



2014 NIAC Symposium

Stanford University, Stanford, CA - February 4-6, 2014



Tuesday, February 4

- 8:30 **Welcoming Remarks** *Prof. Charbel Farhat Chair of Aeronautics & Astronautics, Stanford University*
- 8:40 **Introduction & Overview** *Jay Falker, NIAC Program Executive*
- 9:00 **Keynote Address** *Jamie Hyneman, Host & Executive Producer of Mythbusters
"Innovation, Explosives and the Benefit of Adolescent Behavior"*
- 10:00 Break**
- 10:10 **Special Address** *S. Pete Worden, Center Director, NASA Ames Research Center*
- 10:30 *Robert Winglee, University of Washington, Seattle, 2013 Phase II Fellow*
Sample Return Systems for Extreme Environments
- 11:00 *David Wettergreen, Carnegie Mellon University, 2013 Phase II Fellow*
Nomadic Exploration: Following routes of solar sustenance and temperate climate
- 11:30 **Invited Speaker** *Gary Hudson, Space Studies Institute
"A Matter of Some Gravity"*
- 12:00 Lunch**
- 1:30 S. J. Ben Yoo, University of California, Davis, 2013 Phase I Fellow
Low-Mass Planar Photonic Imaging Sensor
- 2:00 Christopher Walker, Univ. of Arizona, 2013 Phase I Fellow
10 meter Sub-Orbital Large Balloon Reflector (LBR)
- 2:30 Adrian Stoica, NASA Jet Propulsion Laboratory, 2013 Phase I Fellow
Transformers For Extreme Environments
- 3:00 Joshua Rovey, University of Missouri, Rolla, 2013 Phase I Fellow
Plasmonic Force Propulsion Revolutionizes Nano/PicoSatellite Capability
- 3:30 Break (Stanford Student Poster Sessions will be posted)**
- 4:00 *Bong Wie, Iowa State University, 2012 Phase II Fellow*
An Innovative Solution to NASA's NEO Impact Threat Mitigation Grand Challenge and Flight Validation Mission Architecture Development
- 4:30 *William Whittaker, Astrobotic Technology, Inc., 2012 Phase II Fellow*
Cavehopping Exploration of Planetary Skylights and Tunnels
- 5:00 *Shayne Westover, NASA Johnson Space Center, 2012 Phase II Fellow*
Radiation Protection and Architecture Utilizing High Temperature Superconducting Magnets
- 5:30 Adjourn**
- 7:00 7:00-8:30PM Special Event at the SETI Institute, "Private Funding Opportunities for Space Research"**



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Wednesday, February 5

- 8:30 **NIAC Plans and Announcements** *Jay Falker, NIAC Program Executive*
- 9:00 **Keynote Address** *Peter Norvig, Director of Research, Google Inc.*
- 10:00 Break**
- 10:30 *Babak Saif, NASA Goddard Space Flight Center, 2013 Phase II Fellow*
A Gravitational Wave Detector Based on an Atom Interferometer
- 11:00 *Vytas SunSpiral, NASA Ames Research Center, 2013 Phase II Fellow*
Super Ball Bot - Structures for Planetary Landing and Exploration
- 11:30 Lunch**
- 1:00 *Lynn Rothschild, NASA Ames Research Center, 2013 Phase I Fellow*
Biomaterials out of thin air: in situ, on-demand printing of advanced biocomposites
- 1:30 *Thomas Prettyman, Planetary Science Institute, 2013 Phase I Fellow*
Deep Mapping of Small Solar System Bodies with Galactic Cosmic Ray Secondary Particle Showers
- 2:00 *Mark Moore, NASA Langley Research Center, 2013 Phase I Fellow*
Eternal Flight as the Solution for 'X'
- 2:30 *Anthony Longman, Anthony P. Longman, 2013 Phase I Fellow*
Growth Adapted Tensegrity Structures - A New Calculus for the Space Economy
- 3:00 Break (Stanford Student Poster Sessions will be posted)**
- 3:30 *Berok Khoshnevis, University of Southern California, 2012 Phase II Fellow*
ISRU-Based Robotic Construction Technologies for Lunar and Martian Infrastructures
- 4:00 *John Slough, MSNW LLC, 2012 Phase II Fellow*
The Fusion Driven Rocket: Nuclear Propulsion through Direct Conversion of Fusion Energy
- 4:30 *Kendra Short, NASA JPL, 2012 Phase II Fellow*
Printable Spacecraft: Flexible Electronic Platforms for NASA Missions
- 5:00 *Joe Ritter, Neoteric Physics, Inc., 2012 Phase II Fellow*
OCCAMS: Optically Controlled and Corrected Active Meta-material Space Structures
- 5:30 Adjourn**



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Thursday, February 6

- 8:30 **NIAC Phase II Q&A and Other Topics** *Jay Falker, NIAC Program Executive*
- 9:00 *Keynote Address* *Seth Shostak, Senior Astronomer, SETI Institute*
 "Finding Cosmic Company: A Transformative Event of the 21st Century"
- 10:00 Break**
- 10:30 Robert Hoyt, Tethers, Unlimited, Inc., 2013 Phase II Fellow
 SpiderFab: Architecture for On-Orbit Construction of Kilometer-Scale Apertures
- 11:00 *Young K. Bae, Y.K. Bae Corporation, 2013 Phase II Fellow*
 Propellant-less Spacecraft Formation-Flying and Maneuvering with Photonic Laser Thrusters
- 11:30 Lunch**
- 1:00 *Nathan Jerred, Universities Space Research Association, 2013 Phase I Fellow*
 Dual-mode Propulsion System Enabling CubeSat Exploration of the Solar System
- 1:30 *Hamid Hemmati, NASA Jet Propulsion Laboratory, 2013 Phase I Fellow*
 Two-Dimensional Planetary Surface Landers
- 2:00 *John Bradford, SpaceWorks Engineering, 2013 Phase I Fellow*
 Torpor Inducing Transfer Habitat For Human Stasis To Mars
- 2:30 *Rob Adams, NASA Marshall Space Flight Center, 2013 Phase I Fellow*
 Pulsed Fission-Fusion (PuFF) Propulsion System
- 3:00 Break (Stanford Student Poster Sessions will be posted)**
- 3:30 *David Miller, Massachusetts Institute of Technology, 2012 Phase II Fellow*
 High-Temperature Superconductors as Electromagnetic Deployment and Support Structures
- 4:00 *Dmitry Strelakov, NASA Jet Propulsion Laboratory, 2012 Phase II Fellow*
 Ghost Imaging of Space Objects
- 4:30 *Kevin Duda, The Charles Stark Draper Laboratory, Inc., 2012 Phase II Fellow*
 Variable Vector Countermeasure Suit (V2Suit) for Space Habitation and Exploration
- 5:00 Adjourn**



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ABOUT NIAC:

The NASA Innovative Advanced Concepts (NIAC) Program supports early studies of visionary concepts that could one day “change the possible” in space and aeronautics. NIAC studies develop and assess revolutionary, yet credible, aerospace architecture, mission, and system concepts. They aim to enable far-term capabilities, and spawn exciting innovations to radically improve aerospace exploration, science, and operations.

NIAC also contributes to the Nation's leadership in key research and technology areas, and fosters outreach, education, and economic benefits. Part of the Space Technology Mission Directorate, NIAC is the most open-ended and far-reaching program in NASA.

SYMPOSIUM SPEAKERS:



Jamie Hyneman **Host & Executive Producer of Mythbusters**

Dr. Jamie Hyneman, currently host and executive producer for Mythbusters, now in its 11th year on the Discovery channel, came to that role along a path that sounds like something right out of fiction.

Raised on an apple orchard in Indiana, he left home at 14. After high school, he purchased and ran a pet store for some years, then acquired a degree in Russian linguistics from Indiana University. He has worked at the UN in Geneva, has worked as a cook, in construction, as a concrete inspector, and at one point moved to the Caribbean and became a captain in a charter diving and sailing boat business.

Eventually he decided to get into special effects for film, and soon had his own effects facility which he ran for about a decade before becoming a host on Mythbusters. Mythbusters has received praise across the world for its effect on popularizing science and engineering. It airs in over 160 countries, is one of the most successful and long running Discovery Channel brands in its history, and Dr. Hyneman and his team have been called to the White House repeatedly for support in the STEM initiative. Outside of Mythbusters, Dr. Hyneman has been developing a range of innovative products, from new types of armor to robots, to flying Humvees, to automated camera systems. One of his robot designs has been considered by NASA as a scout robot for Mars missions.



Peter Norvig
Director of Research
Google, Inc.

Peter Norvig is a Director of Research at Google Inc. Previously he was head of Google's core search algorithms group, and of NASA Ames's Computational Sciences Division, making him NASA's senior computer scientist. He received the NASA Exceptional Achievement Award in 2001. He has taught at the University of Southern California and the University of California at Berkeley, from which he received a Ph.D. in 1986 and the distinguished alumni award in 2006. He was co-teacher of an Artificial Intelligence class that signed up 160,000 students, helping to kick off the current round of massive open online classes. He has over fifty publications in Computer Science, concentrating on Artificial Intelligence, Natural Language Processing and Software Engineering, including the books *Artificial Intelligence: A Modern Approach* (the leading textbook in the field), *Paradigms of AI Programming: Case Studies in Common Lisp*, *Verbmobil: A Translation System for Face-to-Face Dialog*, and *Intelligent Help Systems for UNIX*. He is also the author of the Gettysburg Powerpoint Presentation and the world's longest palindromic sentence. He is a AAAI Fellow, ACM Fellow, and American Academy of Arts & Sciences Member.



Seth Shostak
Senior Astronomer, SETI Institute

Seth is the Senior Astronomer at the SETI Institute, in Mountain View, California. He has an undergraduate degree in physics from Princeton University, and a doctorate in astronomy from the California Institute of Technology. For much of his career, Seth conducted radio astronomy research on galaxies, and has published approximately sixty papers in professional journals.

He has written more than four hundred popular magazine, newspaper and Web articles on various topics in astronomy, technology, film and television. He lectures on astronomy and other subjects at Stanford and other venues in the Bay Area, and for six years was a Distinguished Speaker for the American Institute of Aeronautics and Astronautics. He was Chair of the International Academy of Astronautics' SETI Permanent Committee. Every week he hosts the SETI Institute's science radio show, "Big Picture Science"

Seth has written, edited and contributed to a half dozen books. His most recent tome is *Confessions of an Alien Hunter: A Scientist's Search for Extraterrestrial Intelligence* (National Geographic).



Charbel Farhat
Chair, Department of Aeronautics & Astronautics, Stanford University

Charbel Farhat is the Vivian Church Hoff Professor of Aircraft Structures and Chairman of the Department of Aeronautics and Astronautics at Stanford University. He is also Professor of Mechanical Engineering, Professor in the Institute for Computational and Mathematical Engineering, and Director of the Army High Performance Computing Research Center. He is a member of the National Academy of Engineering, a designated ISI Highly Cited Author in Engineering by the Institute for Science Information (ISI) Web of Knowledge, Thomson Scientific Company, and a Fellow of six international

societies. He also currently serves on the United States Bureau of Industry and Security's Emerging Technology and Research Advisory Committee (ETRAC) at the United States Department of Commerce.



S. Pete Worden
Center Director, NASA Ames Research Center

Dr. Simon P. Worden (Brig. Gen., USAF, ret.) is the center director at NASA Ames Research Center where he leads a staff of nearly 2,500 civil servants and contractors and oversees an annual budget of approx. \$800 million providing the critical R&D support that makes NASA's and the nation's aeronautics and space missions possible.

In just three years, Worden has completely transformed Ames, reinvigorating the center's workforce and taking a leadership role in important, cost-effective small satellite missions.

Worden has also put Ames on the critical path for all major NASA space exploration missions through effective use of the center's unique wind tunnels, arc jets, intelligent systems and supercomputer facilities and capabilities. Worden's 'GreenSpace' initiative has brought Ames' remote sensing capabilities to bear on air traffic safety, fighting forest fires, and the study of climate change. And Ames' new Sustainability Base facility will serve as a model for future eco-friendly, high-performance federal buildings. In recognition of these outstanding achievements, Worden was named the Federal Laboratory Consortium's Laboratory Director of the Year for 2009.

Prior to becoming Ames' director, Worden was a Research Professor of Astronomy, Optical Sciences and Planetary Sciences at the University of Arizona where his primary research direction was the development of large space optics for national security and scientific purposes and near-earth asteroids. Additionally, he worked on topics related to space exploration and solar-type activity in nearby stars. He is a recognized expert on space issues — both civil and military. He has authored or co-authored more than 150 scientific technical papers in astrophysics, space sciences, and strategic studies. Moreover, he served as a scientific co-investigator for two NASA space science missions.

In addition to his former position with the University of Arizona, Worden previously served as a consultant to the Defense Advanced Research Projects Agency (DARPA) on space-related issues. In 2004, he worked as a Congressional Fellow and chief advisor to the Chairman of the US Senate Subcommittee on Science and Space regarding NASA and space issues.

Worden retired in 2004 after 29 years of active service in the United States Air Force. His final position was Director of Development and Transformation, Space and Missile Systems Center, Air Force Space Command, Los Angeles Air Force Base, CA.



Gary Hudson, President
The Space Studies Institute

Gary C Hudson is President and a Trustee of the Space Studies Institute, a 501(c)3 nonprofit organization dedicated to advancing the technologies necessary for permanent human settlement of space (ssi.org). He was founder and CEO of several commercial space enterprises, including the Transformational Space Corporation (t/Space), Rotary Rocket Company and AirLaunch LLC. His work at t/Space led directly to the NASA COTS-Commercial Crew Program. He is a co-recipient of an Aviation Week & Space Technology Laurel Award for the DC-X Program (1994), a recipient of the Founder's Award of the Space Frontier Foundation and an inductee of the International Space Hall of Fame, as well as a Fellow of the British Interplanetary Society and an Associate Fellow of the AIAA. He has 45 years experience in the space industry focusing mainly on low-cost access to space and advanced propulsion.