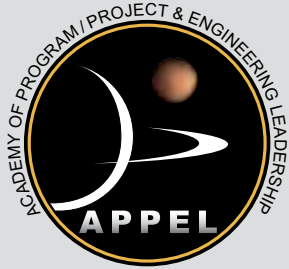
Presented January 25, 2016, by



S SCIENCE
M MISSION
D DIRECTORATE

S SCIENCE
O FFICE FOR
M MISSION
A ASSESSMENTS

*The NASA Academy of Program/Project and Engineering Leadership's Knowledge Sharing initiative,
in partnership with NASA's Science Mission Directorate and NASA's Science Office for Mission Assessments, presents*



PI-Team Masters Forum 5

March 16, 2016

Hyatt Regency Hotel | Herndon, VA 20171

Welcome to the **Principal Investigator (PI)–Team Masters Forum 5**, a collaboration between NASA’s Science Mission Directorate (SMD), Science Office of Mission Assessments (SOMA), and Academy of Program/Project and Engineering Leadership (APPEL). This is the fifth of our PI Team knowledge-sharing events, which are held following major science mission announcement of opportunity (AO) Phase A selections as established by SMD Policy Directive 13B (SPD-13B). The purpose of this Forum is to enable you to engage, share with, and learn from colleagues in relevant science missions through their stories, shared experiences, and lessons learned as a means to enhance the probability of executing a mission successfully.

Your participation in this Forum is in recognition of your selection in the Discovery 2014 Announcement of Opportunity process, and we wish to congratulate your team on these outstanding accomplishments. The Forum reflects the importance that NASA places on providing a context for knowledge that can contribute to a successful mission. We are delighted to have you participate.

Among the many benefits of your participation, this Forum is meant to help you gain an understanding of program/project management, systems engineering, and science mission design best practices and lessons learned; to cultivate reflective practitioners within your team; and to help solidify cross-organizational relationships in support of your project.

In addition to thought-provoking presentations and dynamic group discussions, the Forum offers you the chance to build relationships with peers and meet face to face with key leaders in this community. Former Forum participants have stated that the opportunity to network with colleagues from across NASA, other government agencies, universities, and private industry is one of the Forum’s most valuable features.

We hope that this Forum will provide you with an enhanced perspective and be useful in helping you conduct your studies, investigations, and missions.

Sincerely,

Greg Robinson, SMD Deputy Associate Administrator for Programs

Cindy Daniels, SOMA Director

Roger Forsgren, APPEL Director

This page intentionally left blank

Agenda

PI Forum #5 –Agenda
March 16, 2016
Hyatt Regency Hotel, Herndon, Virginia

Session Title	Time	Speaker / Panelists
Formal Welcome & Opening Remarks <ul style="list-style-type: none"> - Charge to Participants, Agenda Review - Attendee Introductions, PIs introduce teams 	8:30-8:50	<i>Ed Weiler, Moderator</i>
SMD Introduction/Overview <ul style="list-style-type: none"> - How Discovery Program fits within SMD mission set 	8:50-9:05	Geoff Yoder, SMD DAA
SMD Management of PI-Led Missions: Guidance and Expectations (PANEL) <ul style="list-style-type: none"> - Introduction of Panelists (5 min) - Working within NASA Policy and Directives (15 min) - Guidance and Expectations of the Division (15 min) - NASA HQ SMD PE/PS Role (15 min) - Discussion & Q&A (20 min) 	9:05-10:15	<i>Panel Host: Ed Weiler, Moderator</i> <i>Greg Robinson / DAA Programs</i> <i>David Schurr, Planetary Science</i> <i>Deputy Division Director</i> <i>Joan Salute and Michael New</i>
Break	10:15–10:30	
Lessons from Previous Missions – PI PANEL <ul style="list-style-type: none"> - Introduction of Panelists (5 min) - Messenger (15 min) - GRAIL (15 min) - MAVEN (15 min) - Discussion & Q&A (30 min) 	10:30-11:50	<i>Panel Host: Ed Weiler, Moderator</i> <i>Sean Solomon, PI</i> <i>David Smith, DPI</i> <i>Bruce Jakosky, PI</i>
Lunch	11:50-12:50	
Lessons from Previous Missions – PM PANEL <ul style="list-style-type: none"> - Introduction of Panelists (5 min) - Dawn (15 min) - Juno (15 min) - New Horizons (15 min) - Discussion & Q&A (30 min) 	12:50-2:10	<i>Panel Host: Ed Weiler, Moderator</i> <i>Keyur Patel, Development PM</i> <i>Doug Bernard, Development PSE</i> <i>Glen Fountain , PM</i>
Program Office Role – Assistance vs. Oversight <ul style="list-style-type: none"> - Q&A (10 min) 	2:10-2:35	<i>Allen Bacskay / ProgM</i>
Break	2:35-2:50	
Essential Elements for Successful Missions <ul style="list-style-type: none"> - Introduction of Speakers (5 min) - Creating a Realistic, Resource Managed Schedule (20 min) - Q&A (10 min) - Managing Mission Development Risk (20 min) - Q&A (10 min) - Managing Resources within the Mission Cost Cap (20 min) - Q&A (10 min) 	2:50-4:30	<i>Host: Ed Weiler, Moderator</i> <i>David Mitchell / MAVEN PM</i> <i>Tom Fraschetti / Dawn</i> <i>Development PM</i> <i>Joe Vellinga for Ken Atkins /</i> <i>Stardust Devel. PM</i>
SOMA Analysis of Previous PI Missions Performance	4:30-5:00	<i>Cindy Daniels or W. Sasamoto / SOMA</i>
Capturing Knowledge / Closing Remarks <ul style="list-style-type: none"> - Evaluation of Forum 	5:00-5:30	<i>Ed Weiler, Moderator</i>

DISCOVERY 2014

Presentations

About the Presenters

Moderator: Dr. Edward J. Weiler

Dr. Weiler retired from NASA, effective Sept. 30, 2011. Dr. Weiler and his spouse, Dr. Barbara Thorne, now reside in Vero Beach, Fl. Although retired from NASA, he continues active in Space Science through several advisory and consulting positions including Adjunct Senior Scientist, University of Colorado, member of the LASP (U. of COLO.) Advisory Board, Executive Science Advisor to SGT, Inc., member of the board of directors of USRA, member of the board of advisors to JPL (CalTech) and some science and technical consulting for Lockheed and Boeing.

Dr. Edward J. Weiler was named Associate Administrator of the Science Mission Directorate at NASA Headquarters in Washington, D.C. in May 2008. He was previously Center Director of NASA's Goddard Space Flight Center in Greenbelt, Md., a position he held since August 2004. Prior to that, he served as the Associate Administrator for NASA's Space Science Enterprise since 1998. Under his leadership, the Enterprise had numerous successes, including the Chandra Observatory, NEAR, MAP, FUSE, Spitzer, Mars Odyssey, and Mars Exploration Rover missions. He was responsible for a new Mars Exploration Program architecture in 1999 that has subsequently led to 7 successes in a row over the past 14 years including the incredibly prolific rovers, Spirit, Opportunity and Curiosity, the nuclear-powered Mars Rover (Curiosity) which landed in August 2012. The successes realized under Dr. Weiler's leadership have earned consistent support from the Administration and Congress and have secured an unprecedented level of funding to continue such important space science missions. Dr. Weiler received his Ph.D. in astrophysics from Northwestern University in 1976. He has published numerous papers in scientific journals. In his role as the Hubble Space Telescope Chief Scientist, he acted as the prime scientific spokesperson for the program and has appeared on a number of National TV programs including NIGHTLINE, TODAY, GOOD MORNING AMERICA, 60 MINUTES, etc. He also is routinely requested as a keynote speaker for a variety of professional and public events.

Science Mission Directorate (SMD) Deputy Associate Administrator: Mr. Geoffery L. Yoder

Geoffery L. Yoder, served as the Deputy Associate Administrator for Programs for NASA's Science Mission Directorate from May 2013 to December 2014. Prior to this assignment, he assumed leadership responsibilities for the James Webb Space Telescope, as program director at the agency's headquarters in Washington, on June 30, 2012. Yoder has also served as the director of the Office of Evaluation at NASA Headquarters, responsible for assessing NASA programs, projects and institutions for cost effectiveness, quality, and performance in achieving strategic objectives, including ensuring alignment with national goals and the agency's vision and mission. In May 2010, Mr. Yoder served as Deputy Director for the Astrophysics Division in the Science Mission Directorate at NASA HQ.

Mr. Yoder joined NASA in 2000 formulating the Flight Hardware Development Branch within the Engineering Directorate at the Johnson Space Center, Houston Texas. In 2005, Mr. Yoder joined the Exploration Systems Mission Directorate at NASA Headquarters serving in various roles including Director for the Directorate Integration Office where he was responsible for a broad range of ESMD integration activities including architecture trades and analysis, information technology architecture and IT management, risk and knowledge management, technology protection, and Constellation Program Level 1 requirements. Mr. Yoder served as the Director of the Constellation Systems Division within the Exploration Missions Directorate NASA Headquarters where he was responsible for Division management of the Constellation Systems Program and Commercial Crew and Cargo Program.

From 1986 to 2000, working for Litton Systems Inc., Mr. Yoder was responsible for reliability assurance of various avionics suites directing reliability and qualification test and verification activities. He served as scientist for the Reliability Assurance Department participating in the various product improvement initiatives such as the Navy Production Technology Improvement Program (PTIP). He also served as Engineering Project Manager for various commercial, military, and space projects.

SMD Management of PI-Led Missions: Guidance and Expectations Panel

Panel Host: Ed Weiler

SMD DAA Programs: Greg Robinson

HQ Planetary Science Division (PSD) Deputy Director: David Schurr

HQ PSD Lead Program Executive, Discovery Program and Europa: Joan Salute

Discovery Program Lead Scientist: Michael New

Working within NASA Policy and Directives

Greg Robinson - Mr. Gregory L. Robinson is Deputy Associate Administrator for Programs, NASA Science Mission Directorate (SMD). He is responsible for assessing NASA programs, projects and institutions for technical and cost effectiveness, quality, and performance. He also coordinates program and project content with the other NASA Mission Directorates, and federal agencies in which SMD has partnerships. SMD has a portfolio of 97 missions in formulation, development, and operations.

Mr. Robinson served as Deputy Center Director at NASA's John H. Glenn Research Center (GRC), Cleveland Ohio. Mr. Robinson was responsible for planning, organizing, and controlling the effective accomplishment of all missions assigned to the Center. GRC is engaged in a diverse program of research, technology advancement, and project management related to aeronautical propulsion, space power propulsion, cryogenic fluids, microgravity science, expendable launch vehicles, space communications, materials, structures, instrumentation and controls, computational fluid dynamics, and electronics.

Mr. Robinson served as NASA Deputy Chief Engineer (2005-2013); He had primary responsibility and authority for oversight of Agency engineering work, including the design, manufacture, testing, operation, training, and maintenance practices and products. Additionally, he provided policy for and oversight of the readiness and execution of all NASA programs to ensure development efforts and mission operations were planned and conducted with sound engineering and proper programmatic controls.

Mr. Robinson served as the National Oceanic and Atmospheric Administration (NOAA), Acting National Environmental Satellite, Data, and Information Service (NESDIS) Deputy Assistant Administrator, Systems (2011-2012). He led the acquisition, and management of all NOAA satellite flight and ground acquisitions.

Guidance and Expectations of the Planetary Science Division

David Schurr - David C. Schurr is the Deputy Director of the Planetary Science Division of NASA's Science Mission Directorate, and is the Director of Solar System Exploration Programs. Mr. Schurr oversees a \$1 billion in annual development, operations, and research for missions exploring all aspects of the solar system.

Formerly, Mr. Schurr was the NASA Comptroller. In this position, Mr. Schurr directed NASA's budget formulation, advocacy and execution processes for the Agency's institutions, programs and projects. In 1982, Mr. Schurr began his career at the Johnson Space Center in Houston Texas, as a Shuttle flight controller in mission control. He was responsible for various defense and interplanetary satellites deployed using the Space Shuttle.

Beginning in 1993, Mr. Schurr was responsible for managing the integration of the Japanese Laboratory into the International Space Station. Subsequently, he managed development of the Italian-built logistics and habitation modules for the International Space Station.

Mr. Schurr managed the Prime development contract for the International Space Station and became deputy business manager of the International Space Station Program in 2001, responsible for program control and budget processes.

Mr. Schurr has been at NASA Headquarters since 2003.

Mr. Schurr received a Bachelor of Science degree in aerospace engineering from the University of Notre Dame in 1982, a master of science degree in process control from the University of Houston in 1987, and a master of business administration degree from the University of Houston in 1996.

SMD Management of PI-Led Missions: Guidance and Expectations Panel, cont.

NASA HQ SMD Role

Joan Salute - Joan Salute is a senior technical manager with 35 years of experience in NASA projects. Her current position in the NASA HQ Planetary Sciences Division is Lead Program Executive for the Europa Mission and the Discovery Program. Prior NASA HQ responsibilities included Lead Program Executive (PE) for the Lunar Quest Program; PE for the Lunar Atmosphere and Dust Environment Explorer (LADEE), the NASA Liaison to ESA's Outer Planet Missions and leading two agency wide teams for Agency reform. During 23 years at the NASA Ames Research Center her positions grew from earth science research, to science management, to project management, to technical organization management. Joan managed two flight projects to demonstrate the performance of ultra-high temperature thermal protection materials; projects to market and commercialize NASA developed technology; and commercial applications of remote sensing projects, including a project with Robert Mondavi Winery, with a commercial potato grower, and with the Government of Mexico to research the spread and control of malaria. She served as Associate Administrator in both the Aeronautics Directorate and the Information Technology Directorate. Joan is a Stanford University Graduate School of Business Sloan Fellow, (M.S. in Management Science), has an MBA in High Technology Management from Golden Gate University, and a B.S. in Mathematical Sciences from Purdue University.

Dr. Michael New - Michael New has been the Astrobiology Discipline Scientist at NASA Headquarters since September 2002 and the Discovery Program Lead Scientist since 2006. Dr. New manages grants for the Exobiology and Evolutionary Biology and Astrobiology Science and Technology Instrument Development programs. Dr. New was born and raised in New York City. After graduating from the Bronx High School of Science, he attended Yale University. He graduated summa cum laude in 1988 with a BS degree in Chemistry. He earned his PhD in Chemical Physics at Columbia University with Dr. Bruce Berne and has performed post-doctoral research at UC Berkeley (with Dr. David Chandler) and UC San Francisco (with Dr. Andrew Pohorille). He became a civil servant scientist in the Exobiology Branch at NASA Ames Research Center in 1998, and the Deputy Chief (Acting) of his Branch in 2001. Michael's research interests are wide, encompassing the biophysics of basic life processes, the statistical analysis of complex ecological experiments, machine learning, bioinformatics and the application of complexity theory and computer science to the origin of life. His most recent research has focused on a novel mechanism for evolution in the absence of information storage, a concept he and Andrew Pohorille have called "non-genomic evolution." Dr. New is the recipient of an NSF Pre-Doctoral Fellowship, the J. Malcolm Miller Award for Excellence in Teaching from the Chemistry Department of Columbia University, and several "Spotlight" awards from NASA Ames Research Center. He is an Eagle Scout.

Lessons from Previous Missions – PI Panel

Panel Host: Ed Weiler
MESSENGER PI: Sean Solomon
GRAIL DPI: David Smith
MAVEN PI: Bruce Jakosky

MESSENGER

Launched on August 3, 2004, the MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER) mission was a scientific investigation of the planet Mercury, the least explored terrestrial planet. Understanding Mercury and its history is essential to understanding the origin and evolution of the other terrestrial planets. To get into orbit around Mercury, it followed a complex path through the inner solar system, using one flyby of Earth, two flybys of Venus, and three flybys of Mercury for gravity assists. This impressive journey returned the first new spacecraft data from Mercury since the Mariner 10 mission more than 30 years ago. On March 18, 2011, MESSENGER, with its seven instruments, became the first mission to orbit Mercury and only the second mission to visit this planet closest to the Sun. During its 4-year long mission, MESSENGER's instruments imaged the surface in high resolution, mapped nearly the entire planet in color, and measured the composition of the surface, atmosphere, and nature of the magnetic field and magnetosphere. This highly successful orbital mission came to an end on April 30, 2015, as the spacecraft ran out of propellant and the force of solar gravity caused it to impact the surface of Mercury, but analysis of the wealth of scientific data it returned is just beginning.

GRAIL

The Gravity Recovery and Interior Laboratory (GRAIL) mission was launched on Sep 10, 2011 with a goal of using high-quality gravity field mapping of the moon to determine the moon's interior structure. GRAIL consisted of two spacecraft that flew in tandem orbits around the moon for several months to measure its gravity field in great detail. The first probe entered orbit on December 31, 2011 and the second followed on January 1, 2012. GRAIL's primary science objectives were to determine the structure of the lunar interior, from crust to core and to advance understanding of the thermal evolution of the Moon. The new information obtained will help in targeting a landing site for future missions. Each spacecraft carried multiple cameras onboard to document their views and to allow students and the public to view observations from the satellites. The primary science phase of GRAIL lasted for 88 days, from March 7, 2012 to May 29, 2012. A second science phase extended from August 8, 2012 to Dec 12, 2012. The two spacecraft impacted the Lunar surface on December 17, 2012, ending the mission.

MAVEN

The Mars Atmosphere and Volatile Evolution Mission (MAVEN) launched on November 18, 2013 and entered Mars' orbit on September 21, 2014. MAVEN was the second mission selected in NASA's Mars Scout program and the first to explore the planet's upper atmosphere, ionosphere, and interactions with the sun and solar wind. Scientists will use MAVEN data to determine the role that loss of volatile compounds, such as CO₂, N₂, and H₂O, from the Mars atmosphere to space has played over time, giving insight into the history of Mars atmosphere and climate, liquid water, and planetary habitability. On November 5, 2015, NASA announced that data from MAVEN shows that the erosion of Mars' atmosphere increases significantly during solar storms. That loss of atmosphere to space likely played a key role in Mars' gradual shift from its carbon dioxide-dominated atmosphere - which had kept Mars relatively warm and allowed the planet to support liquid surface water - to the cold, arid planet we see today. The University of Colorado's Laboratory for Atmospheric and Space Physics (LASP) is the lead institution for the MAVEN mission.

About the Presenters

Dr. Sean Solomon, MESSENGER PI

Dr. Sean Solomon is the Director of Lamont-Doherty Earth Observatory, the Associate Director for Earth Systems Science at the Earth Institute, and the William B. Ransford Professor of Earth and Planetary Science in the Department of Earth and Environmental Sciences, all at Columbia University.

Prior to arriving at Columbia in July 2012, Solomon served for 19 years as Director of the Carnegie Institution's Department of Terrestrial Magnetism in Washington, D.C., where his research focused on planetary geology and geophysics, seismology, marine geophysics, and geodynamics. From 1972 to 1992, he was a member of the faculty of the Department of Earth, Atmospheric, and Planetary Sciences at the Massachusetts Institute of Technology.

Solomon has led or been involved in oceanographic expeditions on Earth and spacecraft missions to the Moon, Venus, Mars, and Mercury. He served as a Co-Investigator on the Magellan mission to Venus, the Mars Global Surveyor mission, and the GRAIL mission to the Moon. He currently chairs the Gravity Science Working Group for the Europa Multiple Flyby mission. He has been the Principal Investigator for NASA's MESSENGER mission to Mercury since 1999. The MESSENGER spacecraft was inserted into orbit about Mercury in March 2011 after traveling for nearly seven years through the inner solar system, and it continuously mapped the surface, interior, and environment of the innermost planet until the probe's onboard propellant was exhausted and the spacecraft impacted Mercury's surface in April 2015.

Dr. David Smith, GRAIL Deputy PI

Dr. David Smith is a Research Scientist at MIT, and was previously a Division Director at the NASA Goddard Space Flight Center. As a planetary geophysicist/geodesist Dr. Smith has been involved with many spaceflight missions. He is currently the Deputy Principal Investigator for the GRAIL Discovery mission to the Moon, Principal Investigator for the laser altimeter instrument and investigation on the Lunar Reconnaissance Orbit mission, and Instrument Lead for the laser altimeter and gravity field modeling on the MESSENGER Discovery mission to Mercury. Previously, Dr. Smith was the principal investigator/team leader for the laser altimeters and gravity field investigations on Mars Global Surveyor, Clementine, and a Co-Investigator for several other missions for geodesy and geophysics. In addition, Dr. Smith was the Project Scientist for the Lageos and Crustal Dynamics Projects of the NASA Earth Science program.

Dr. Smith was educated in England and obtained his bachelor's degree in mathematics from the University of Durham, and his masters in wave propagation in plasmas and his doctorate in planetary geodesy from the University of London.

Dr. Bruce M. Jakosky, MAVEN PI

Dr. Jakosky is a Professor in the Laboratory for Atmospheric and Space Physics and the Dept. of Geological Sciences at the University of Colorado in Boulder, and is Associate Director for Science at LASP. He has been at the University since 1982. His research interests are in the geology of planetary surfaces, the evolution of the Martian atmosphere and climate, the potential for life on Mars and elsewhere, and the philosophical and societal issues in astrobiology. He has been involved with the Viking, Solar Mesosphere Explorer, Clementine, Mars Observer, Mars Global Surveyor, Mars Odyssey, Mars Science Laboratory, and Lunar Reconnaissance Orbiter spacecraft missions. He headed the University of Colorado's team in the NASA Astrobiology Institute for more than ten years.

He is the Principal Investigator of the Mars Atmosphere and Volatile Evolution (MAVEN) mission to Mars. MAVEN is a P.I.-led mission developed through the Mars Scout program. It was selected competitively in 2008, launched in 2013, and has been orbiting Mars since fall of 2014. It just completed its primary science mission and is in extended mission, and the first major results were published in November 2015 in a series of 49 papers in *Science* and *Geophysical Research Letters*.

Dr. Jakosky received his B.S. in Earth and Space Sciences from UCLA in 1977, and his Ph.D. in Planetary Science and Geophysics from Caltech in 1982. He has published more than 120 papers in the refereed scientific literature, and has authored or co-authored a number of books, including "The Search for Life on Other Planets" and "Science, Society, and the Search for Life in the Universe".

Lessons from Previous Missions – PM Panel

Panel Host: Ed Weiler
DAWN Development PM: Keyur Patel
JUNO Development PSE: Dr. Doug Bernard
New Horizons PM: Glen Fountain

DAWN

Enabled by an ion propulsion system, Dawn was the first mission ever to orbit a main belt asteroid and the first ever to orbit two different targets. It was also the first spacecraft to visit a dwarf planet when it arrived at Ceres in March 2015. The Dawn spacecraft orbited the asteroid Vesta from July 2011 until Sept 2012 and will continue orbiting Ceres at least until the end of the prime mission in June 2016. The mission was launched September 27, 2007. Dawn's goal is to characterize the conditions and processes of the solar system's earliest epoch by investigating in detail two of the largest protoplanets remaining intact since their formations. Ceres and Vesta reside in the extensive asteroid zone between Mars and Jupiter. Each has followed a very different evolutionary path constrained by the diversity of processes that operated during the first few million years of our solar system. The top level question that the mission addresses is the role of size and water content in determining the evolution of the planets. Ceres and Vesta are the right two bodies with which to address this question, as they are the most massive of the protoplanets, whose growth was interrupted by the formation of Jupiter. Ceres is very primitive and wet while Vesta is evolved and dry. The complete set of on-board instruments is similar to that used for Mercury, Mars, the Moon, other asteroids and comets. The science team consists of leading experts in the investigation of the rocky and icy planets using proven measurement and analysis techniques.

JUNO

The launch of the Juno mission in August 2011 began a five-year journey to Jupiter, to investigate the remaining unanswered questions beneath the surface of the largest gas giant. Juno arrives at Jupiter on July 4, 2016 after a 59-month cruise. The spinning, solar-powered Juno spacecraft will enter into a highly elliptical polar orbit around Jupiter that skims only 5000 kilometers above the planet's atmosphere. Building on the results of previous missions, Juno will provide new information to help us determine how, when and where this giant planet formed. Answering these questions for Jupiter is essential for an understanding of the origin of the solar system itself because Jupiter contains more mass than all the other planets combined. Juno will seek these answers with instruments that can sense the hidden world beneath Jupiter's colorful clouds while other experiments investigate the external effects that world produces.

New Horizons

The New Horizons Pluto-Kuiper Belt Mission, launched in January 2006, flew by Jupiter in February 2007 and arrived at Pluto in July 2015. The fastest spacecraft ever launched, New Horizons traveled more time and distance — more than nine years and three billion miles — than any space mission in history to reach its primary target. In the approach, Pluto flyby and departure phases, the spacecraft and its instruments spent over 100 days collecting data about Pluto and its system of five moons, including detailed images of mountain ranges and ice flows such as the “heart-shaped” Sputnik Planum. This data collected will help us understand the icy worlds at the edge of our solar system. The mission is now being targeted to visit one or more Kuiper Belt Objects beyond Pluto. New Horizons made the close flyby of Jupiter in February 2007 in order to get a gravitational boost enroute to Pluto, shortening its cruise time by about 3 years. The instruments were exercised successfully and returned exciting Jupiter science to Earth, including images of a 200-mile-high plume from the active Tvashtar volcano.

About the Presenters

Keyur Patel, Dawn PM

Keyur Patel is the Director for the Interplanetary Network Directorate at NASA's Jet Propulsion Laboratory, a position he has held since 2013. Previously he was Deputy Director for the Solar System Exploration Directorate (2009–2013) and earlier was Deputy Director for the Office of Safety and Mission Success (2008–2009). He has held a number of positions on NASA/JPL flight projects. As Project Manager for Dawn, he oversaw the mission's reorganization — an assignment he was asked to undertake just one year from launch — and shepherded the mission through its launch in September 2007 to orbit and study the protoplanets Vesta and Ceres. He served as Deputy Project Manager and Chief Engineer for the Deep Impact mission, helping to ensure a successful encounter with comet Tempel 1 in July 2005. Joining the Jet Propulsion Laboratory in 1986, he spent more than 15 years in a variety of flight systems, technical management, and engineering roles, contributing to missions that included Spitzer Space Telescope, Mars Observer, Topex/Poseidon, and the Voyager mission to the outer planets. Keyur Patel has been awarded NASA medals for outstanding leadership (Dawn), exceptional engineering (Deep Impact), and exceptional service (Spitzer Space Telescope). He has also received a number of NASA group achievement medals. He serves on the Jet Propulsion Laboratory's Executive Council, representing the Interplanetary Network Directorate.

Keyur Patel holds Bachelor's and Master's degrees in Aerospace Engineering–Control Theory from California State Polytechnic University in Pomona, California.

Dr. Doug Bernard, JUNO Development PSE

Dr. Doug Bernard is a Principle Engineer at the Jet Propulsion Laboratory where he has worked for 30 years. He is currently the Project System Engineer (PSE) for Mars 2020, a mission that would launch a rover to Mars in 2020 to study geologic history, find evidence of past habitability, and prepare a cache of rock samples for possible future return to Earth.

Prior to Mars 2020, Doug also served as the PSE for two competitively-selected missions. The first of these was the New Frontiers Program's Juno Mission to Jupiter starting in Phase A and continuing through the start of Phase E. After Juno, Doug served as the PSE on the Discovery Program's InSight Mission to Mars in Phases A and B. Doug's technical background is in dynamics and control and he has had opportunities to serve as a spin dynamics on the Galileo mission to Jupiter and an attitude control engineer on the Cassini mission to Saturn.

His educational background includes BS degrees in Mechanical Engineering and Mathematics from the University of Vermont, a MS in Mechanical Engineering from MIT, and a Ph.D. in Aeronautics and Astronautics from Stanford University.

Glen Fountain, New Horizons PM

Glen Fountain received his B.S. and M.S. degrees in electrical engineering from Kansas State University in 1965 and 1966 respectively, and joined the Applied Physics Laboratory (APL) in 1966. During his early career he was a member of APL's technical staff that developed a number of space missions for both the Department of Defense and NASA. From 1974 on he has held a number of line and project management positions in APL's Space Department. From 2004 through 2015 he was the Project Manager of the New Horizons mission to Pluto which was launched in January 2006 and made observations of the Pluto system during the flyby in 2015. As of January 2016 he is the New Horizons Deputy Project Manager. In 2007, Glen was presented the Von Braun Award for outstanding space program management by the AIAA and in 2008, the NASA Exceptional Achievement Award. In 2015 he was presented with the Space X/AIAA Award for technical excellence.

Program Office Role – Assistance vs. Oversight

Allen Bacskey, NASA's Discovery, New Frontiers and Solar System Exploration Programs PM

Mr. Bacskey possess over 30 years of experience supporting NASA Programs and Projects in various roles and responsibilities. In his current position, Mr. Bacskey is the Program Manager for NASA's Discovery, New Frontiers and Solar System Exploration Programs. He is responsible for managing the 3 Programs for NASA's Science Mission Directorate (SMD). The 3 Programs are managed out of the Planetary Missions Program Office (PMPO) at the Marshall Space Flight Center which Mr. Bacskey is responsible for. Prior to being named Program Manager, Mr. Bacskey served as the Deputy Program Manager and Assistant Office Manager for the Discovery and New Frontiers (D&NF) Program Office. He has also worked as the Mission Manager within the Discovery and New Frontiers (D&NF) Program Office for the Dawn, MESSENGER and New Horizons Missions.

Mr. Bacskey began his career at the Kennedy Space Center in 1983 as a Fluid Systems Design Engineer for EG&G Florida. He then relocated to the Marshall Space Flight Center working for McDonnell Douglas Astronautics Corporation as a Thermal and Environmental Control and Life Support (ECLSS) Engineer for NASA's Spacelab Program. Mr. Bacskey came to work for NASA in 1987 and was named as the Spacelab Systems Thermal and ECLSS Chief Engineer in the early 1990's. In 1994, Mr. Bacskey was selected as the Chief Engineer for the First Microgravity Science Laboratory (MSL-1) Spacelab Module Mission. Following the end of the Spacelab Program in the late 1990's, Mr. Bacskey transitioned to work as the Project Manager for the EXPRESS Pallet Project supporting the International Space Station (ISS) Program. The EXPRESS Pallet was a bilateral venture between NASA and Brazilian Space Agency.

Mr. Bacskey received his B.S. Degree in Chemical Engineering from the University of Alabama in 1983.

This page intentionally left blank

Essential Elements for Successful Missions

Host: Ed Weiler
MAVEN PM: David Mitchell
DAWN Development PM: Tom Frascchetti
Stardust Industry PM: Joe Vellinga

Creating a Realistic, Resource Managed Schedule

On November 18, 2013, MAVEN launched on schedule, under budget, and with the full technical capability that was intended. This presentation provides the principals of success used by the project, with a special focus on techniques used to develop and manage schedules integrated with cost.

Managing Mission Development Risk

In July 2012, Dawn became the first mission ever to orbit a main belt asteroid and in 2012 the first ever to break out of orbit and travel to and orbit a different target. This presentation examines the development risks and the mission risks faced by the project team as they developed the spacecraft for its mission and offers sage advice on techniques to mitigate these risks.

Managing Resources within the Mission Cost Cap

The Stardust mission (summary below) was the first mission since Apollo days to return, in 2006, an extraterrestrial sample to Earth for analysis. Design of a new sample collection system and its Earth-return capsule added to the uncertainty of final costs. This presentation describes resource management techniques used by the project to bring the mission to the launch pad on schedule and under cost.

Stardust

The Stardust spacecraft was launched on February 7, 1999 with a primary goal to collect comet dust during its close encounter with Comet Wild 2 and return it to Earth. In addition, during part of its flight, it was to collect interstellar dust. In January 2004, the Stardust spacecraft flew through the comet's coma and captured dust specks in a very light, low-density substance called aerogel. During the encounter, the Dust Flux Monitor recorded rates of impact of dust particles and the Comet and Interstellar Dust Analyzer performed real time analyses of their compositions. But primarily, Stardust captured samples and stored them for safe keeping on the long journey back to Earth. Stardust's return capsule parachuted to the Utah Test and Training Range on January 15, 2006 after a seven-year mission. The science canister containing the comet particles and interstellar dust particles were taken to Johnson Space Center. From there, the cometary samples have been processed and distributed to about 150 scientists worldwide who are using a variety of techniques to determine the properties of the cometary grains. The Stardust spacecraft was brought out of hibernation in 2006 and given a new assignment - New Exploration of Tempel 1 (NExT). The Stardust-NExT mission used the spacecraft to revisit comet Tempel 1, previously visited by the Deep Impact spacecraft. This investigation provided the first look at the changes to a comet nucleus produced after its close approach to the Sun and an opportunity to image the crater created by the Deep Impact mission from its encounter with the comet on July 4, 2005. It marked the first time a comet has ever been revisited. Stardust-NExT successfully flew by Tempel 1 on February 14, 2011.

About the Presenters

David Mitchell, MAVEN PM

David Mitchell is currently the Director of the Flight Projects Directorate at the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. He began his career in 1984 with the Department of Navy testing solid rocket motor systems. In 1987 Mitchell joined GSFC with much of his early work focused on expendable launch vehicles, including the successful Delta launches of the Mars Global Surveyor and Mars Pathfinder missions. In 1997, he joined the Geostationary Operational Environmental Satellites (GOES) Program as the Source Evaluation Board chairman, then became the Observatory Manager, and ultimately the Project Manager. In 2005, he was detailed to the Kennedy Space Center to work on strategic planning initiatives and then a related detail at NASA Headquarters. In 2006, Mitchell worked as a NASA Congressional Fellow in the office of U.S. Senator Bill Nelson. In October 2006, he returned to GSFC and became the Deputy Associate Director of the Earth Science Projects Division. Concurrently, he was the Project Manager for a Mars Scout proposal effort - the Mars Atmosphere and Volatile Evolution (MAVEN) mission. With MAVEN's selection as NASA's next Mars Scout mission in 2008, Mitchell became the full time Project Manager until its successful insertion into Mars orbit and the start of science operations in late 2014. Following MAVEN, Mitchell became the Deputy Director of Goddard's Flight Projects Directorate (FPD) and then the Director of FPD in 2015. Mitchell received the NASA Outstanding Leadership Medal twice for his work on GOES and MAVEN. In December 2015, he received a Presidential Rank Award.

Mr. Mitchell received his B.S. in Mechanical Engineering from the State University of New York at Buffalo and his M.S. in Engineering Administration from George Washington University. He is a Senior Fellow with the Council for Excellence in Government, a Senior Executive Fellow with the Kennedy School of Government/Harvard University, and is a graduate of NASA's Senior Executive Service Candidate Development Program.

Tom Frascetti, Dawn Development PM

Tom Frascetti is the Assistant Director for Operations in the JPL Engineering and Science Directorate. He has over 40 years of extensive line and project management experience, and safety and mission assurance experience. He spent 15 years at General Dynamics prior to joining JPL in 1983. At JPL he has had positions in line management from group supervisor to Deputy Director for the Engineering and Science Directorate. He has been the project manager to two missions, the Space Interferometry mission and the Dawn mission. Tom served as the development project manager for the Dawn Project during Phases B and C. He has a BSEE from the California State Polytechnic University, Pomona and a MSEE from the California State University, Los Angeles.

Joe Vellinga, Lockheed Martin Stardust Program Manager

Joe Vellinga retired as the Lockheed Martin Program Manager for the OSIRIS-REx Flight System in 2013. He was LM Stardust Program Manager from its proposal to NASA in 1994 through recovery of the sample return capsule in January 2006, working daily with the NASA Stardust Project Manager, Kenneth Atkins. He was also the Lockheed Martin Program Manager for the Genesis Phase A and again for mission completion.

Prior to Stardust Joe delivered the Faint Object Spectrograph to the Hubble Space Telescope and performed studies of weather satellite instruments and earth observing imaging spectrometers.

In 1991 he demonstrated that the Manned Maneuvering Units flown in 1984 were still flight worthy. Joe studied space based lasers for the U. S. Air Force and integrated payloads into the SCATHA U.S. Air Force research satellite. He integrated instruments into the Skylab program from inception through the three manned missions. He participated in the early development of small radiation cooled rocket motors including those flown on the Apollo Service Module and the Lunar Excursion Module. He performed aerodynamic analyses of inlet control systems for Mach 2 to 4 aircraft.

He received a B.S. degree in Engineering from University of California in Los Angeles in 1961. He completed the Defense Systems Management College Program Manager's course in 1985. He received the NASA Public Service Medal for Leadership of the Stardust Development Team.

SOMA Analysis of Previous PI Missions Performance

To encourage the submission of the highest-quality mission proposals and concept-study reports, the Science Office for Mission Assessments maintains an ongoing effort to identify and analyze common areas of major weaknesses resulting from the technical, management, and cost-review process. The results of this effort will be described, including appropriate lessons learned that can provide valuable guidance to future mission proposal and concept-study teams.

About the Presenter

Washito Sasamoto, Acquisition Manager, SOMA, NASA Langley Research Center

Washito Sasamoto is currently the Discovery 2014 Acquisition Manager, preparing for the Technical, Management, and Cost evaluation of the upcoming Step 2 Concept Study Reports (CSRs) – a continuation of his role on the Step 1 Proposal Evaluation. Mr. Sasamoto has been a member of SOMA since 2010 – having worked with the office since its inception in 1996 – leading the Heliophysics Explorer 2011 Step 2 CSR Evaluation and the Explorer 2011 Step 1 Proposal Evaluation. He was responsible for the Astrophysics Explorer 2011 Step 2 CSR Evaluation until its Site Visit phase, the development of the Mars 2020 Announcement of Opportunity (AO), and the implementation of the 2014 Standard AO Template update. He has also served as a Subpanel or Alternate Acquisition Manager on Mars 2020, Discovery 2010, and ExoMars Trace Gas Orbiter. Prior to joining SOMA, Mr. Sasamoto's entire post-college career was with the Space Mission Analysis Branch, where he was responsible for stochastic, dynamic, and conceptual tool development; conceptual and mission design for robotic and human space flight missions; and analysis of the International Space Station Thermal Control System.