

# LCPM-12 2017

Low-Cost Planetary Missions Conference

PASADENA, CA AUGUST 15-17, 2017

## ONSITE PROGRAM



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# Tuesday, 15 August 2017

07:30 – 17:00    **On-site Registration**    **Hameetman Auditorium Foyer**

07:30 – 09:00    **Light Breakfast**    **Cahill Center Patio**

09:00 – 09:15    **Welcome and Workshop Overview**  
Hameetman Auditorium    **Dr. Michael Mischna**  
Jet Propulsion Laboratory,  
Caltech, USA

**Dr. Jacob Van Zyl**  
Jet Propulsion Laboratory,  
Caltech, USA

## Session 1 Agency Programs and Plans for Low-Cost Planetary Missions

Chair: Dr. Michael Mischna & Mr. Gregg Vane

09:15 – 09:35    NASA planetary science division  
programs in low-cost missions    **Mr. David Schurr**  
National Aeronautics and  
Space Administration, USA

09:35 – 09:55    The CNES French space agency  
planetary program--low cost  
perspectives    **Mr. Pierre Bousquet**  
Centre National d'Étude  
Spatiales, France

09:55 – 10:15    ISAS/JAXA exploration program  
into solar system    **Prof. Hitoshi Kuninaka**  
Japan Aerospace Exploration  
Agency, Institute of Space and  
Astronautical Science, Japan

10:15 – 10:35    **Morning Coffee Break**

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## Session 2 Low-Cost Mission Infrastructure and Considerations

Chair: Dr. Christophe Sotin & Prof. Hajime Yano

10:35 – 10:55    OPAG viewpoint: Are small  
spacecraft or low-cost missions  
useful for exploration of giant  
planets and ocean worlds?    **Prof. Alfred McEwen**  
University of Arizona, USA

10:55 – 11:15    The role of small satellites in  
addressing Mars science goals    **Dr. Jeffrey Johnson**  
Applied Physics Laboratory,  
Johns Hopkins University, USA

11:15 – 11:35    Archiving low-cost mission data in  
NASA's planetary data system    **Dr. Nancy Chanover**  
New Mexico State University, USA

# Tuesday, 15 August 2017

11:35 – 11:55	SPICE can help smallsat missions obtain important, accurate observation geometry	<b>Mr. Charles Acton</b> Jet Propulsion Laboratory, Caltech, USA
11:55 – 12:15	Risk mitigation approach for SmallSats	<b>Dr. Harald Schone</b> Jet Propulsion Laboratory, USA
12:15 – 12:35	Venus Bridge: A Smallsat Program Through the Mid-2020s	<b>Dr. Robert Grimm</b> Southwest Research Institute, USA

12:35 – 13:35 **Lunch Break**

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## Session 3: Asteroids Active Missions and Missions Currently Under Development for Launch in the Near Future

Chairs: Mr. Pierre Bousquet & Dr. Diana Laufer

13:35 – 13:55	Current status and proximity operation of MINERVA-II rovers onboard Hayabusa2 asteroid explorer	<b>Dr. Tetsuo Yoshimitsu</b> Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science, Japan
13:55 – 14:15	Asteroid impact and deflection assessment (AIDA): The double asteroid redirection test (DART) mission	<b>Ms. Cheryl Reed</b> Applied Physics Laboratory, Johns Hopkins University, USA
14:15 – 14:35	DESTINY+: Deep Space Exploration Technology Demonstrator and Explorer to Asteroid 3200 Phaethon	<b>Dr. Hiroyuki Toyota</b> Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science, Japan
14:35 – 14:55	Asteroid resource exploration mission by reconnaissance and landed investigation	<b>Prof. Yonghe Zhang</b> Shanghai Engineering Center for Microsatellites, China
14:55 – 15:15	Near Earth Asteroid (NEA) Scout CubeSat mission	<b>Dr. Anne Marinan</b> Jet Propulsion Laboratory, Caltech, USA

15:15 – 15:35 **Afternoon Coffee Break**

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## Session 3: Other Active Missions Active Missions and Missions Currently Under Development for Launch in the Near Future

Chairs: Mr. Stephen West and Ms. Cheryl Reed

15:35 – 15:55	The Lunar Polar Hydrogen Mapper CubeSat mission	<b>Dr. Craig Hardgrove</b> Arizona State University, USA
15:55 – 16:15	Experimental results of formation conditions and composition of comets as derived from Rosetta's measurements	<b>Dr. Diana Laufer</b> Tel Aviv University, Israel
16:15 – 16:35	Twinkle space mission - a commercial mission for space science	<b>Mr. Marcell Tessenyi</b> Blue Skies Space Ltd., United Kingdom
16:35 – 16:55	Q-PACE: A cubesat microgravity mission to study collisions in the protoplanetary disk	<b>Dr. Joshua Colwell</b> University of Central Florida, USA
16:55 – 17:15	NatBio (Natural Biofilm Biotech) mission of Team Killalab: Analyzing the survival of biofilms on lunar surface	<b>Mr. Herbert Silva</b> Scientific Society of Astrobiology of Peru, USA
17:15 – 17:35	EQUULEUS: A 6U CubeSat to fly to lunar Lagrange point onboard SLS	<b>Assoc. Prof Ryu Funase</b> University of Tokyo, Japan
17:35 – 17:55	Development of a signal processing circuit of the micrometeoroid impact sensor within a multi-layered insulation (CLOTH) on the exterior of the 6U space craft EQUULEUS	<b>Mr. Hiroyuki Mochizuki</b> Hosei University, Japan
18:30 – 21:30	<b>IAA Banquet (Conference Dinner)</b>	<b>Caltech Athenaeum</b>

# Wednesday, 16 August 2017

07:30 – 17:00    **On-site Registration**    **Hameetman Auditorium Foyer**

07:30 – 08:30    **Light Breakfast**

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## Session 4a: Non-imaging instruments Science Instruments Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Dr. Kunio Sayanagi & Dr. Jorge Nunez

08:30 – 08:50    Advances in planetary seismology using infrasound and airglow signatures on Venus    **Dr. Attila Komjathy**  
Jet Propulsion Laboratory, Caltech, USA

08:50 – 09:10    Interplanetary and interstellar dust near Earth (i2-DUNE): Exploring the variability of the chemical makeup of solar system bodies from 1 AU    **Dr. Mihaly Horanyi**  
University of Colorado, USA

09:10 – 09:30    Electromagnetic handling of regolith particles on Moon, Mars, Asteroids, and Comets    **Prof. Hiroyuki Kawamoto**  
Waseda University, Japan

09:30 – 09:50    Low-cost magnetometer for space applications    **Dr. Leonardo Regoli**  
University of Michigan, USA

09:50 – 10:10    Low cost breakthroughs in planetary atmospheres and interior structures with precisionradio equipped small spacecraft    **Dr. Sami Asmar**  
Jet Propulsion Laboratory, Caltech, USA

10:10 – 10:30    Radio emissions from electrical activity in martian dust storms    **Dr. Shahab Arabshahi**  
Jet Propulsion Laboratory, Caltech, USA

10:30 – 10:50    **Morning Coffee Break**

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## Session 4a: Imaging instruments Science Instruments Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Prof. Hiroyuki Kawamoto & Mr. Sami Asmar

10:50 – 11:10	The Europa Imaging System (EIS): A camera suite to investigate Europa's geology, ice shell, and potential for current activity	<b>Dr. Wes Patterson</b> Applied Physics Laboratory, Johns Hopkins University, USA
11:10 – 11:30	Flexible camera architecture for generic space imaging applications	<b>Mr. Robert Staehle</b> Jet Propulsion Laboratory, Caltech, USA
11:30 – 11:50	The Advanced Multispectral Infrared Microimager (AMIM) for future in situ exploration of planetary surfaces	<b>Dr. Jorge Núñez</b> Applied Physics Laboratory, Johns Hopkins University, USA
11:50 – 12:10	A smallsat-based thermal imager with high accuracy multiple source calibration system	<b>Dr. David Osterman</b> Ball Aerospace, USA
12:10 – 12:30	A low cost far-UV mission concept for Planetary Science	<b>Dr. Philippa Molyneux</b> Southwest Research Institute, USA
12:30 – 12:50	New generation of compact cometary D/H survey mission	<b>Dr. Sona Hosseini</b> Jet Propulsion Laboratory, Caltech, USA

12:50 – 14:00 **Lunch Break**

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## Session 4b: Software, modeling and simulations Technology and Engineering Developments Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Dr. Philippa Molyneux & Prof. Ian Garrick-Bethell

14:00 – 14:20	Characterization of planetary atmospheric dynamics by Doppler tracking of a constellation of small entry probes	<b>Dr. David Atkinson</b> Jet Propulsion Laboratory, Caltech, USA
14:20 – 14:40	Applying model predictive control architecture for efficient autonomous data collection and operations on planetary missions	<b>Mr. Michael Lieber</b> Ball Aerospace, USA

# Wednesday, 16 August 2017

## Session 4b: Software, modeling and simulations Technology and Engineering Developments Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Dr. Philippa Molyneux & Prof. Ian Garrick-Bethell

14:40 – 15:00 Landing dynamics of two-step  
landing method for small  
lunarplanetary lander

**Mr. Shunpei Morikawa**  
Shizuoka University, Japan

## Session 4b: Hardware Technology and Engineering Development Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Dr. Philippa Molyneux & Prof. Ian Garrick-Bethell

15:00 – 15:20 Saturn Swarm Study

**Mr. Andrew Blocher**  
California Polytechnic State  
University, USA

15:20 – 15:40 **Afternoon Coffee Break**

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## Session 4b: Hardware Technology and Engineering Development Enabling the Next Generation of Low-Cost Planetary Exploration

Chairs: Dr. Philippa Molyneux & Prof. Ian Garrick-Bethell

15:40 – 16:00 Flexible three phase brushless DC  
motor driver for medium radiation  
level

**Mr. Hans-Juergen Sedlmayr**  
Germany Aerospace Center,  
Germany

16:00 – 16:20 Combustion joining of regolith  
tiles for the in-situ fabrication of  
launch/landing pads on the  
Moon and Mars

**Mr. Robert Ferguson**  
University of Texas at El Paso,  
USA

16:20 – 16:40 Assembly of structures on the  
surface of the Moon by  
selforganized robots

**Dr. Gustavo Medina-Tanco**  
Institute of Nuclear Science,  
National Autonomous  
University, Mexico

## Invited Talk

16:40 – 17:20 The JPL 'A-Team' and Mission  
Formulation Process

**Mr. Steve Matousek**  
Jet Propulsion Laboratory,  
Caltech, USA

18:00 – 21:00 **Poster Networking Reception  
& Exhibition**

**Dabney Hall and Courtyard**



# Thursday, 17 August 2017

07:30 – 17:00    **On-site Registration**    **Hameetman Auditorium Foyer**

07:30 – 08:30    **Light Breakfast**    **Cahill Center Patio**

## Session 5: Concepts for Mars Advanced Concepts for the Next Generation of Low-Cost Missions, Including CubeSats, NanoSats and Others

Chairs: Dr. Laura Kerber & Dr. George Clark

08:30 – 08:50    An Interplanetary CubeSat mission to Phobos    **Prof. Jekan Thanga,**  
Arizona State University, USA

08:50 – 09:10    Deep Space 9 Mission Concept – Secondary Payload study for the proposed Next Mars Orbiter    **Mr. Adrian Arteaga Garcia**  
University of Michigan, USA

**Ms. Robyn Hinchman**  
University of Michigan, USA

**Ms. Tatiana Roy**  
University of Michigan, USA

**Mr. Tod Schulter**  
University of Michigan, USA

09:10 – 09:30    Radio occultation mission to Mars using CubeSats    **Dr. Walton Williamson**  
Jet Propulsion Laboratory,  
Caltech, USA

09:30 – 09:50    Mars DartDrop: Probing contemporary habitability at recurring slope lineae    **Dr. Robert Grimm**  
Southwest Research Institute,  
USA

09:50 – 10:10    Aeolus - a mission to study the thermal and wind environment of Mars    **Dr. Anthony Colaprete**  
Ames Research Center,  
National Aeronautics and  
Space Administration, USA

10:10 – 10:30    Benefits offered by a network of CubeSat-class rovers for planetary cave exploration    **Dr. Abigail Fraeman**  
Jet Propulsion Laboratory,  
Caltech, USA

10:30 – 10:50    **Morning Coffee Break**

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# Thursday, 17 August 2017

## Session 5: Concepts for small bodies Advanced Concepts for the Next Generation of Low-Cost Missions, Including CubeSats, NanoSats and Others

Chairs: Dr. Laura Kerber & Dr. George Clark

10:50 – 11:10    Spacecraft Penetrator for Increasing Knowledge of NEOs (SPIKE)    **Prof. Erik Asphaug**  
Arizona State University, USA

11:10 – 11:30    Intrepid: A fleet of highly autonomous SmallSat Near Earth Asteroid (NEA) explorers--Mission concept and science instrument development    **Dr. Jordana Blackberg**  
Jet Propulsion Laboratory, Caltech, USA

11:30 – 12:30    **Lunch Break**

## Session 5: Concepts for outer planets Advanced Concepts for the Next Generation of Low-Cost Missions, Including CubeSats, NanoSats and Others

Chairs: Dr. Abigail Fraeman & Dr. Robert Lillis

12:30 – 12:50    CHARGE: A small satellite mission concept to explore critical, but challenging regions at Jupiter    **Dr. George Clark**  
Applied Physics Lab,  
Johns Hopkins University, USA

12:50 – 13:10    Jupiter Magnetospheric boundary Explorer (JUMPER)    **Dr. Robert Ebert**  
Southwest Research Institute, USA

13:10 – 13:30    Jovian Orbiters Like THEMIS (JOLT): A multi-spacecraft mission concept to explore Jupiter's dynamic magnetosphere    **Dr. Frank Crary**  
University of Colorado, USA

13:30 – 13:50    Europa surface and plume sampling CubeSat explorer    **Prof. Jekan Thanga**  
Arizona State University, USA

13:50 – 14:10    SNAP: Small Next-generation Atmospheric Probe    **Dr. Kunio Sayanagi**  
Hampton University, USA

14:10 – 14:40    **Afternoon Coffee Break**

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## Session 5: Concepts for the Moon Advanced Concepts for the Next Generation of Low-Cost Mission, Including CubeSats, NanoSats and Others

Chairs: Dr. Abigail Fraeman & Dr. Robert Lillis

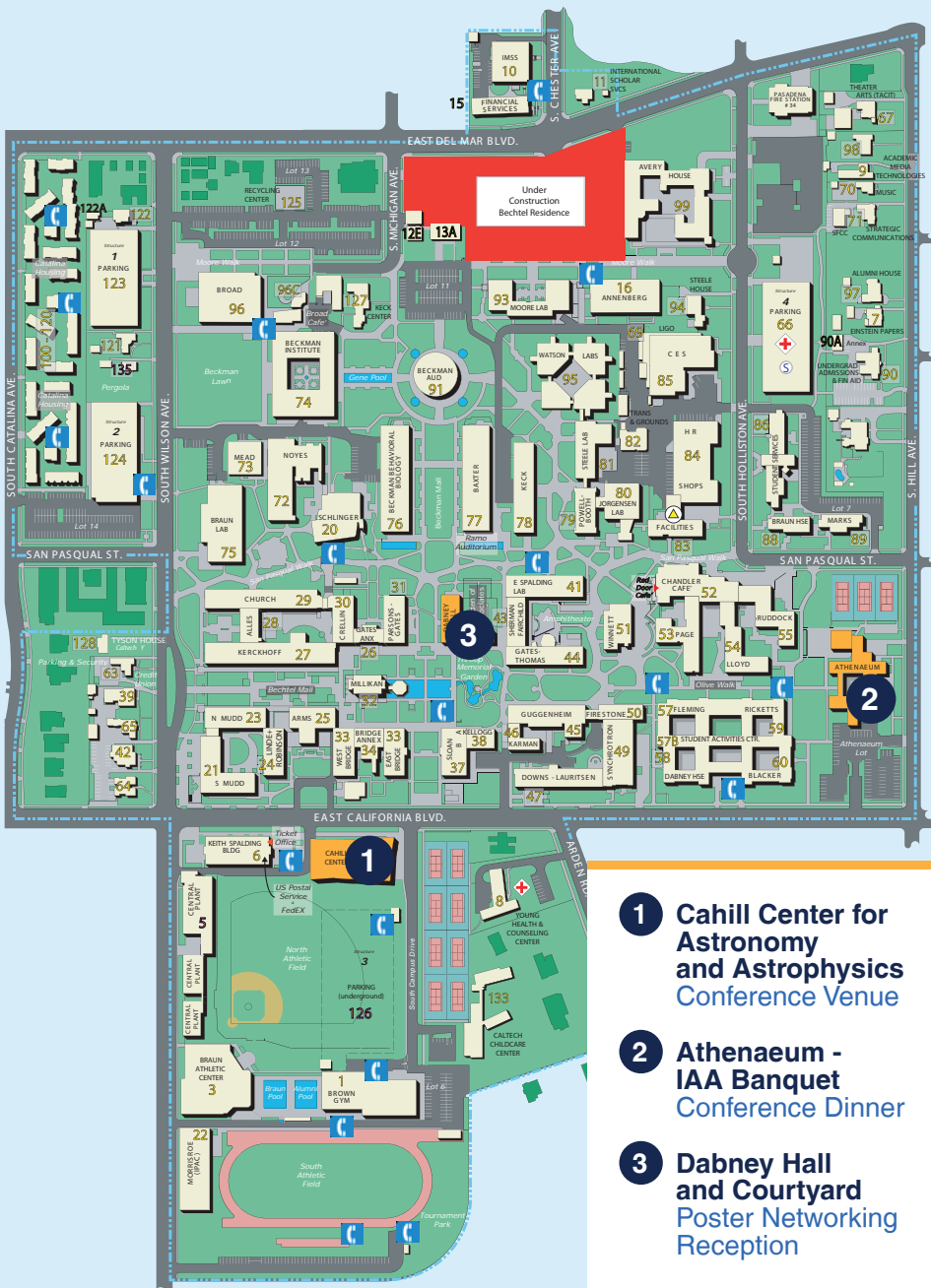
14:40 – 15:00	Commercial partnerships for exploration: Making small lunar missions viable	<b>Mr. Steve Eisele</b> Surrey Satellites, United Kingdom
15:00 – 15:20	Moon Diver: A Discovery mission concept for the exploration of a lunar pit crater using the Axel Rover	<b>Dr. Laura Kerber</b> Jet Propulsion Laboratory, Caltech, USA
15:20 – 15:40	Rocksat: Mapping the Moon's composition at the 10-m scale	<b>Dr. Paul Lucey</b> University of Hawaii, USA
15:40 – 16:00	The Lunar Compass mission concept: Rover exploration of a magnetic anomaly	<b>Dr. David Blewett</b> Applied Physics Lab, Johns Hopkins University, USA
16:00 – 16:20	Lunar Water small satellite mission concept	<b>Dr. David Blewett</b> Applied Physics Lab, Johns Hopkins University, USA
16:20 – 16:40	NanoSWARM: A Discovery class lunar mission to study space weathering, the solar wind, surface water, and remnant magnetism	<b>Prof. Ian Garrick-Bethell</b> University of California, Santa Cruz, USA
16:40 – 17:00	The Lunar Volatiles Orbiter: A solar System volatiles mission	<b>Dr. Paul Lucey</b> University of Hawaii, USA

## Session 5: Concepts for the solar system Advanced Concepts for the Next Generation of Low-Cost Mission, Including CubeSats, NanoSats and Others

Chairs: Dr. Abigail Fraeman & Dr. Robert Lillis

17:00 – 17:20	Cupid's Arrow: A small satellite to measure noble gases in the atmospheres of Venus and Titan	<b>Dr. Christophe Sotin</b> Jet Propulsion Laboratory, Caltech, USA
17:20 – 17:40	Planetary aeronomy and atmospheric escape from smallsat constellations	<b>Dr. Robert Lillis</b> University of California, Berkeley, USA
17:40 – 18:00	Laplace – A comprehensive experimental protoplanetary dust growth simulation under longduration microgravity conditions	<b>Dr. Joshua Colwell</b> University of Central Florida, USA

18:00 **Adjourn**



- 1** Cahill Center for Astronomy and Astrophysics Conference Venue
- 2** Athenaeum - IAA Banquet Conference Dinner
- 3** Dabney Hall and Courtyard Poster Networking Reception

# Conference MAP

Campus of California Institute of Technology