NASA SSERVI Update

Small Bodies Assessment Group Meeting
January 8, 2014

Yvonne Pendleton

Solar System Exploration Research Virtual Institute
Central office at NASA Ames Research Center
Central Office at NASA Ames:
- Yvonne Pendleton – Director
- Greg Schmidt – Deputy Director
  International Partnerships, LEAG/SBAG Rep
- Doris Daou – Associate Director, NASA HQ Liaison based in DC
- David Morrison – SSERVI Senior Scientist and NEA specialist
- Brad Bailey – SSERVI Staff Scientist, Grad Student Programs

Plus 4 Technical staff (virtual communications/technology development) & 3 Communications/public engagement staff
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Cycle-1 SSERVI Teams (9) – geographically distributed across the U.S.
with five-year cooperative agreement support (FY14-18)
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International Partnerships (7) at present:
Canada, U.K., Netherlands, Germany, South Korea, Saudi Arabia, Israel
SSERVI was created by NASA to address fundamental and applied science questions related to the Moon, Near Earth Asteroids and the Moons of Mars, so that human exploration can benefit from the fact that: *Science enables Exploration and Exploration enables Science*

SSERVI is jointly supported by NASA’s Science Mission Directorate (Planetary Science Division) and Human Exploration and Operations Mission Directorate (AES Division).

The NASA virtual institute structure is uniquely suited to catalyze inter-team and interdisciplinary collaborations, and has been an effective method of integrating science and exploration research goals through the NASA Lunar Science Institute (2008-13).
SSERVI Cycle 1 Teams


• Dan Britt, University of Central Florida. “Center for Lunar and Asteroid Surface Science”

• Ben Bussey, Applied Physics Lab, Johns Hopkins University. “Volatile, Regolith and Thermal Investigations Consortium For Exploration and Science”

• Bill Farrell, Goddard Space Flight Center. “Dynamic Response of Environments at Asteroids, the Moon, and moons of Mars”

• Tim Glotch, Stony Brook University. “Remote, In Situ and Synchrotron Studies for Science and Exploration”

• Jennifer Heldmann, Ames Research Center, “Field Investigations to Enable Solar System Science & Exploration”

• Mihaly Horanyi, University of Colorado. “Institute for Modeling Plasma, Atmospheres and Cosmic Dust”


Science and Exploration Balance

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<th>Role of Target Body(s) in Revealing the Origin and Evolution of the Inner Solar System</th>
<th>Target Body Structure and Composition</th>
<th>Target Body and Martian Moon Investigations as Windows into Planetary Differentiation Processes</th>
<th>Dust and Plasma Interactions on Target Body(s)</th>
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<th>Geotechnical Properties (Moon, NEAs, Mars)</th>
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<th>Volatiles (in its Broad Sense) and Other Potential Resources on Target Body(s)</th>
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### Science and Exploration Balance

| Role of Target Body(s) in revealing the origin and evolution of the inner Solar System | Target Body structure and composition | Innovative observations that will advance our understanding of the fundamental physical laws, composition, and origins of the Universe | Moon, NEA, and Martian moon investigations as windows into planetary differentiation processes | Dust and plasma interactions on Target Body(s) | Near-Earth asteroid characterization (including NEAs that are potential human destinations) | Geotechnical properties (Moon, NEAs, Mars) | Regolith of Target Bodies | Radiation | Volatiles (in its broad sense) and other potential resources on Target Body(s) | In-Situ Resource Utilization (ISRU)/Prospecting (Moon, NEAs, Mars) | Propulsion-induced ejecta (Moon, NEAs, Mars) | Operations/Operability (all destinations, including transit) | Human health and performance (all destinations, including transit) |
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| **Science emphasis** | | | | | | | | | | | | | | |
| **Exploration emphasis (SKGs)** | | | | | | | | | | | | | | |
Community Engagement

Exploration and Science community support through:

- First Exploration Science Forum, July 22-24, 2014 at Ames
- Special sessions at major meetings (e.g. AGU 2013, all-day event)
- Virtual “workshops without walls” and Director’s seminars on topics driven by community interest (hour long to several days)
- Active roles in LEAG & SBAG (Executive and Steering Committees)
- Strong support of community-wide efforts (e.g. Focus Groups)
- Active support of the Next Generation activities (e.g. Next Gen Lunar Scientists and Engineers workshops)
- Lunar and Asteroid Graduate Conference
- Initiation of a virtual graduate student journal club
- Support of the NASA Postdoctoral Program
- Virtual meeting support (schedule permitting)
Conclusion

• The newly selected SSERVI teams create a well-balanced institute that is broadly responsive to the needs of SMD as well as HEOMD in an integrative, collaborative fashion.

• Selection yielded 6 Institute-Experienced PIs, 3 new PIs, and ~60% new Co-Is and Collaborators with strong inter-team and international partner synergies.

• SSERVI Cycle #2 (intended for release in FY16, pending budget approval) will provide overlapping teams, flexibility and continuity as NASA’s needs evolve.

• SSERVI leadership team at Ames looks forward to serving exploration science community through research and community-building efforts.
SSERVI Selected Teams: Details


• Formation of terrestrial planets and asteroid belt, modeling of the Moon’s origin and Phobos/Deimos, history of NEAs and lunar bombardment, NEA origins, identification and characterization

Dan Britt, University of Central Florida. “Center for Lunar and Asteroid Surface Science”

• Studies of physical properties of regoliths: geotechnical properties, microgravity effects, impact ejecta, dynamics, hydration and weathering of NEAs, charging and mobilization of dust


• Volatiles sources/sinks/processes and interaction with regoliths, evolution of regoliths on all target bodies, identification and exploitation of resources
Bill Farrell, Goddard Space Flight Center. “Dynamic Response of Environments at Asteroids, the Moon, and moons of Mars (DREAM2)”

- Plasma interactions, exospheres, Radiation of exposed materials, space weathering, solar storms/solar wind

Tim Glotch, Stony Brook University. “Remote, In Situ and Synchrotron Studies for Science and Exploration”

- Remote sensing of airless bodies, field operations and metrics for human exploration, reactivity and toxicity of regoliths, synchrotron analyses of samples, volcanics and impact crater analog research


- Volcanics construct and magma chamber evolution, impact cratering mechanics and chronology, sampling for impact melt geology/geochemistry, volatile evolution and entrapment
Mihaly Horanyi, University of Colorado. “Institute for Modeling Plasma, Atmospheres and Cosmic Dust (IMPACT)”
- Small scale impact studies/regolith gardening, plasma charging and mobilization of dust, near surface plasma environments, new advancements on dust accelerator facility

- Impact history and processes, geochemistry of regoliths, age dating of regolith materials, NEA identification and characterization

- Thermal/chemical evolution of planetary bodies, origin and evolution of volatiles, remote sensing, space weathering of regoliths
• Scientists in NLSI vs. SSERVI

Scientists in SSERVI
(Co-Is and Collaborators)

- Previous NLSI Scientists in SSERVI (127)
- New SSERVI Scientists (191)
• Conduct basic and applied research fundamental to lunar and planetary sciences while advancing human exploration of the solar system

• Conduct and catalyze collaborative research in lunar and planetary science, enabling cross-disciplinary partnerships throughout the science and exploration communities

• Provide scientific, technical, and mission-relevant analyses for appropriate NASA programs, planning, and space missions as requested by NASA

• Explore innovative ways of using information technology for scientific collaboration and information dissemination across geographic and contextual boundaries to stimulate inter- and cross-discipline research

• Train the next generation of scientific explorers through research opportunities, and encourage global education and public outreach (EPO) through formal education, informal programs, and participatory public events