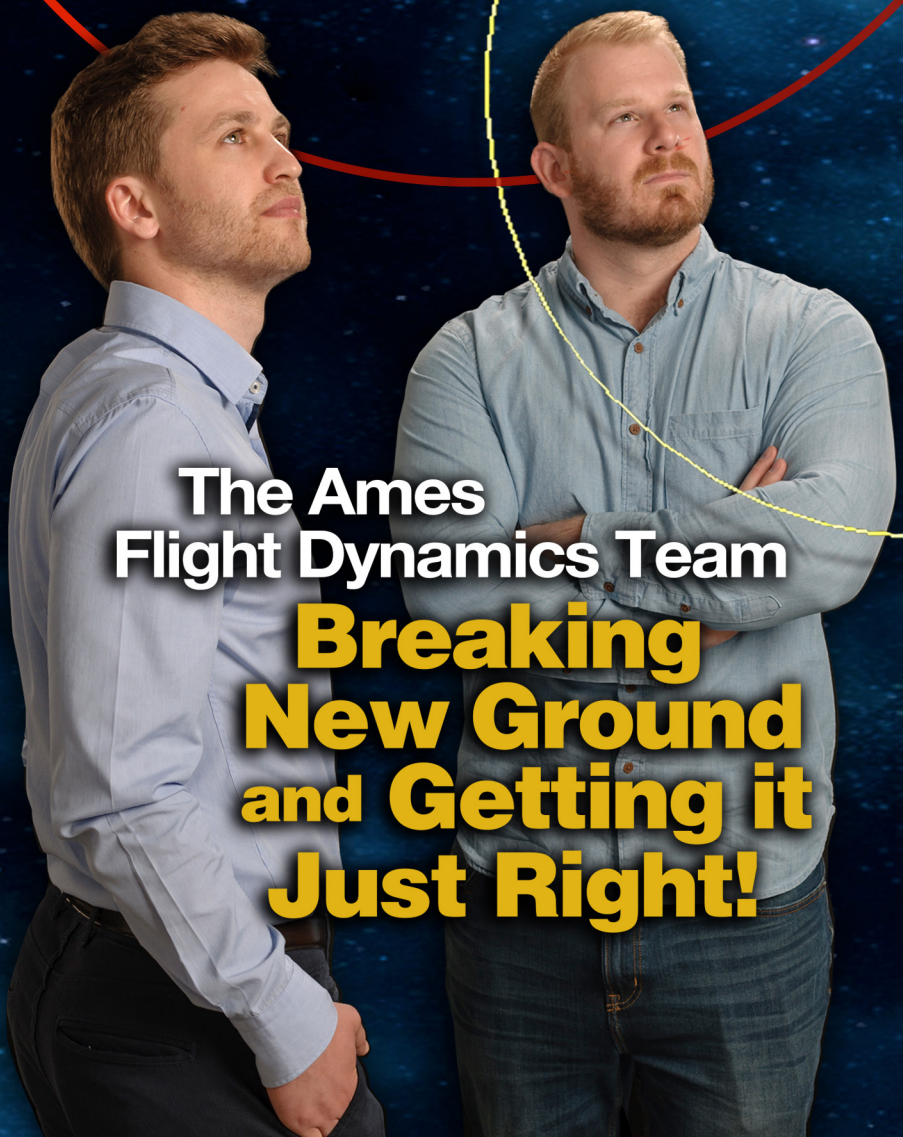
National Aeronautics and Space Administration

tech bytes

AMES' EMERGING TECHNOLOGIES



The Ames Flight Dynamics Team

Breaking New Ground and Getting it Just Right!

Summer 2018

In this issue:

Center Chief Technologist's Corner

The Ames Office of the Center Chief Technologist (OCCT) is happy to introduce the NASA Ames Innovation Seedling Fund, a concept incubator that will fund approximately 1-4 innovations from across the Center each year, pending available funding. Innovation Seedling funds are provided by NASA OCT on a yearly basis in late spring to the Ames Office of the Center Chief Technologist for select and manage of Innovation Seedling awards. The intent is to include a broad range of topics, including new innovations or improvements to existing processes in outreach, laboratory facilities, technologies and mission support. Unlike the Center Innovation Fund (CIF), Innovation Seedling ideas are not limited to technology development, nor do they need to be linked to an existing NASA project. Awards are typically for one year, and range from $25-$75K per year, with funds and work beginning in mid-summer. Each Innovation Seedling awardee is expected to present their ideas at the Ames Research and Technology Showcase (ARTS) in September, along with other CIF, ARIA and IRAD awardees. There is no formal proposal and the OCCT will accept Innovation Seedlings ideas throughout the year. If you have an innovative idea that you wish to be considered, you can send an email at any time with a 1 paragraph description of your idea to arc-cct@mail.nasa.gov, with the subject line, "Innovation Seedling Concept". Each spring, when funding becomes available, the OCCT will send out a reminder for ideas, then review all submitted concepts. For the 2018 inaugural year, two concepts were selected, including:

Non-Aqueous Biomarker Sample Processor for Life Detection, PI: Mary Beth Wilhelm

The goal of the Non-Aqueous Biomarker Sample Processor for Life Detection Seedling activity is to develop and fabricate a simple poly-functional point-to-point plumbing system extractor and sample processor for lipid biomarkers. This system serves as a stepping-stone to a more complex manifold-based system that will be proposed to the Fall 2018 PICASSO proposal call. This system automates and integrates "gold standard" organic solvent-based laboratory biomarker extraction techniques. Lipid biomarkers are extracted, processed, and concentrated from small masses of planetary analog samples to increase signal by at least one order of magnitude for delivery to a bench-top GC-MS. The technology development is to prototype a system that delivers mixed-phase solvents to an extractor containing a small mass of a sample. The sample is sonicated and then the solvent volume is reduced to concentrate the extract. It is then transferred through an in-line cartridge that transfers analytical targets from a mixed-phase system to a pure organic phase that would then be injectable on a GC-MS. Seedling funds are used to cover the cost of construction materials (e.g., pumps, plumbing, sonicator, containers), consumables (e.g., solvents, standards), and labor.

In Situ Biomanufacturing of Modulaar High Performance Material, PI: Jonathan Galazka

Advanced protein materials could fulfill a number of NASA technology needs, particularly if they can be produced on-site during future space missions. In order to advance the technology readiness level of these materials, the In Situ Biomanufacturing of Modulaar High Performance Materials seedling activity will develop strategies for the production of these materials using the resources that are expected to be available at various destinations, including CO2 from spacecraft cabins or Mars. Specifically, the activity will focus on strategies for producing protein-based material in E. coli using acetate that has been electrochemically derived from CO2. Resources will be used to hire interns, and procure microbial media and DNA parts. The work proposed here would be a key step in making the on-site production of protein materials a feasible technology for NASA.

Sincerely,
Harry Partridge
NASA Ames Center Chief Technologist

ABOUT THE COVER

Ames Flight Dynamic Team members: Andres Dono (left) and Joel Mueting (right), ponder the orbit of the ARCUS mission. The image is an Earth-Moon rotating frame where a quarter of the Moon's orbit period (i.e., a P/4 lunar resonant science orbit) is observed in the form of the four distinct lobes painted in red. The orbit utilizes a lunar flyby to gain sufficient energy for transfer. The science orbit is stable in altitude and avoids any crossings of the Van Allen belts, represented as the outer green ring around Earth, and the GEO belt, represented as the inner orange ring around Earth.

The Ames Flight Dynamics Team
Breaking New Ground and Getting it Just Right!

- Andres Dono

The Ames Flight Dynamics Team, within the Mission Design Center (MDC), is breaking new grounds in astrodynamics. They design the mission orbits and trajectories for the center's disparate mission concepts, and have one very big responsibility: getting it all just right. Orbital mechanics is the study of how objects move in space. Flight dynamics engineers create spacecraft trajectories and calculate design parameters, such as the necessary change in velocity required to move a spacecraft from one position to another, the propellant mass that the spacecraft needs to carry, and the maneuver durations that give the necessary energy to accomplish those tasks, among other relevant parameters.

The Ames Team is led by Laura Plice, an astrodynamics expert with extensive experience of flight projects in the industry. She led the trajectory and orbit design for the LADEE mission that sent a spacecraft to the Moon to study lunar regolith composition. LADEE's trajectory and mission operations were performed very successfully, exceeding all expectations. It continues to be a model mission for lunar flight dynamics. Other astrodynamics specialists on the Ames Team include Andres Dono, Joel Mueting, Tracie Conn, and Anthony Genova. All the members in the Team are actively pursuing research in the fields of formation flight and interplanetary trajectory design.

The Team utilizes advanced commercial tools, and custom algorithms to design creative and robust solutions that meet the science and engineering requirements of a mission. Each

Swarm Orbital Dynamics Advisor (SODA) controls the configuration of satellites in a distributed swarm mission. Image credit: NASA

The Ames Flight Dynamics Team **Breaking New Ground and Getting it Just Right! (continued)**

time a concept is proposed, the engineers meet to discuss the viable options for the trajectory design that satisfy the mission's constraints. This is followed by a preliminary analysis that limits the problem to a particular trade space. Knowing the viable orbit solutions is fundamental to mission design and enables the design of other spacecraft subsystems. As the mission design matures, the Team refines the trajectory by iterating and testing various solutions. This is done to ensure that the trajectory design ultimately chosen will be robust against anomalies that the spacecraft may encounter during the mission.

Over the last few years, several lunar trajectories have been studied at the MDC, consolidating the NASA Ames expertise in this type of mission. Those concepts include the Dark Ages Radio Explorer (DARE), which requires a low altitude lunar orbit that would use the Moon as a radio interference shielding from both the Earth and the Sun. The Team has studied several flyby missions in which the spacecraft travels very near a gravitational body without entering orbit. One such mission is BioSentinel, a 6U CubeSat that will perform a gravity assist at the Moon to gain enough energy to leave the Earth-Moon system and achieve a final orbit around the Sun. Additionally, other flyby concepts were analyzed including outer solar system flybys. The ELSA mission concept studied at the MDC presented an innovative trajectory that would perform consecutive flybys of the Jovian moons Europa and Callisto. Some of the most recent work includes the Arcus mission, which plans to perform lunar flyby to gain the necessary energy for insertion into a lunar resonant Earth orbit. The flyby is achieved by using a technique known as 'phasing loops' that utilizes several highly eccentric orbits to time a lunar encounter. After the flyby, the spacecraft is inserted into an orbit that takes advantage of the Moon and Earth's gravity to maintain stability without decaying into one of those celestial bodies. The same fundamental idea was previously utilized in other NASA missions such as IBEX and the more recent TESS space telescope that used similar resonances to find a stable orbit that would last over a hundred years and beyond.

In 2017, the flight dynamics Team designed the orbit and trajectory for two Research Opportunities in Earth and Space Science (ROSES)-awarded CubeSat mission concept studies, Aeolus and CubeX. The Aeolus mission concept consists of a Mars orbiting spacecraft that measures the wind environment of the red planet, while the CubeX mission involves mapping the lunar crust and mantle materials excavated by impact craters with an X-ray telescope. Both studies provide a proof of concept that CubeSats can be utilized to gather meaningful science data in interplanetary missions.

Recently, Ames has placed its focus on small satellite formations, or swarms. These consist of several spacecraft orbiting in close formation and combining their functionality to replace one larger monolithic satellite. The flight dynamics Team has been working on several different concepts that address the challenges associated with the deployment and maintenance of small spacecraft in close proximity. The relative orbit dynamics involved in the formation design can be quite complex. Only a small number of missions have presented the idea to operate spacecraft in close proximity for long durations, and most involve just two-satellite formations in Low-Earth Orbit.

The concept of dividing the capabilities and mission needs of one large expensive spacecraft between multiple smaller, more inexpensive spacecraft is currently being investigated at the MDC. This concept of fractionated space missions has the possible advantage of providing better data coverage and resolution for Earth-orbiting missions at a lower cost. For example, a common swarm mission application is interferometric synthetic aperture radar. This is a formation in which two satellites some distance apart along an orbit can produce high resolution radar images using interferometry. An ongoing challenge for these types of missions, however, are the operational complexity. Operating one spacecraft is already a formidable task. The MDC is studying methods of simplifying formation operations such that the level of effort during the operational phase of the mission does not simply multiply with the number of spacecraft in the swarm.

In an effort to meet this challenge, the MDC flight dynamics Team is developing a set of tools that can be used to facilitate swarm mission design and operations. The Swarm Orbital Dynamics Advisor (SODA) is a software suite currently in development that provides mission design engineers with the ability to design custom spacecraft formations in multiple dynamic environments. The aim of SODA is to automatically compute the necessary formation configuration and station-keeping maneuvers for any swarm mission, and to provide a platform to perform various trajectory trade studies. Thus, greatly reducing the time and effort of conventional trajectory design for this mission type. The flight dynamics Team envisions that tools like SODA could potentially be used in mission operations to plan, predict, and command swarm motion.

The ultimate goal is to automate individual spacecraft commanding such that an operator would only need to command the swarm as a whole to achieve some task, such as to perform an imaging campaign or reconfigure into a specified formation geometry. Eventually, this research could pave the way to autonomous spacecraft systems

Swarm mission concepts are gaining momentum as scientists are beginning to take advantage of a satellite formation's unique capabilities to enable ground-breaking measurements that were not possible before with single spacecraft or even largely spaced constellations of multiple satellites. Ames' Starling mission consists of a group of four Earth orbiting small spacecraft in close proximity that will test cutting edge relative navigation and inter-satellite communication technology. Swarm relative dynamics are not only being applied in LEO, however. The HelioSwarm mission concept proposes a swarm of at least 8 spacecraft that will measure solar wind in a formation outside the Earth's magnetic field.

All of these concepts and awarded missions require extensive work involving astrodynamics. In addition, other spacecraft subsystems also feed from data gathered in the simulations performed by the flight dynamics Team. This type of data can involve the application and study of various geometries for scientific observations, the range data to study link budgets for telecommunications, and the data needed for thermal analyses, just to name a few. The MDC flight dynamics Team plays a key role in practical mission design and provides a core capability that enables Ames NASA to propose, develop and fly future novel mission concepts. ■

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NASA's Solar System Exploration Research Virtual Institute (SSERVI)

www.nasa.gov/smallsat-institute

- Debra Reiss-Bubenheim

SSERVI Overview

NASA's Solar System Exploration Research Virtual Institute (SSERVI), sponsored by the NASA Science

Mission Directorate (SMD) and Human Exploration and Operations Mission Directorate (HEOMD), continues to enable the exchange of insights between the human exploration and space science communities, paving a clearer path for future space exploration.

SSERVI provides a unique environment for scientists and engineers to interact within multidisciplinary research teams regardless of their physical location. As a virtual institute, the best teaming arrangements can be made irrespective of the geographical location of individuals or laboratory facilities. The interdisciplinary science that ensues from virtual and in-person interactions, both within the teams and across team lines, provides answers to questions that many times cannot be foreseen. Much of this research would not be accomplished except for the catalyzing, collaborative environment enabled by SSERVI. The SSERVI Central Office, located at NASA Ames Research Center in Silicon Valley, CA, provides the leadership, guidance and technical support that steers the virtual institute.

In 2017 SSERVI added four new U.S. teams, bringing the institute total to 13 U.S. teams, and 10 international partnerships. International partnerships collaborate with SSERVI domestic teams on a no-exchange of funds basis, but they bring a richness to the institute that is priceless.

The international partner teams interact with the domestic teams in a number of ways, including sharing students, scientific insights, and access to facilities.

SSERVI's domestic teams compete for five-year funding opportunities through proposals to a Cooperative Agreement Notice (CAN) released by NASA every few years. Having overlapping CANs allows SSERVI to be more responsive to any change in direction NASA might experience, while providing operational continuity for the institute. Allowing new teams to blend with the more seasoned teams preserves corporate memory and expands the realm of collaborative possibilities. A key component of SSERVI's mission is to grow and maintain an integrated research community focused on questions related to the Moon, Near-Earth asteroids, and the moons of Mars.

SSERVI Central Office

• ***NESF***

SSERVI Central Office organizes and sponsors the annual NASA Exploration Science Forum (NESF), which brings together several hundred researchers to discuss topics ranging from modeling to mission science.

The 5th annual NASA Exploration Science Forum (NESF), will be held June 26-28th at NASA Ames Research Center, Moffett Field, CA, featuring scientific discussions regarding human exploration targets of interest (the Moon, near-Earth asteroids, and the moons of Mars).

SSERVI researchers teamed with GSFC's virtual science data team to produce landscapes for AR and VR. Here Alan Stern, PI of the New Horizons mission, uses VR goggles to explore a lunar analog environment in hi-def. Image Credit: NASA

• SSTP

The Solar System Treks Project is managed by the SSERVI Central Office, overseeing the JPL development team. This year witnessed significant changes as the Lunar Mapping and Modeling Project (LMMP) evolved into the Solar System Treks Project (SSTP) with a significantly expanded scope covering development of new portals for new target bodies, and involving an expanded user base. The original LMMP portal was retired and replaced by the new Moon Trek portal, featuring greatly enhanced data visualization capabilities, improved performance, new data layers, and new analysis tools. In 2017, the development team included the dramatic implementation of virtual reality.

• Regolith Test Bed

The SSERVI Central Office maintains the Regolith Testbed Facility at NASA Ames Research Center-- a sandbox filled with 8 tons of JSC-1A lunar regolith simulant. SSERVI-sponsored facilities can be made available to the broader scientific community. In 2017, SSERVI provided the facilities and operational support for innovative lighting research funded by the agency's Advanced Exploration Systems and Game Changing Development programs. Researchers tested special stereo-camera systems to improve stereo viewing capabilities and understand how robotic systems can navigate in the challenging lighting conditions at the lunar poles. The work produced a Polar Optical Lunar Analog Reconstruction (POLAR) dataset, providing standard information for rover designers and programmers to develop algorithms and sensors for safe navigation. The POLAR dataset is applicable not only to our Moon, but to other airless bodies, including Mercury, the asteroids, and regolith-covered moons like Mars' Phobos. Dr Uland Wong, a robotics researcher with the Intelligent Robotics Group at NASA Ames was interviewed about his work on the Polar Stereo Dataset at a Facebook Live Event on July 20th.

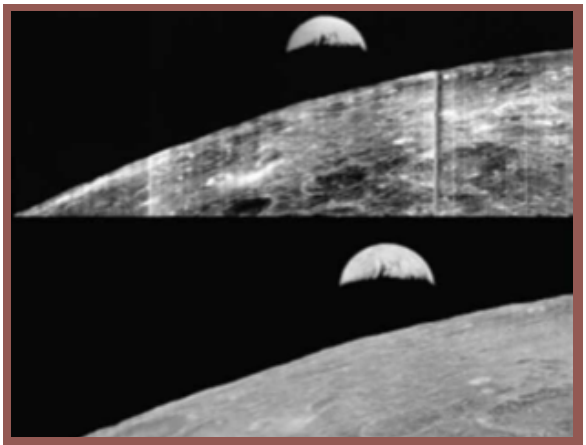
In 2017, SSERVI began keeping a comprehensive database of regolith simulants for the community.

The 4m x 4m x 0.5m testbed at NASA Ames is filled with 8 tons of JSC-1A regolith simulant--an excellent laboratory space for resource prospecting and regolith investigations. Image Credit: NASA

• LOIRP

NASA funded LOIRP to digitally reprocess the original lunar orbiter images that were integral to the safe Moon landing by Apollo astronauts, and the SSERVI Central Office

managed the project. In 2017, a comprehensive collection of images from all five Lunar Orbiters was recovered in optimal resolution/dynamic range and delivered to the Planetary Database System. The images have ~4x the dynamic range compared to the original images, with twice the average resolution of archived USGS images. These datasets will be critical to understanding the lunar cratering record over the past 50 years.



SSERVI Director Yvonne Pendleton, Center Director Eugene Tu, and SSERVI Deputy Director Greg Schmidt celebrate at the 10 year anniversary party.

SSERVI Director Yvonne Pendleton, Center Director Eugene Tu, and SSERVI Deputy Director Greg Schmidt celebrate at the 10 year anniversary party.

10 yr Anniversary photo

SSERVI (formerly NLSI) celebrated 10-years on Wednesday, April 11th, 2018. ■

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Small Spacecraft Systems Virtual Institute (S3VI)

- Debra Reiss-Bubenheim

www.nasa.gov/smallsat-institute

S3VI Overview

The mission of the S3VI is to advance the field of small spacecraft systems and allied sciences by promoting innovation, exploring new concepts, identifying emerging technology opportunities, and establishing effective conduits for collaboration and the dissemination of research results relevant to small spacecraft systems and subsystems.

The S3VI Central Office and Projects

The S3VI's central office is located at NASA Ames Research Center and is co-located in the NASA Research Park with the agency's other virtual institutes. The S3VI is co-sponsored by NASA's Space Technology Mission Directorate (STMD) and Science Mission Directorate (SMD) and is the common portal for NASA related small spacecraft activities.

A major function of the S3VI is to host the Small Spacecraft Body of Knowledge (SSBK) *https://www.nasa.gov/smallsat-institute/small-spacecraft-body-of-knowledge*, an online resource for NASA small spacecraft information,

including working group products, solicitations, and the report on Small Spacecraft Technology State of the Art. The SSBK will soon include a lessons learned library, systems test data, and reliability best practices.

In a recent interview with Bruce Yost, director of the S3VI, Bruce spoke about the small spacecraft parts databases that the institute is working to federate, meaning to interconnect them via a common search function. “Finding quality parts is an issue for NASA and commercial companies interested in developing and launching small spacecraft.” To help solve this challenge, the S3VI, in collaboration with the Air Force Research Laboratory (AFRL) established the first of several planned federated searchable databases called SmallSat Parts On Orbit Now (SPOON) to host tried-and-true quality parts for small spacecraft. The SPOON database will be followed by both NASA-developed and possibly other small spacecraft community established databases hosting not only parts, but papers, presentations, and test data. It is anticipated that this federated database set will be routinely cited in papers and will quickly gain traction in the commercial sector.

Director Yost also reported on very positive S3VI collaborations with Goddard Space Flight Center and the Jet Propulsion Laboratory and also stated that SMD is interested in increasing small spacecraft reliability for science applications. When asked about challenges facing the institute, Bruce replied “Funding!” Currently the institute is supported fifty-fifty between STMD and SMD. Yost outlined some future directions for the institute including interfacing with other agencies including the National Oceanic and Atmospheric Administration, as well as the, military. Another potential collaboration involves engaging with the international small spacecraft community. The S3VI will be presenting at an ESA (European Space Agency) conference this month .

The institute is hosting the 20th Annual Small Payload Rideshare Symposium June 12-14 at ARC as well as other workshops, working group meetings and conferences later in the calendar year. ■

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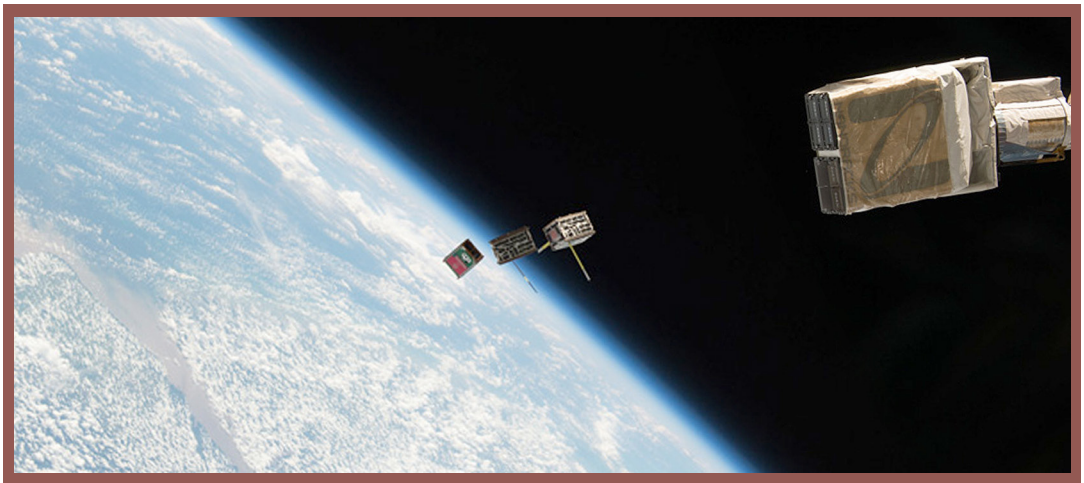


The St. Thomas More satellite, STMSat-1, and two NODeS satellites are released from the NanoRacks CubeSat deployer on the International Space Station. Image Credit: NASA

NASA Astrobiology Institute (NAI) *nai.nasa.gov/*

- Debra Reiss-Bubenheim

The NASA Astrobiology Institute (NAI) was established in 1998 as an innovative way to advance the field of astrobiology by providing a multidisciplinary, multi-institution, science-directed program, executed by universities, research institutes, NASA, and other government laboratories.

Created as a Virtual Institute, the first of four virtual institutes based at NASA Ames Research Center, it leverages NASA's investment through in-kind contributions from its teams, sharing students, facilities and resources. It utilizes virtual technology tools to enhance communication and eliminate geographical constraints enabling the competitively-selected teams to address NASA's current goals, regardless of where team members or infrastructure reside.

Located at NASA Ames, the NAI Central Office (NAI Central) forms the organizational, administrative, and collaborative hub for its domestic teams and international partners and is responsible for advocacy and ensuring the long-term health and relevance of the Institute. The NAI is led by Director Dr. Penny Boston.

Astrobiology is the study of the origins, evolution, distribution, and future of life in the universe. This interdisciplinary field requires a comprehensive, integrated understanding of biological, geological, planetary, and cosmic phenomena. Astrobiology encompasses the search for habitable environments in our Solar System and on planets around other stars; the search for evidence of prebiotic chemistry or life on Solar System bodies such as Mars, Jupiter's moon Europa, and Saturn's moon Titan; and research into the origin, early evolution, and diversity of life on Earth. Astrobiologists address three fundamental questions: How does life begin and evolve? Is there life elsewhere in the Universe? What is the future of life on Earth and beyond?

This yeaar, the NAI welcomes three new research teams to its ongoing portfolia of seven teams that are distributed across the U.S. Habitability of Hydrocarbon Worlds: Titan and Beyond Team at NASA's Jet Propulsion Laboratory (JPL), Pasadena, California

Dr. Rosaly Lopes will lead research at JPL focusing on Saturn's largest moon, Titan, to address what habitable environments may exist on the moon and what potential signatures of life would be expected, using data from the Cassini-Huygens mission. These data cover a wide swath of the moon, from beneath its surface all the way up through its thick atmosphere.

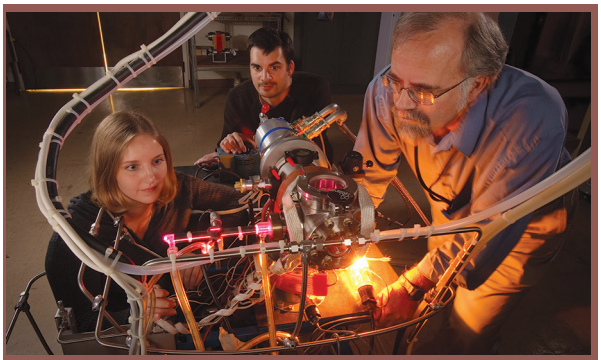
Evolution of Nanomachines in Geospheres and Microbial Ancestors (ENIGMA) Team at Rutgers University, New Brunswick, New Jersey.

The NASA Ames hyperwall allows researchers to view and interact with lareg simulations at a high resolution. Image Credit: NASA

Led by Professor Paul Falkowski, the ENIGMA team will investigate how proteins evolved to become the catalysts of life on Earth by looking at prebiotic molecules and enzymes that are ancestral and common across many types of microbes.

The Astrobiology Center for Isotopologue Research (ACIR) Team at Pennsylvania State University, University Park, Pennsylvania

ACIR, led by Professor Kate Freeman, will address how the features of elements within molecules reveal the origins and history of organic compounds, from compounds that arrived from planetary environments to those that were derived from metabolic systems, using cutting-edge observational and computational tools.



NASA scientists studying the origin of life. Left to right: Stefanie Milam, Michel Nuevo and Scott Sandford. Image Credit: Dominic Hart/NASA

Each interdisciplinary team will bring unique capabilities and expertise to NASA's Astrobiology Program, and the collaborative structure of the NAI will provide for productive interactions not only across these teams, but with the current NAI teams and its International Partners.

International Partners

The NASA Astrobiology Institute has developed a partnership program with other international astrobiology organizations to provide collaborative opportunities for its researchers within the global science community (Fig. 4). Addressing astrobiology's research objectives

NAI Executive Council and guests inside the Edgar Experimental Mine in Idaho Springs, CO, for the in-person meeting May 15-16, 2018, hosted by the CUB team. Image Credit: NASA

requires international collaboration to facilitate full access to critical field sites and facilities, interdisciplinary scientific expertise, and unique mission data. International partners are invited to participate in all aspects of the Institute's activities and programs, and the mutual exchange of researchers and students is highly encouraged. Through these and other activities, NAI researchers and international partners exchange ideas, information, and data arising from their respective research efforts, and contribute to the training of early-career astrobiologists.

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Office of the Chief Scientist (OCS) Corner

The Office of the Chief Scientist continues with the 2018 NASA Ames Summer Series. This year, the OCS has produced a platform for innovative discussion to inspire, catalyze scientific progress, share ideas, and communicate new and exciting concepts. The 2018 Series consists of 10 seminars from a collection of subject leaders from and external to NASA spanning across multiple subject areas including science and technology, science fiction and exploration.

For more information, please visit: *https://www.nasa.gov/ames/ocs/summerseries/2018*.

The seminars are held from 11:00 a.m. – 12:00 p.m. in the Syvertson Auditorium (N201).

Wednesday, June 6 - Claire Max – Adaptive Optics for Astronomy: Achievements and Prospects

Wednesday, June 13 - Philip Lubin – STARLIGHT - Directed Energy for Relativistic Propulsion

Tuesday, June 19 - Tori Hoehler – Life in the Deep, Dark places

Wednesday, June 27
David J. Smith – Ocean of Life in the Sky

Tuesday, July 17 - Douglas Caldwell – Exoplanets - Moving from Discovery to Understanding

Wednesday, July 25 - Kevin Hand – Ocean Worlds of the Outer Solar System

Wednesday, August 1 - Michael Lowry – Software Engineering in the Era of Neuromorphic Computing

Wednesday, August 8 - W. Bruce Banerdt – InSight: Journey to the Center of Mars

Wednesday, August 15 - Randall Smith – Arcus - Exploring the Formation and Structure of the Universe

Wednesday, August 22 - Parimal Kopardekar – Airspace Operations Management

Upcoming Activities & Events – June 2018 to January 2019

NASA Solicitations

Science Mission Directorate (SMD) Opportunities
2018 Heliophysics Technology Demonstration Mission of Opportunity via SALMON-3
Community Announcement NNH18ZDA008L

External Solicitations

Defense Advanced Research Projects Agency (DARPA) Information Innovation Office (I2O) Office-wide
<*https://www.fbo.gov/index?s=opportunity&mode=form&id=c34b746c900150006de2fc322d0ac408&tab=core&_cview=1*>
Solicitation Number: HR001117S0048

I2O seeks unconventional approaches that are outside the mainstream, challenge accepted assumptions, and have the potential to radically change established practice. Proposed research should investigate innovative approaches that enable revolutionary advances in science, devices, or systems. • **RESPONSE DATE**: August 31, 2018 12:00pm Eastern

National Science Foundation
Division of Chemical, Bioengineering, Environmental
and Transport Systems
Nano-Biosensing <*https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505340*> Solicitation
Number: PD 17-7909 • **FULL PROPOSAL WINDOW**: October 1, 2018 - October 22, 2018

National Science Foundation
Directorate for Computer & Information Science & Engineering Cyberlearning for Work at the Human-Technology Frontier
https://www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=504984&ods_key=nsf17598
Solicitation Number: NSF 17-598

The purpose of the Cyberlearning for Work at the Human-Technology Frontier program is to fund exploratory and synergistic research in learning technologies to prepare learners to excel in work at the human-technology frontier. Learning technology research in this program should be informed by the convergence of multiple disciplines: education and learning sciences, computer and information science and engineering, and cognitive, behavioral and social sciences.• **RESPONSE DATE**: Jan.14, 2019

Events & Conferences

August 4-9, 2018
32nd Small Satellite Conference
https://smallsat.org
Logan, Utah

September 6, 2018
Ames Research and Technology Showcase (ARTS)
https://www.nasa.gov/centers/ames/cct/arts
NASA Ames Conference Center

September 17-19, 2018
International Union of Theoretical and Applied Mechanics Symposium on Architectured Material Mechanics
http://iutam.org/event/iutam-symposium-on-architectured-material-mechanics/
Chicago, Illinois

September 25-26, 2018
TMS Machine Learning for Materials Science 2018
Embassy Suites, Pittsburgh, Pennsylvania

October 14-17, 2018
4th International Conference on Bioinspired and Biobased Chemistry & Materials
http://www.unice.fr/nice-conference/
Nice, France

November 25-30, 2018
2018 Materials Research Society
https://www.mrs.org/fall-2018-call-for-papers
Boston, Massachusetts

January 12-17, 2019
International Union of Theoretical and Applied Mechanics Symposium on Phase Transformation in Shape Memory Materials: Modeling and Applications
http://iutam.org/event/iutam-symposium-on-phase-transformation-in-shape-memory-materials-modeling-and-applications/
Austin, Texas

Awards

Drone Traffic Management Researcher Parimal Kopardekar nominated as a finalist for the 2018 Samuel J. Heyman Service to America Awards

Parimal Kopardekar from NASA Ames designed a first-of-its-kind traffic management system for unmanned aerial vehicles, paving the way for large-scale use of commercial drones. For his work in this area, Kopardekar has been selected as a finalist for the 2018 Samuel J. Heyman Service to America Awards. The "Sammies" highlight excellence in the federal workforce, and Kopardekar is a finalist for this year's Promising Innovations Medal.

Twenty-seven Sammies finalists are eligible for this special recognition. The Sammies have a People's Choice Award where you can cast your vote for as many finalists as you want, submitting your votes once per day. Visit the site below to view the profiles of this year's finalists and vote for those who have made the most outstanding contributions to the federal government and our society:

https://servicetoamericamedals.org/peoples-choice/index.php

APPEL Courses

Held Around the Agency

COURSE: Creativity and Innovation
https://appel.nasa.gov/course-catalog/appel-ci/
DATES: GRC **Aug 14-16, 2018**
MSFC **Sep 17-19, 2018**
Registration Open

COURSE: Cognitive Bias in Engineering Decision-Making (APPEL-CBED)
https://appel.nasa.gov/course-catalog/cognitive-bias-in-engineering-decision-making-appel-cbed/
DATES: ARC **September 12, 2018**
Registration Open
Registration Cut-off Date:
August 29, 2018

Essentials of Astronomy for NASA Engineers
(Appel-Astro)
https://appel.nasa.gov/course-catalog/appel-astro/
Registration: Open online all year

For more information on APPEL visit:
https://appel.nasa.gov

The NASA Ames TechByte newsletter is produced and edited by the Office of the Chief Technologists. If you have an interesting article you would like to contribute, please send an email with: your name, Ames organization code, work phone number, and a brief (1 paragraph) description of your potential contribution to: jill.bauman@nasa.gov.