



POSSUM SCIENTIST-ASTRONAUT QUALIFICATION PROGRAM

and 2015 PoSSUM Academy



Class 1502 and Class 1503
October 4-14, 2015

Embry-Riddle Aeronautical University, Daytona Beach, FL

www.projectpossum.org

3 October 2015

Dear PoSSUM Scientist-Astronaut Classes 1502 and 1503,

On behalf of Project PoSSUM, I would like to welcome you all to the Project PoSSUM scientist-astronaut class. This is an exciting time for everyone involved with Project PoSSUM, and your class marks a first step towards a great new era of citizen-science in our upper atmosphere.

In the next five days, you will embark upon a journey to understand the basic science behind the PoSSUM research program and we will assess your abilities to perform in simulated PoSSUM missions. Our Scientist-Astronauts enable cutting edge research and also serve as ambassadors that can engage and educate the public about the upper atmosphere and the vital role that it plays in the study of our global climate.

Even though man has maintained a presence in orbit for decades, the mesosphere is still largely an unknown. The mesosphere is a region that we have only briefly transited in our forays to orbital space. It is a region that harbors strange 'space clouds', strange electrical phenomena, and ionization that brings silence to vehicles reentering through it. It is an area too high to access by balloon or aircraft yet too low to access by orbital spacecraft. It is the most unknown part of our atmosphere, and yet soon we will have the means to access this elusive region and claim our presence there. Our PoSSUM scientist-astronauts will be the first explorers of the mesosphere, not just travelers passing through to orbit or returning from orbit, but there to understand.

As the tourist travels 'away from'; the explorer travels 'towards'. At the core, a scientist is an explorer; an explorer travels with an unbiased mind seeking to understand. To the explorer, the journey is the classroom. The explorer welcomes surprise. The explorer invites challenge to his assumptions and beliefs. The explorer realizes that everything and everyone that crosses the journey brings a lesson and an opportunity to grow, and welcomes the changes these influences bring. And as the explorer's environs reveal their secrets, the explorer accepts a responsibility to preserve the beauty of what is seen and experienced. The explorer becomes an ambassador and advocate of all that reveals itself during the journey, because one can never regain the ignorance of the times before the journey started.

We wish you all an exciting and rewarding week as you embark on your first step to becoming an explorer of the mesosphere and an ambassador of Project PoSSUM.

A handwritten signature in black ink, appearing to read 'J. Reimuller', with a stylized, sweeping underline.

Dr. Jason D. Reimuller, PhD
Executive Director/Principal Investigator
Project PoSSUM, Inc.

PoSSUM Class 1502 Schedule

SATURDAY October 3rd, 2015 at Embry-Riddle Aeronautical University, Daytona Beach, FL.

6:30 PM Reception. Pick up instructional materials and flight suits

SUNDAY October 4th, 2015 at Southeast Aeromedical institute (SAMI), Melbourne, FL.

6:30 AM	Transport to SAMI Facility	
8 AM	Concepts of Hypoxic effects on Spaceflight Crews	Buza
9 AM	High-Altitude Simulation and Slow-Onset Hypoxia Effects	Buza
12 PM	LUNCH (provided). Introduction to PoSSUM	Reimuller
1 PM	High-Altitude Simulation and Slow-Onset Hypoxia Effects	Buza
4 PM	Biometric System Operations	Komatireddy
5:30 PM	DINNER at El Ambio Cubano, Melbourne, FL.	
7:30 PM	Transport to Embry-Riddle University	

MONDAY October 5th, 2015 at Embry-Riddle Aeronautical University, Daytona Beach, FL.

8 AM	Introduction to the Mesosphere	Reimuller
9 AM	Noctilucent Clouds and Scattering	Fritts
10 AM	Observing Geometry during Suborbital Flight	Reimuller
11AM	Education and Public Outreach	Guined
12 PM	LUNCH (ERAU Cafeteria)	
1 PM	Aerospace Physiology for Spaceflight Crews	Seedhouse
2 PM	Spacecraft Life Support Systems	Seedhouse
3 PM	PoSSUMSim Operations and practice	Carlstrom
4 PM	PoSSUMCam Operations	Wampler
5 PM	DINNER	
7:30PM	KEYNOTE SPEAKER: Spacesuit Operations	Mr. Nikolay Moiseev

TUESDAY October 6th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

*Monday and Tuesday events will revolve, so teams will not necessarily perform events at the timeframes listed below.

8 AM	Crew Resource Management Training in PoSSUMSim	Seedhouse
12 PM	Lunch at Embry-Riddle University	
1 PM	Spacesuit Operations Training	Moiseev, Love
3 PM	Full Simulation with Spacesuits	Seedhouse
5 PM	DINNER	
	Dinner at Hotel	
7:30 PM	KEYNOTE SPEAKER: Aerospace Medicine	Dr. Perry Bechtle, MD

WEDNESDAY October 7th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

8AM - 12AM	High-G Operations, biometrics	Wagstaff
12 PM	LUNCH at Embry-Riddle University	
1PM - 4 PM	High-G Ops with Anti-G garments	Wagstaff
4 PM	Debrief and Graduation	
5 PM	Dinner and Graduation Party	

THURSDAY October 8th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

Reserved as a weather day and for remedial work

PoSSUM Class 1503 Schedule

FRIDAY October 9th, 2015 at Embry-Riddle Aeronautical University, Daytona Beach, FL.

6 PM	Reception. Pick up instructional materials and flight suits	
7:30 PM	KEYNOTE SPEAKER: Spacesuit Operations	Nikolay Moiseev

SATURDAY October 10th, 2015 at Embry-Riddle Aeronautical University, Daytona Beach, FL.

8 AM	Introduction to the Mesosphere	Reimuller
9 AM	Noctilucent Clouds and Scattering	Fritts
10 AM	Observing Geometry during Suborbital Flight	Reimuller
11 AM	Education and Public Outreach	Guined
12 PM	LUNCH (ERAU Cafeteria)	
1 PM	Aerospace Physiology for Spaceflight Crews	Seedhouse
2 PM	Spacecraft Life Support Systems	Seedhouse
3 PM	PoSSUMSim Operations and practice	Carlstrom
4 PM	PoSSUMCam System Operations	Wampler
5 PM	DINNER	Carlstrom
7:30 PM	KEYNOTE SPEAKER: Aerospace Medicine	Dr. Perry Bechtel, MD

SUNDAY October 11th, 2015 at Southeast Aeromedical institute (SAMI), Melbourne, FL.

6:30 AM	Transport to SAMI Facility	
8 AM	Concepts of Hypoxic effects on Spaceflight Crews	Buza
9 PM	High-Altitude Simulation and Slow-Onset Hypoxia Effects	Buza
12 PM	LUNCH (provided)	
1 PM	High-Altitude Simulation and Slow-Onset Hypoxia Effects	Buza
3 PM	High Altitude Spacesuit demonstration	TBD
4 PM	Biometric System Operations	Komatireddy
5:30 PM	DINNER at El Ambio Cubano, Melbourne, FL.	
7:30 PM	Transport to Embry-Riddle University	

MONDAY October 12th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

*Monday and Tuesday events will revolve, so teams will not necessarily perform events at the timeframes listed below.

8 AM	Crew Resource Management Training in PoSSUMSim	Seedhouse
12 PM	Lunch at Embry-Riddle University	
1 PM	Spacesuit Operations Training	Moiseev, Love
3 PM	Full Simulation with Spacesuits	Seedhouse
5 PM	DINNER	

TUESDAY October 13th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

8AM - 12AM	High-G Operations, biometrics	Wagstaff
12 PM	LUNCH at Embry-Riddle University	
1PM - 4 PM	High-G Ops with Anti-G garments	Wagstaff
4 PM	Debrief and Graduation	
5 PM	Dinner and Graduation Party	

WEDNESDAY October 14th, 2015 at Embry Riddle Aeronautical University, Daytona Beach, FL.

Reserved as a weather day and for remedial work

Project PoSSUM Scientist-Astronaut Webinar Schedule

Project PoSSUM Scientist-Astronaut Webinar 1 (Meeting Password: possum)

Time Option 1: Thu, Sep 10, 2015 8:00 AM - 9:00 AM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/375890373>

You can also dial in using your phone.

United States : +1 (626) 425-3113

Access Code: 375-890-373

Time Option 2: Thu, Sep 10, 2015 8:00 PM - 9:00 PM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/848737645>

You can also dial in using your phone.

United States : +1 (571) 317-3112

Access Code: 848-737-645

Project PoSSUM Scientist-Astronaut Webinar 2 (Meeting password: possum)

Time Option 1: Thu, Sep 17, 2015 8:00 AM - 9:00 AM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/802966301>

You can also dial in using your phone.

United States : +1 (408) 650-3123

Access Code: 802-966-301

Time Option 2: Thu, Sep 17, 2015 8:00 PM - 9:00 PM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/640889381>

You can also dial in using your phone.

United States : +1 (571) 317-3122

Access Code: 640-889-381

Project PoSSUM Scientist-Astronaut Webinar 3 (Meeting password: possum)

Time Option 1: Thu, Sep 24, 2015 8:00 AM - 9:00 AM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/518373093>

You can also dial in using your phone.

United States : +1 (571) 317-3112

Access Code: 518-373-093

Time Option 2: Thu, Sep 24, 2015 8:00 PM - 9:00 PM Mountain Standard Time

Please join my meeting from your computer, tablet or smartphone.

<https://global.gotomeeting.com/join/538707109>

You can also dial in using your phone.

United States : +1 (312) 757-3121

Access Code: 538-707-109



PoSSUM Management

Dr. Jason Reimuller
Dr. Dave Fritts
Jamie Guined

Executive Director
Chief Scientist
Program Manager

PoSSUM Science Leads

Dr. Gary Thomas
Dr. Mike Taylor
Dr. Steve Mitchell
Dr. Gerald Lehmacher
Dr. Zoltan Sternovsky
Dr. Kathy Mandt

PMC Science Lead
Infrared Imagery Lead
LiDAR Systems Lead
PMC Temperatures Lead
Particle Detection Lead
Atmospheric Sampling Lead

PoSSUM Instructors

Dr. Paul Buza
Nikolay Moiseev
Dr. Erik Seedhouse
Patty Wagstaff
Van Wampler
Michael Marco
Shiloh Dudley
Kari Love
Parker Rice

PoSSUM Instructor
PoSSUM Instructor
PoSSUM Instructor
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PoSSUM Instructor
PoSSUM Instructor
PoSSUM Instructor
PoSSUM Instructor

Embry-Riddle Simulation

Dr. Erik Seedhouse
Nicholas Carlstrom

Simulation Manager
Simulation Technician



Dr. Jason Reimuller, Ph.D.



Dr. Jason Reimuller is a Research Scientist with the Space Science Institute and President of Integrated Spaceflight Services, serving as Principal Investigator of Project PoSSUM (Polar Suborbital Science in the Upper Mesosphere) campaign to study the polar mesosphere and noctilucent cloud structures using manned reusable launch vehicles. Jason is also leading the development of spacecraft egress training modules, training simulators, and analog space training capability. In addition, Jason works as a commercial research pilot and flight test engineer with GATS, Inc., is a NAUI SCUBA Divemaster, and is the author of "Spacecraft Egress and Rescue Operations."

Jason served for six years as a systems engineer and project manager for NASA's Constellation Program, leading studies on launch aborts, launch commit criteria, landing conditions, post-landing and emergency crew egress trades, and propulsion options. Jason also led a NASA and NSF-funded flight research campaign to study noctilucent cloud time evolution, structure, and dynamics in Northern Canada as lead investigator and pilot-in-command, then further applied his background in airborne remote sensing to conduct research in glaciology to better understand the dynamic changes of the Greenlandic Ice Sheet as part of NASA's Operation ICE Bridge. Jason has been a Commissioned Officer of the US Air Force and a spacecraft flight director for Space Systems Loral.

Jason holds a Ph.D. in Aerospace Engineering Sciences from the University of Colorado in Boulder. He also holds an M.S. degree in Physics from San Francisco State University, an M.S. degree in Aviation Systems from the University of Tennessee, an M.S. Degree in Aerospace Engineering from the University of Colorado, and a B.S. degree in Aerospace Engineering from the Florida Institute of Technology.



Dr. Dave Fritts, Ph.D.



Dr. Dave Fritts has worked in a number of areas of atmospheric dynamics extending from the stable boundary layer (SBL) into the thermosphere, acquiring broad experience with theoretical, modeling, and experimental activities. He has guided a number of experimental programs, including rocket campaigns in Alaska, Norway, Sweden, and Brazil, radar measurements on six continents, and multi-instrument field programs. He has installed MF or meteor radars at Hawaii, McMurdo, Rothera, Rarotonga, Tierra del Fuego (TdF), and King George Island (KGI), participated in the planning of the ALOMAR lidar/radar observatory in northern Norway, and suggested the formation and structure of the NSF-funded Consortium of Resonance and Rayleigh Lidars (CRRL) within which he serves as PI for the ALOMAR sodium lidar. Dave also helped design and was an Interdisciplinary Scientist with the NASA TIMED satellite mission studying middle atmospheric dynamics.

Dr. Fritts has organized and/or coordinated several large, international field programs addressing atmospheric dynamics (MAC-EPSILON, CADRE, MaCWAVE, SpreadFEx, SpreadFEx-2, CASES-99), performed or guided the major studies of gravity wave instability dynamics to date, and employed various modeling technologies to develop a new-generation turbulence forecasting methodology intended for government and commercial (i.e., airline) applications. Dr. Fritts has also been a founder, manager, and senior research scientist at Northwest Research Associates in Boulder, CO. Recently, Dave is also a co-founder of Space & Weather Technologies, Inc., promoting commercial opportunities for two revolutionary imaging systems that would re-define capabilities for two key atmospheric measurements.

Dr. Fritts holds a Ph.D. and an M.S. degree in physics from the University of Illinois and a B.A. in physics from Carleton College. He has been a professor of physics at the University of Alaska, Fairbanks and a research professor of electrical and computer engineering at the University of Colorado at Boulder. He has over 200 publications; listed among top 1/2% of cited researchers by ISIhighlycited.com.



Jamie Guined



Ms. Jamie Guined currently serves as an Exercise Scientist with the University of Houston supporting research at the NASA Johnson Space Center. The focus of her research is to better understand how spaceflight produces changes to the muscular, neurovestibular, and cardiovascular systems, and the development of effective countermeasures and countermeasures hardware that will facilitate adaptation and maintenance of crew health during long-duration spaceflight, as well as recovery and re-adaptation post-flight. Jamie also supports a variety of other physiologic, medical requirements, and human performance testing of International Space Station crew members and ground-based research subjects, and has served as Study Lead for multiple NASA and NSBRI funded research projects during her tenure. During her time working for the University of Houston, she has been awarded several group and individual achievement awards for her contributions to various mission-related and ground-based research projects.

As an active member of the spaceflight community and industry, Jamie serves as Vice President of Sales & Marketing for Integrated Spaceflight Services, Secretary of the Board for the Project PoSSUM suborbital noctilucent cloud research campaign.

Jamie holds a bachelor's in Exercise Science/Wellness, a master's degree in Health & Physical Education, a Master of Business Administration, and is currently completing a master's in Health Science and a master's of Aeronautical Science. As a professional Exercise Scientist, she also holds several industry certifications including: Certified Strength & Conditioning Specialist from the National Strength & Conditioning Association, Corrective Exercise Specialist and Performance Enhancement Specialist from the National Academy of Sports Medicine, and is a Certified Functional Movement Specialist.



Dr. Paul Buza, Ph.D.



Dr. Paul W. Buza D.O. F.A.C.N, is board certified in Neurology and specializes in Clinical Hyperbaric Medicine, Cellular Biology, Diving Medicine and Aerospace Physiology. Dr. Buza founded SAMI in July 1999. The primary goal was to establish an advanced clinical hyperbaric and diving medicine program for the east central coast of Florida using a unique hyperbaric/hypobaric chamber. In 2001, the chamber went on line for hypobaric operations for research and training for the aviation community, and in 2002 NASA approved the facility as a triage center for support operations related to the Shuttle Launch Program. Since that time, SAMI has provided over 45,000 patient treatments for the area hospitals and has trained over 3000 pilots in the high altitude chamber for hypoxia training. In addition, SAMI has provided a platform for research related to clinical medicine and the aerospace industry.



Patty Wagstaff



To **Patty Wagstaff**, the sky represents adventure, freedom and challenge. A six-time member of the US Aerobatic Team, Patty has won the gold, silver and bronze medals in Olympic-level international aerobatic competition and is the first woman to win the title of US National Aerobatic champion and one of the few people to win it three times.

Patty one of the world's top airshow pilots, flies thrilling, low-level aerobatic demonstrations before millions of people each year. Her breathtaking performances give airshow spectators a front-row seat view of the precision and complexity of modern, unlimited hard-core aerobatics. Her smooth aggressive style sets the standard for performers the world over.

Patty is a six-time recipient of the "First Lady of Aerobatics" Betty Skelton Award. In July 2004, Patty was inducted into the National Aviation Hall of Fame and was the recipient of the National Air and Space Museum's Award for Current Achievement in 1994. Having received many awards for her flying, she is particularly proud of receiving the Airshow industry's most prestigious award, the "Sword of Excellence", and the "Bill Barber Award for Showmanship". Recently she was awarded a Lifetime Achievement Award from the Air Force Association. In March, 1994, her airplane, the Goodrich Extra 260, went on display in the Smithsonian National Air & Space Museum in Washington DC. Patty's airplane is displayed in the Pioneers of Flight Gallery.

Patty has trained with the Russian Aerobatic Team and has flown Airshows and competitions in such exotic places as South America, Russia, Europe, Mexico and Iceland. She is a member of the Screen Actors Guild, Motion Picture Pilots Association, United Stuntwomen's Association, working as a stunt pilot and aerial coordinator for the film and television industry. Today, Patty owns the "Patty Wagstaff Aerobatic School" in St. Augustine, Florida, located at Southeast Aero, the U.S. Distributor for the Extra Aircraft and she continues to fly airshows around the world.



Dr. Erik Seedhouse, Ph.D.



Dr. Erik Seedhouse is an aerospace/life sciences scientist and Assistant Professor in the Applied Aviation Sciences Department at ERAU, where he teaches life support systems in the Space Studies Program. After completing his first degree in Sports Science at Northumbria University the author joined the legendary 2nd Battalion the Parachute Regiment, the world's most elite airborne regiment. During his time in the 'Para's' Erik spent six months in Belize, where he was trained in the art of jungle warfare and conducted several border patrols along the Belize-Guatemala border. Later, he spent several months learning the intricacies of desert warfare on the Akamas Range in Cyprus. He made more than thirty jumps from a Hercules C130 aircraft, performed more than two hundred abseils from a helicopter and fired more light anti-tank weapons than he cares to remember!

Upon returning to the world of academia, Erik embarked upon a Master's degree in Medical Science at Sheffield University and then completed his Ph.D. at the German Space Agency's Institute for Space Medicine. In 1999, he started his post-doctoral studies at Simon Fraser University. While living in Vancouver, Erik gained his pilot's license, started climbing mountains and took up sky-diving to relax in his spare time. In 2005 he worked as an astronaut training consultant for Bigelow Aerospace in Las Vegas and wrote 'Tourists in Space', a training manual - of sorts - for spaceflight participants. He is a Fellow of the British Interplanetary Society and a member of the Aerospace Medical Association. In 2009 he was one of the final thirty candidates of the Canadian Space Agency's Astronaut Recruitment Campaign. Erik currently works as manned spaceflight consultant and author (he has written 12 books).

In addition to being an accomplished scientist, Erik is a world-class triathlete and scuba diver. In 1997, GQ magazine nominated him as the 'Fittest Man in the World'.



Nikolay Moiseev and Kari Love



Mr. Nikolay Moiseev was trained at the Moscow Aviation Institute, and graduated with a M.S. in Life Support Systems Engineering 1986. He began work at Zvezda, Russia's space suit provider, in 1986, and worked there for 20 years. Mr. Moiseev's suit designs have flown on Mir, Buran, and ISS, and he has worked with both the ESA and NASA on advanced EVA designs. Mr. Moiseev is a co-founder of FFD and has been working in the commercial space industry for the last 7 years.

Ms. Kari Love has worked with Final Frontier Design since 2013 as Lead Patternmaker and Fabricator. In this role she served as a technical expert on 3 NASA SBIR contracts, a Space Act Agreement, and a contract on Mechanical Counter-Pressure gloves. Ms. Love developed costumes for Broadway for more than a decade, including her Spider-Man: Turn Off The Dark costume which was inducted into the Smithsonian collection. She is also a wearable soft robotics collaborator with Brooklyn start-up Super-Releaser, and was a bridesmaid on the first documented weightless wedding in parabolic flight.



Shiloh Dudley



Mr. Shiloh Dudley was and raised in Jacksonville, Florida. Shiloh is a Certified Flight Instructor with over 2000 hours of flight time, and has earned his Single Engine and Multi Engine Commercial ratings and has just taken his ATP Written. He is looking forward to adding his Commercial Seaplane rating.

Shiloh is currently the Southeast U.S. regional Sportsman Champion, having competed at several competitions in the Super Decathlon. He is now competing in Intermediate category in the Extra 300L and is being coached by Patty Wagstaff

Shiloh instructs his students in class, precision competition style aerobatics. His friendly, patient and relaxed attitude is a bit hit with students. His goals for the future include gaining more ratings, competing in Intermediate and Advanced categories in competition and to continue to develop his skills as a Certified Flight Instructor.



Michael Marco



Mr. Michael Marco was born and raised in Jacksonville, Florida. He comes from an aviation family. His Grandfather was a B-24 pilot in WWII and he started flying with his dad when he was a small boy. Michael started flying gliders at age 13 and soloed a glider at age 14. At age 16 he soloed a powered airplane, a Taylorcraft L-2 and every year since then has gotten a new rating. He is a Certified Flight Instructor with Commercial and Instrument, Multi and Single Engine Land and Seaplane ratings and has obtained his FAST – Formation Airmanship card to qualify him for formation flying.

Michael started flying for Talkeetna Air Taxi in Talkeetna, Alaska, last summer, getting experience flying on the glaciers of Denali. He owns a Super Decathlon and like Shiloh is committed to helping people become the best stick and rudder pilots they can be. His goals for the future include competing in the Super Decathlon and flying in formation with his father, Dave, in airshows.



Van Wampler and Parker Rice



Mr. Van Wampler founded CinemaRaven in 2011 after graduating from University of Colorado Boulder with a BFA in Film Studies. He's been shooting films for years, and loves every aspect of filmmaking. Van is experienced in directing, lighting, editing, mixing audio... anything he needs to do to make projects look and sound great! He also writes the musical score for many of CinemaRaven's projects. Van has had award winning films play in festivals coast-to-coast.

Mr. Parker Rice, a fellow University of Colorado graduate, leads CinemaRaven's still photography department. He's also an excellent camera operator, director of photography, and editor. Many of his projects have gone viral, getting millions of views in mere minutes. His work has been displayed in galleries across the state of Colorado.



Nicholas Carlstrom



Mr. Nicholas Carlstrom works as Lead Technician in charge of the simulation software, computer hardware, and troubleshooting of technology for the Suborbital Space Flight Simulator at Embry-Riddle Aeronautical University. Nicholas applies his knowledge of suborbital space flight operations which include vehicle performance, aerodynamic flight control systems, propulsion systems, mission control room operations, in-flight emergencies, astronautics, and basic air traffic management to support training operations. Nicholas is an undergraduate in the Commercial Space Operations degree program at Embry-Riddle Aeronautical University with a Flight Testing and Simulation minor.



PoSSUM Science Leads

Dr. Gary Thomas, PMC Science Lead



Professor Gary Thomas has been involved in Polar Mesospheric Cloud (PMC) research since 1981, when PMC were detected by the Ultraviolet Spectrometer on the SME spacecraft. (The term PMC was coined in the paper by Thomas, 1984.) Since then he has authored or co-authored over 80 papers on PMC and related subjects, and supervised two graduate students in this area. From 1986 to 2008, he served as Chair of the International Working Group on Noctilucent Clouds (now the Working Group on Layered Phenomena in the Mesopause Region). He served as Chair of the

AstroGeophysics Department at the University of Colorado (CU) in 1982-83; Associate Editor of the Journal of Geophysical Research, September 10, 1992 to December 31, 1995; Secretary of the International Commission on the Meteorology of the Middle Atmosphere, 1987-1995; and Interim Director of LASP from 1992 to 1994. He has taught at CU in the areas of meteorology, astronomy, aeronomy, statistical physics, and radiative transfer. His 1999 textbook on Radiative Transfer in the Atmosphere and Ocean is still in use in graduate classes throughout the world. He is currently a Senior Research Associate at LASP, a Co-Investigator on the NASA Small Explorer Satellite mission (the Aeronomy Of Ice in the Mesosphere, AIM), and co-chair of the CAWSES-II Project 3 PMC/NLC altitude, frequency and brightness changes related to changes in dynamics and chemical composition. Professor Thomas has been a member of the Laboratory for Atmospheric and Space Physics (LASP) since 1967.

Dr. Steven Mitchell, LiDAR Instrumentation



Dr. Steven Mitchell received his B.S. degree in Mechanical Engineering from the University of Maryland at College Park in 2005, and his M.S. and Ph.D. degrees in Aerospace Engineering Sciences from the University of Colorado at Boulder in 2009 and 2013, respectively. His thesis research was on high-resolution depth measurement of remote semitransparent media through development of novel LiDAR technologies. He holds the patent on the seminal LiDAR technology enabling remote measurement of extremely shallow media depths through polarization analyses of transmitted and received optical signals. In his current role as LiDAR systems engineer, Steve has led the development of multiple LiDAR instrumentation efforts for measurements including surface topography, water depth, and wind velocities. His primary interest is instrument development for high-altitude platforms, with successful deployment of LiDAR sensors onboard aircraft including NASA's ER-2 and Global Hawk airborne science platforms.

Dr. Gerald Lehmacher, Mesospheric Temperatures Lead



Dr. Gerald Lehmacher received his M.S. and Ph.D. in physics from the University of Bonn, Germany. His thesis research was on mass spectrometry for a cometary mission and on sounding rocket measurements in the mesosphere and lower thermosphere. His positions were National Research Council Resident Research Associate at NASA Goddard Space Flight Center; Research Scientist at the University of Wuppertal, Germany, working on the Cryogenic Infrared Spectrometers and Telescopes space shuttle missions; and

Research Associate at Western Kentucky University involving astronomy students in small atmospheric and space missions. Since 2002, he has served as faculty in the Department of Physics and Astronomy at Clemson University, working primarily on upper atmospheric turbulence using sounding rockets and the giant Jicamarca radar array in Peru. A memorable highlight was his involvement with the Helium Abundance Detector of the Galileo Jupiter Probe mission.

Dr. Michael Taylor, Infrared Imagery Lead



Dr. Michael Taylor is a specialist in optical remote sensing measurements of atmospheric optical emissions at the Center for Atmospheric and Space Sciences and (CASS) Utah State University, Logan, Utah. He has developed several high-performance imaging systems utilizing the airglow emissions to investigate upper atmospheric dynamics and temperature structure. These instruments have been used to study a broad range of atmospheric phenomena including gravity waves, tides, polar mesospheric clouds, equatorial and mid-latitude F region dynamics, upper atmosphere lightning, meteor ablation and satellite re-entry signatures. His group is actively involved in collaborative LiDAR, radar, imaging and temperature mapping programs at low, mid-latitudes with ongoing measurements programs in Chile, Norway, and Antarctica. He is a Co-Investigator on

the NASA Aeronomy of Ice in the Mesosphere (AIM) mission designed to study polar mesospheric clouds (NASA Group Achievement Award 2008), and Director of the USU Bear Lake Observatory (BLO), Utah. As a professor in Utah State's Physics Department, his graduate and undergraduate students are involved in all aspects of these research programs which have resulted in 5 Ph.D.'s, 6 M.S.'s and over 135 collaborative publications to date. Dr. Taylor holds a Ph.D. in Atmospheric Physics from Southampton University, U.K., 1986, an M.Sc. in Electronics from Southampton University, U.K., 1977, and a B.Sc. with honors in Physics from Southampton University, U.K., 1974.

Dr. Zoltan Sternovsky, Aerosol Detection Lead



Dr. Zoltan Sternovsky is an assistant professor of Aerospace Engineering Sciences at the University of Colorado in Boulder, Colorado, and a research scientist at the Laboratory for Atmospheric and Space Physics, focusing on aerosols and dusty plasmas. Dr. Sternovsky holds a Ph.D. and an M.S. degree in physics from Charles University in Prague, Czech Republic. His dissertation focused on the elementary processes associated with dusty plasmas. He is a recipient of the 2011 Young Scientist Award from the Union of Pure and Applied Physics (IUPAP), noted for "pioneering contribution to the study of charged dust particle dynamics in laboratory and space plasmas."

PoSSUM Partner Organizations

Integrated Spaceflight Services



GATS, Inc.

Located in Boulder, Colorado, Integrated Spaceflight Services (ISS) develops, tests, integrates, and operates scientific payloads onboard airborne and spaceborne platforms. ISS is the research and education partner of Swiss Space Systems (S3) Zero-G flights in America, operating an Airbus microgravity aircraft, and is the managing and integration partner of Project PoSSUM. ISS also offers complete space program development services and is the exclusive purchasing agent of the Ecuadorian Space Agency in North America.



GATS, Inc., is an aerospace company founded in 1986 by Larry L. Gordley, the President and CEO, to support atmospheric remote sensing projects, including all phases of project life cycle, from concept development to data dissemination and research efforts. GATS has expertise in software development, web-based systems, satellite instrument operations, atmospheric radiative transfer calculations, and project management that can serve a wide variety of applications. GATS currently participates in several major remote sensing projects. Collaborations include NASA, Science Systems and Applications Inc. (SSAI), Ball Aerospace, National Center Atmospheric Research (NCAR), Applied Research Laboratory (APL) at Johns Hopkins University, Hampton University, and Space Dynamics Laboratory (SDL) at Utah State University. The company's calibration and performance analysis software, radiative transfer packages, flight operations utilities, and web-based project and data management systems are some of the most efficient and accurate in the business.

NASA Flight Opportunities Program



The NASA Flight Opportunities Program intends to mature to flight readiness status crosscutting technologies that advance multiple future space missions. It provides frequent flight opportunities to demonstrate and develop technology payloads on both parabolic aircraft and suborbital reusable launch vehicles for reduced gravity or near-space flights. Flight Opportunities is part of the Space Technology Program within NASA's Office of the Chief Technologist and is managed at NASA's Dryden Flight Research Center in Edwards, California. NASA's Ames Research Center in Moffett Field, California, manages the payload activities for the program. The March 2011 NASA press release announcing the suborbital flight opportunity is available at <http://www.nasa.gov/centers/ames/news/releases/2012/12-28AR.txt>.

Embry Riddle Aeronautical University



Embry-Riddle Aeronautical University, the world's largest, fully accredited university specializing in aviation and aerospace, is a nonprofit, independent institution offering more than 70 baccalaureate, master's and Ph.D. degree programs in its colleges of Arts & Sciences, Aviation, Business, Engineering and Security & Intelligence. Embry-Riddle educates students at residential campuses in Daytona Beach, Fla., and Prescott, Ariz., through the Worldwide Campus with more than 150 locations in the United States, Europe, Asia and the Middle East, and through online programs. The university is a major research center, seeking solutions to real-world problems in partnership with the aerospace industry, other universities and government agencies.

Southern AeroMedical Institute



The Southern AeroMedical Institute (SAMI) addresses a wide diversity of applications from clinical medicine to advanced high-altitude physiological training. Founded in 1999, SAMI manages a state-of-the-art Hyperbaric/Hypobaric Chamber and has now provided over 45,000 patient treatments and trained over 3,000 pilots in the high-altitude chamber. SAMI is the home of “Scenario Based Physiological

Training” where over 2,500 pilots have undergone specialized training with the successful integration of flight simulators within the chamber to achieve the most realistic training available today. Depending upon your needs please take the time to explore the many diverse resources the SAMI has available to offer.

Space Science Institute



The Space Science Institute (SSI) is a nonprofit, public benefit corporation formed in 1992. SSI's purpose is to create and maintain an environment where scientific research and education programs can flourish in an integrated fashion. SSI has five major branches: Research, Flight Operations, Education, Business Operations, and Information Systems and Technology (IST). SSI's research program encompasses the following areas: space physics, earth science, planetary science, and astrophysics. The flight operations branch manages the Cassini spacecraft's visible camera instrument and provides spectacular images of Saturn and its moons and rings to the public. SSI's education program includes developing traveling exhibits and professional development workshops for scientists and

educators, education planning for the research community, and developing instructional materials. The business operations area strives to create an efficient working environment. It provides the necessary infrastructure that allows the organization to carry out its day-to-day tasks and meet its regulatory and contractual obligations. And finally, the IST branch is responsible for keeping our computers running, protecting the Institute from virus attacks, and providing a variety of education services.

Laboratory for Atmospheric and Space Physics



The Laboratory for Atmospheric and Space Physics (LASP) is a full-cycle space institute, combining all aspects of space exploration through expertise in science, engineering, mission operations, and scientific data analysis. LASP is an institute at the University of Colorado at Boulder. LASP began in 1948, a decade before NASA,

to develop a stabilized platform for instruments launched aboard sub-orbital rockets. LASP addresses key questions in solar influences, atmospheric science, planetary and space physics. LASP focuses on the study of Earth's atmosphere, the sun, and the solar system. LASP is the world's only research institute to have sent instruments to all eight planets and Pluto.

University of Colorado Department of Aerospace Engineering Sciences



Located in Boulder, Colorado, the University of Colorado's Aerospace Engineering Sciences department is home to 36 tenure-track, research, and instructional faculty, over 250 graduate students and more than 400 undergraduates. Our vibrant community of engineers and scientists tackle challenges in aerospace technology and science, focusing on Astrodynamics & Satellite Navigation Systems, Vehicle Systems, Bioastronautics, Structures & Material Systems, and Remote Sensing, Earth & Space Sciences.

Department of Meteorology at Stockholm University



The Department of Meteorology at Stockholm University conducts a broad research program ranging from the Earth's oceans to the upper atmosphere. Activities include experimental, theoretical and modeling studies of atmospheric and oceanic processes, with particular attention devoted to effects on the global climate. Field research makes use of satellites, rockets, balloons, aircraft, ships as well as ground-based observations. Numerical investigations are undertaken with process models, weather-forecast models, as well as climate models from regional to global scales. The Atmospheric Physics group at the Department of Meteorology is involved in a number of satellite, rocket, ground-based and modeling projects concerning the Earth's stratosphere and mesosphere. Major focus is on the coupling between atmospheric regions and the understanding of underlying dynamical, microphysical, radiative and chemical interactions. Since 1990 a major focus of the group has been the development and operation of the Swedish-led Odin satellite, launched in 2001. The Atmospheric Physics group is also active in international sounding rocket programs, in close collaboration with scientific groups in Germany, Norway, and the USA.

Leibniz-Institute for Atmospheric Physics



The Leibniz-Institute of Atmospheric Physics e.V. is located at the University of Rostock (IAP). The Institute was founded in 1992 and is a member of the research association Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz (WGL). The institute is located near the Baltic Sea resort Kühlungsborn and owns a separate site on the island Rügen, close to Juliusruh. In addition, IAP is a major partner of the ALOMAR observatory in northern Norway. A total of 65 persons are employed at IAP including 10 – 15 Ph.D. students. The Leibniz-Institute is one of the main German centers for Middle Atmosphere research and operates active cooperations with several international research organizations. The most important scientific topics at IAP are 1) investigation of the mesosphere, 2) atmospheric coupling, and 3) trends in the middle atmosphere.

Clemson University Department of Physics



The Department of Physics and Astronomy at Clemson University has 25 faculty and 66 graduate students (2012) conducting research in the areas of Astrophysics, Atmospheric and Space Physics, Biophysics, Condensed Matter, Atomic Physics, and Foundations of Quantum Theory. It is housed in the four-story Kinard Laboratory, which includes a fully equipped machine shop and a state-of-the-art planetarium. Campus computing facilities are spearheaded by the 15,000+ core high-performance Palmetto cluster. Research facilities include an electron beam ion trap facility, a scanning tunneling and other powerful microscopes, laboratories for the creation and processing of thermoelectrical and diverse nanomaterials, and access to ground-based and space telescopes.

Silicon Valley Space Center



Humanity is emerging from the cradle of the Earth, and creating a market of suppliers and users of space products and services, fueled by innovative technologists and entrepreneurs. A healthy commercial space industry needs entrepreneurial companies that target a wide range of revenue levels. New entrepreneurial space companies will fill existing and now unimagined economic niches. The entrepreneurial environment of Silicon Valley can empower the development of such companies in a growing commercial space industry. The Silicon Valley Space Center integrates the innovative and entrepreneurial practices of Silicon Valley into the burgeoning NewSpace industry. This includes the Valley's practices for business acceleration, incubation, and angel-level funding. The SVSC enables entrepreneurial start-up or early-stage companies to commercialize products or service concepts for space, and helps entrepreneurs identify niches in NewSpace markets. SVSC incorporates the Valley's richness of technology, business, entrepreneurial finance, and educational leadership.



PoSSUM Sponsoring Organizations

Sundog Software



Sundog Software creates 3D oceans, skies, volumetric clouds, and weather effects for games and simulators worldwide. Sundog's SilverLining(tm) and Triton(tm) software development kits enable graphics developers to add realistic environmental effects to outdoor virtual worlds with a few lines of code. For more information, visit sundog-soft.com

OMW Machining



OMW was founded in the proverbial garage, in 1996 in San Rafael, California. From the start, OMW had a strong focus on its customers and emerging PC-based manufacturing technology. It started by doing work for local small businesses, but soon attracted larger industrial clients. From one knee mill, OMW grew by 2009 to nearly a dozen state-of-the-art machining and turning centers, with as many computers, and nearly 6,000 square feet of efficiently utilized industrial space. www.omwcorp.com.

CinemaRaven



Founded by Van Wampler and Parker Rice, CinemaRaven is an advanced video production company located in Boulder. For more information, visit their website at cinemaraven.com.

Content FAQ



San Francisco based ContentFAQ helps small and medium-sized business create amazing content, increase traffic to your website, Launch and manage blogs, grow your social following and engagement, generate and tracks leads, and increase revenue. For more information, visit contentdfa.com



Akram Amin Abdellatif graduated from the German University in Cairo (GUC) in 2009 with a Bachelor degree in Communication Engineering. He traveled to Germany in order to pursue his Master's Degree at the University of Stuttgart. During his studies, he had the opportunity to work at the German Aerospace Center (DLR) institute of Design and Structure as an intern in 2010.

Akram went to Munich in order to work on his Master thesis project at DLR in Oberpfaffenhofen institute of Communication and Navigation. In DLR Location, he also joined the flight sport group as a Private Pilot Candidate (PPL). Next, he obtained my open water diving license in Egypt. In January 2012, Akram was employed as a Certification Design Engineer at the institute of Flight Experiments in DLR Oberpfaffenhofen. He now holds the position of a Certification Verification Engineer.

In October 2012, Akram decided to pursue another Master Degree at the Technical University of Munich in the Aerospace and Satellite Engineering major in order to enhance my expertise in the field. He submitted his Thesis in March 2015, which was based on building the first Egyptian CubeSat with the former DLR Astronaut Ulrich Walter.

In August 2012, Akram joined Astronauts4Hire Organization (A4H) as an Associate member and engaged with A4H teams who lead me to a space competition introduced by Space Florida and Nanoracks. The competition named by "International Space Station Research Competition ISSRC" intends to provide 8 free slots for ISS-experiments at the Nanoracks Nano Module. I participated in the competition – I as a PI- along with an Egyptian Colleague at the TUM with a microgravity crystallization experiment. The protein to be crystallized is a Hepatitis C genome-4 protein, which is a virus, found mainly in Egypt and infects about 20% of population. The experiment was flown in the CRS4 Launch in September 2014; the results helped us to estimate the structure of the protein.

SCIENTIST-ASTRONAUT CANDIDATE JAMES BEVINGTON

James Bevington is a freelance researcher and graduate student with a passion for anything science. His formal education is in agricultural and environmental engineering holding a B.S. from the University of Tennessee and an M.S. from the University of Georgia. Through his research he has developed an expertise in statistical analysis and modeling. Recently has become fascinated with biology and questions of life. Currently, James is enrolled in the MSS15 program at the International Space University (ISU). He also works as an intern at NASA Ames, and consults for a synthetic biology research lab at UC Berkeley. His current research focus is microbial ecology of polar environments as analogs for Mars and icy moons of Jupiter and Saturn and he hopes to continue this work as a PhD student. James has dabbled in entrepreneurship and is scanning the horizon for opportunities.

James was born in Louisiana but has lived in several locations both domestic and abroad. Through his experiences he has begun to appreciate cultures and languages and enjoys discovering their diversity and similarities. He also appreciates interdisciplinary approaches to problem solving. James is an avid mountain biker and enjoys learning about science, and traveling. James holds a private pilot license and an open water diver certificate.

SCIENTIST-ASTRONAUT CANDIDATE RICHARD BLAKEMAN

Originally from Denver, Colorado, **Richard Blakeman** is a professional airline captain, aerospace research pilot, scientist, and engineer. He currently holds a B.S. in Aerospace Science, Turbojet Systems Engineering/Meteorology minor; an M.S. in Aeronautical Science; and currently working on a Ph.D. in Aerospace Instructional Design specializing in aerospace engineering, mathematics, science, astronaut/pilot education and training. He recently completed the FAA approved Suborbital Scientist Astronaut Training Program at the National Aerospace Training and Research Center (NASTAR) as well as pressure suit training – Final Frontier Design (FFD). Captain Blakeman is a rated Command pilot, Airline Transport Pilot, and certified Turbojet Flight Engineer and is highly experienced in military, government, and commercial flight operations to include manned and unmanned spaceflight operations. Operational flight experience includes: search and rescue, reconnaissance, survey, experimental research and test missions flown for numerous military, federal and state government agencies. Professional interests include: aviation & space technology; aerospace engineering; mathematics; physics; meteorology; astronomy; military technology; aircrew & operations training programs; aerospace education programs; mathematics & science education.

Our life's mission is to learn, experience, and make a positive contribution to the human species. The greatest tragedy is unused potential. Self-improvement and continued development are lifelong pursuits. Personal achievement is the result of hard work and dedication. When obstacles appear, don't be afraid to think beyond the obvious. Adapt; improvise; persevere; overcome - give nothing less than your best! Per laborem et fortitude ad astra (Through hard work and courage to the stars).

- Richard Blakeman



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SCIENTIST-ASTRONAUT CANDIDATE TIAGO BRITO



Tiago Brito's professional career started in 2001 as a geologist. Tiago currently works with Teixeira Duarte SA, the biggest Portuguese company in construction. Tiago had the opportunity and honor to participate in various international projects, such as:

- The Kerrada dam in Algeria: Worked as the responsible for the geotechnical consolidation of the foundation of the dam
- Marina Luanda in Angola: responsible for the elaboration of a proposal for the construction of the Marina in Luanda-Angola
- Tunnel Baralt in Venezuela: Responsible for the geotechnical study of the area of the tunnel construction as well as project manager for the part of the project related with the slope stability of the highway.

Tiago's increased interest in the development of alternative forms of energy and in the study of climate research led him to Project PoSSUM, which he strongly considers a unique opportunity to acquire knowledge related to the aforementioned areas through different and innovative types of training while working in a multi-disciplinary team.

Tiago holds a bachelor in Geology with specialization in geotechnical science from the University in Lisbon, while for the completion of my thesis I participated to the creation of the geotechnical map of Lisbon.



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SCIENTIST-ASTRONAUT CANDIDATE TROY MICHAEL COLE



Troy Cole is a Propulsion Engineer working for Boeing Commercial Airplanes. He is from San Francisco, CA and graduated top of his class in Aerospace Engineering from Tuskegee University. Troy is passionate about space science, having led the first student team from Tuskegee University to perform a microgravity fluid dynamics experiment with NASA. He is a member of various professional and advocacy associations including the National Space Society (NSS), the American Institute of Aeronautics and Astronautics (AIAA), the Planetary Society, and the American Astronautical Society (AAS). Troy also enjoys inspiring future STEM leaders by volunteering as a mentor in the Michael P. Anderson Foundation. Outside of space related activities Troy is a FAA student pilot working towards gaining a private pilot license and an active member of Phi Beta Sigma Fraternity Inc. He enjoys reading, playing golf, and experimenting with rocket and spacecraft designs in Kerbal Space Program.



SCIENTIST-ASTRONAUT CANDIDATE KYLE FOSTER



Kyle Foster is an image scientist and systems engineer. Originally from West Monroe, NY, he graduated from the Rochester Institute of Technology (RIT) in Rochester, NY with a Bachelor of Science degree in Imaging Science in 2008. While at RIT, he supported the collection of water surface temperatures on and around Lake Ontario for the calibration of the thermal infrared bands of the Landsat 5 Thematic Mapper and the Landsat 7 Enhanced Thematic Mapper Plus instruments. In 2012, Kyle graduated from George Mason University in Fairfax, VA with a Master of Science degree in Earth System Sciences. His thesis research involved the study and application of spectropolarimetry, a fusion of spectral and polarimetric remote sensing techniques common in astronomy but relatively new to terrestrial remote sensing. Since 2007, Kyle has worked in a variety of imaging-related roles, with experience in initialization, calibration, data processing, troubleshooting and artifact investigation, phenomenological study, and systems engineering for software development. When not at work, Kyle enjoys spending his time homebrewing beer, exploring amateur radio, and teaching his daughter and son about the universe around them. Kyle and his family live in Northern Virginia.

SCIENTIST-ASTRONAUT CANDIDATE MICHAEL GALLAGHER

Dr. Michael Gallagher completed his Bachelor of Science Honors degree with a subject of specialization in the Life Sciences at Queen's University. Following this, he received his medical degree at the University of Alberta and did residency training in rural family medicine through the University of Calgary. During his medical studies, he completed an elective in aerospace medicine at NASA's Kennedy Space Centre in 2010, receiving funding for this from the Canadian Space Agency. He became a finalist for the Jeff Myers Young Investigator award at the Aerospace Medicine Association's Annual Scientific Meeting in 2011 for his investigation into lower body negative pressure as a possible countermeasure for bone loss in space. In 2014, he attended the International Space University's Space Studies program in Montréal. This year, he also completed the Principles of Aviation and Space Medicine course at the University of Texas Medical Branch.

Currently, Dr. Gallagher serves as the Director for Biomedical Simulation Research at the Mars Society, where he and his team work to understand and improve the way analog station crews approach simulated medical scenarios. He also serves on the scientific program committee along with the corporate and sustaining membership committee of the Aerospace Medical Association. Through his work as a Flight Member and the Life Sciences Committee Team Lead at Astronauts4Hire, he has provided education about health challenges facing astronauts in space by holding sessions examining scientific journals in aerospace medicine. He also completed basic space training and altitude/hypoxia training at the NASTAR center, alongside colleagues from Astronauts4Hire and future astronauts from Virgin Galactic. This October, he plans to do Project PoSSUM Scientist-Astronaut Candidate training at Embry Riddle Aeronautical University. He holds a Canadian Private Pilot's license and a NAUI Advanced SCUBA diver license. Dr. Gallagher also enjoys running, sea kayaking, and skiing.



Ulyana Nadia Horodyskyj received her PhD in geological sciences from the University of Colorado Boulder in May 2015. Prior to entering the program at CU, she completed a B.S. in Earth Sciences from Rice University (Houston, TX), where she also worked for the Rice Space Institute and campus observatory. In 2010, she earned a M.Sc. in planetary geology from Brown University, focusing her work on weathering of volcanic rocks in Iceland as an analog to past climate conditions on Mars.

Ulyana has published several articles in scientific journals; presented her findings at conferences nationally and internationally (Australia, Peru, India, Nepal); guided student expeditions for National Geographic in Iceland (2009/2010); taught glaciology in the North Cascades and Alaska for a “Girls on Ice” science and mountaineering program (2014/2015); and is featured in “Planet Ice - Himalaya” (2014, Productions Nova Media, Canada), a documentary on changing climate conditions in the Himalaya.

From September 2013 – June 2014, as a recipient of a Fulbright fellowship, she logged nearly 1000 miles and tens of thousands of vertical feet in Nepal, collecting data on growing and deepening glacial lakes and wind-borne pollution effects in snowpack on Himalayan peaks. She was able to blog about these experiences for Scientific American. Ulyana’s work was funded through a combination of small grants from the university, USAID, private donations, as well as multiple crowd-funding campaigns. During her time abroad, she created the “Sherpa-Scientist Initiative” to educate locals on changing climate and how to continue to monitor it.

From ages 14-17, Ulyana worked on a solar sail research project, mentored by the late Dr. Robert L. Forward, who set her on a course of discovery and love of science. By age 23, she had visited all 7 continents, with a particularly unique experience in Antarctica working on a research icebreaker, which set her on a course to study the planet’s changing climate. During her PhD from 2010-2015, she was advised by renowned geophysicist, Dr. Roger Bilham, and Mr. David Breashears, director of the Everest IMAX film (1996).

SCIENTIST-ASTRONAUT CANDIDATE JUSTIN KARL

Born and raised in Ocean City, Maryland, **Dr. Justin Karl** left the beach lifestyle after high school in favor of pursuing his dreams in rocket science at Embry-Riddle Aeronautical University (ERAU) in Daytona, FL. There he earned Bachelor's degrees in Aerospace Engineering and Engineering Physics before going on to earn a Master's degree in Aerospace Engineering. He then completed a Mechanical Engineering PhD under a fellowship at the University of Central Florida (UCF).

Dr. Karl has since worked in several positions in the aerospace and energy industries, but ultimately returned to UCF in a faculty position with the Mechanical and Aerospace Engineering (MAE) department. He enjoys teaching undergraduate and graduate courses in small satellites, payload integration, design, aerodynamics, the space environment, and a host of other topics. He is the founding director of the FSGC/MAE Spaceflight Operations Laboratory.

Outside of academia, Dr. Karl serves as the Chief Payload Officer for the nonprofit Citizens in Space Project, an initiative sending 100 citizen-scientist developed payloads on private suborbital flights for zero cost to the experimenters. He is currently a Senior Associate of the Space Studies Institute, a board member of the Angelicvm Aerospace Foundation, and Director of Terran Sciences Group, an Orlando, Florida-based space technology provider. Dr. Karl is proud to have developed a wide set of space-related skills, and through his R&D company, nonprofit, and research ties, he seeks to bring solutions to the growing private space industry. Furthermore, he emphasizes the importance of engaging in outreach and mentoring activities that help expand opportunities for students and small space programs in the early stages of development.

Dr. Karl currently lives in the Orlando, FL area with his wife Shannon. He is a private pilot, scuba diver, and general outdoor and watersport enthusiast. When he has spare time, he most enjoys spending it traveling and adventuring with his son Flynn.



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SCIENTIST-ASTRONAUT CANDIDATE BLAKE KELLER



Blake Keller is Executive Director of Engineering for a rapidly-growing medical device manufacturer. In this capacity, he oversees new product development and manufacturing engineering. In previous roles, he performed R&D on projects involving aerospace physiology, high-vacuum systems, and use of hydrogen in space systems and internal combustion engines. He was also part of a three-man team that established operations in China for a major welding equipment manufacturer. In that role, he lived in China for almost three years. In 2009, Blake deployed to Iraq on a one-year tour as a State Department advisor to the Army's 1st Brigade Combat Team, 1st Cavalry Division. During the deployment, he helped to expand the industrial base, and increase employment, in the Brigade's area of operation.

Blake holds a Master of Engineering Management from Thayer School of Engineering at Dartmouth College and a BSME from University of Colorado. He's also a Lean Six Sigma Black Belt, and an avid private pilot and scuba diver.

SCIENTIST-ASTRONAUT CANDIDATE ARMIN KLEINBOEHL

Dr. Armin Kleinboehl is an atmospheric and planetary scientist and a specialist in airborne and spaceborne remote sensing. He holds a Master in physics from the University of Frankfurt and a Ph.D. in atmospheric physics from the University of Bremen, Germany. For his Ph.D. work Dr. Kleinboehl studied the Earth's stratosphere with a focus on polar stratospheric clouds (PSCs) that occur in the Arctic stratosphere in winter and have a strong impact on polar ozone depletion. He participated in several airborne field campaigns that lead him on deployments in the Arctic, Europe, North America and Africa in order to study the stratospheric ozone layer and to validate satellite measurements. During these experiments he accumulated nearly 300 flight hours operating scientific instrumentation on board different research aircraft in flight. In addition, he participated in field campaigns for stratospheric measurements from high-altitude balloons.

Working for NASA's Jet Propulsion Laboratory since 2004, Dr. Kleinboehl's main focus has shifted towards the atmosphere of Mars. As a Co-Investigator of the Mars Climate Sounder (MCS) on NASA's Mars Reconnaissance Orbiter (MRO) mission, he is responsible for retrieving geophysical parameters from the orbital measurements. He is the lead developer of the operational retrieval algorithm for the MCS investigation, which is used to derive the vertical structure of temperature, dust, and water ice clouds in the Martian atmosphere. These data are used for scientific studies of his own and by a large community of Mars scientists. Dr. Kleinboehl has authored or co-authored nearly 50 publications in scientific journals on atmospheric and planetary science, as well as numerous conference presentations.

An instrument-rated private pilot, Dr. Kleinboehl is excited to merge his interests in aviation and atmospheric science by being a participant in Project PoSSUM. He sees his participation as a natural development of his airborne campaign activities. He thinks that noctilucent clouds on Earth can serve as analogs to clouds on Mars, and hopes that the results from the PoSSUM campaigns will shed light on the formation of Martian ice clouds.

SCIENTIST-ASTRONAUT CANDIDATE TODD KOHORST

Todd Kohorst is a 6th grade physical science teacher from Farmington, Minnesota. This is Kohorst's eighth year teaching overall, and he has taught all science subjects in grades 6, 7, 8, and 9 in his teaching career. Teaching middle school students is a great adventure as there is never a dull moment, and they have such a curiosity to learn about the world around them. Kohorst feels middle school science is the science that everyone should know and understand in their lives, and he truly appreciate conveying this knowledge and understanding to my students in a meaningful way.

Earth science and physical science have always been Kohorst's specialty areas. He has a M.S. in Geoscience from Mississippi State University. For his master's degree thesis, he wrote a 7-day field guide about the geology and natural history of Minnesota's Iron Range and North Shore of Lake Superior. Hohorst also has a B.A. degree in Earth and Space Science Teaching and Geology from Gustavus Adolphus College in St. Peter, Minnesota. For his undergraduate thesis, he completed two weeks of fieldwork with a team of scientists working under a National Science Foundation Grant in the Uinta Mountains of Utah studying mountain valley glacial remnants such as lake sediment cores and lateral moraines.

Kohorst grew up on a dairy farm in central Minnesota which is where he learned many important life lessons such as hard work, perseverance, and an appreciation for the natural world. He enjoys several sports such as rugby and football, which he played in college and high school. Kohorst also enjoys camping and canoeing in remote areas such as the Boundary Waters of Minnesota, hiking and backpacking scenic areas such as the Superior Hiking Trail, and he tries to fit in a little fishing in both the summer and winter.

Kohorst feels that climate change is the biggest issue that our generation and future generations will have to deal with, and one of his life goals is to research and educate people about the impacts of our changing climate.

SCIENTIST-ASTRONAUT CANDIDATE PEDRO LLANOS

Pedro Llanos is an Assistant Professor of Commercial Space Operations in the Applied Aviation Sciences Department at the Embry-Riddle Aeronautical University (ERAU), Daytona Beach, FL. His passion for space exploration has taken him to work towards unbound frontiers in this new rising and expanding modern commercial space operations era, working closely with space industry experts.

Dr. Llanos currently teaches Space Station Systems & Ops, Introduction to Navigation, Spacecraft & Satellite Systems and the Space Transportation Shuttle. Pedro's current research is how to integrate and utilize Automatic Dependent Surveillance-Broadcast (ADS-B), the NextGen navigation technology system, to ensure the safe and efficient integration of suborbital vehicles in the national airspace system.

Pedro Llanos is the recipient of the Marie Curie Postdoctoral Research Fellowship for the 2012-2013 year as part of the AstroNet-II Astrodynamics Network organized by the Institut d'Estudis Espacials de Catalunya, Spain. Pedro Llanos obtained his Ph.D. in Astronautical Engineering in 2012 from the University of Southern California, with a dissertation titled: "Trajectory Mission Design and Navigation for a Space Weather Forecast". He obtained a Master of Science in Astronautical Engineering from the University of Southern California in 2008. Before then, Dr. Llanos also obtained his Master in Physics (Astrophysics emphasis) from the University of Oklahoma and a B.S. in Physics from University of Valencia in Spain.

Dr. Llanos has published over a dozen papers and technical reports while also conducting presentations at various conferences across the U.S. Dr. Llanos is a member of the American Institute of Aeronautics and Astronautics (AIAA) since 2008. Pedro is an active runner and enjoys fishing and flying.



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SCIENTIST-ASTRONAUT CANDIDATE ROSS LOCKWOOD



Ross Lockwood is a graduate from the University of Alberta with a Ph.D. in condensed matter physics. His doctoral research focused on silicon quantum dots: nanoscale light emitters with potential applications in quantum computing and high-performance chemical sensing. He was inspired to join PoSSUM owing to his passion for space exploration and science advocacy.

In 2014, Ross participated in the second, 120-day long mission of the HI-SEAS Mars simulation, playing the role of systems and communications engineer. During the mission he participated in analog spacesuit testing, food and psychological research, in addition to his personal research studying the performance of 3D printed surgical instruments on long-duration space missions.

Currently, Ross is working on a student-focused 3D printing laboratory environment called the Science Hardware Hackerspace, AKA the Shack, at the University of Alberta. He is also pursuing research into the applications of solid-state silicon-based high-energy ion telescopes for use in space-based particle detection.



SCIENTIST-ASTRONAUT CANDIDATE CHRISTOPHER MACOMBER



Christopher Macomber earned his B.S. in Computer Science from the University of Miami. He was worked professionally in the gaming industry for the past five years, working for companies with noteworthy partners such as Sundance, NBC, and Disney. Alongside games, he has studied the effects of video games on learning and human-computer interaction. Chris also has certificates in cybersecurity, Linux administration, and Apple integration.

Chris is currently working on his Master's in Aeronautical Science at Embry-Riddle Aeronautical University, specializing in aeronautics and space studies. He is a lifelong astronomer, and a member of the Central Florida Astronomical Society. Moreover, he is a citizen scientist, performing astronomical data analysis in several ways, including scientific computational programming.



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SCIENTIST-ASTRONAUT CANDIDATE MICHAEL MASTIN



Michael Mastin was born and raised in Fairbanks, Alaska, and grew up cross-country skiing and snowshoeing in the arctic wilderness around his home. Since that time, he has worked in a wide variety of fields, including outdoor clothing manufacturing, boat canvas construction, upholstery, residential construction, aviation operations, aircraft loading, fueling and maintenance and construction equipment operation and maintenance. He also has experience in the marine industry working on Alaskan tugboats.

In 2001, he attended film school in Sedona, Arizona, and worked in the film industry in Los Angeles and Miami as a remote-operated camera technician, still photographer and location scout until 2007 when he joined the US Army. From 2007 through 2013, he completed a variety of highly competitive military schools, culminating in his graduation from the prestigious U.S. Army Special Forces Qualification Course and assignment to 1st Special Forces Group (Airborne) as a “Green Beret” located in Okinawa, Japan. This assignment allowed him to participate in numerous operations throughout Asia and the Pacific, including Afghanistan, the Philippines, Australia and Nepal.

In 2013 after leaving the service, Michael founded Crater Exploration, a New Space venture intent on developing a commercial astronaut corps in order to service both commercial space infrastructure developers and researchers. Crater is teaming former members of the world’s most elite unconventional military force with cutting edge scientists and medical professionals in order to direct their work toward the goal of human space exploration. Crater’s participation in the Project PoSSUM program is the company’s first test of this business model.

In his free time, Michael SCUBA dives in Alaska and has obtained his Open Water, Advanced SCUBA, Drysuit and Nitrox certifications. Next on his list are his Rescue and Solo diver certifications. He also enjoys freediving, spearfishing and trekking. He lives together with his Nepali wife, Anju, and their two-year-old son in southeast Alaska.



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POSSUM



SCIENTIST-ASTRONAUT CANDIDATE THOMAS McHALE



Captain Alex McHale, 27, hails from the Hudson Valley region in southern New York. Alex graduated Hofstra University in 2010 earning a Bachelor's Degree in Political Science with specialization in international policy and cultural geography. He was also a graduate of Hofstra University's Army ROTC training corps and was commissioned as a 2nd Lieutenant in United States Army as an Aviation officer. Alex graduated Army Flight school at the United States Army Aviation Center of Excellence in 2011 as an Army Aviator and later flew in combat during Operation Enduring Freedom Afghanistan 2013-2014 as a UH-60M Black Hawk Helicopter Pilot. Alex has always been passionate about aviation, specifically space exploration. "I've wanted to be a Pilot and go to space since I could walk. When I was maybe ten or eleven years old, my dad took us to see John Glenn blast off into space at 77 years old aboard Discovery's STS-95, it was one of the most amazing and inspiring experiences of my life. My Dad told me that we live in exciting times, and that sometime in my lifetime, we would be the pioneers of manned space exploration. To this day, I have held this belief near and dear to my heart and I have always wanted to follow that dream. Good things don't come easy, and I embrace the challenge, I want to be part of the frontier of manned space exploration and advance humanity's reach in the stars". Alex is currently pursuing admission into the Cockrell School of Engineering at the University of Texas: Austin and hopes achieve a master's degree in Mechanical Engineering and has plans to pursue another master's degree in Aerospace Engineering. Alex is also the founder of SST Orbital, a start-up space technologies research company that aims at managing and reducing space debris in Earth's orbit. "I am excited about starting the organization, it's still in the concept phase, but I have some exciting ideas that I hope will help "clear to path of the frontier" ". In his spare time, Alex is an avid Skydiver and is a certified NAUI Scuba diver. Alex is currently on active duty and is assigned to Fort Rucker Alabama and will be continuing his career onwards to his next assignment at Ft. Hood, Texas.

SCIENTIST-ASTRONAUT CANDIDATE SHAWNA PANDYA

For **Dr. Shawna Pandya**, life has just been one adventure after another, and she is just getting started. Armed with backgrounds in neuroscience, space, entrepreneurship and medicine, Dr. Pandya has led a life devoted to technology, innovation, social development and, of course, adventure! Her first company, *CiviGuard*, was founded in response to a challenge to “positively impact 1 billion people in 10 years using technology.” Through CiviGuard, the founding team presented their work at the White House, Google.org and the United Nations Emergency-Telecommunications Committee, and was covered by BBC, Inc. and Entrepreneur magazine.

Through the course of her medical career, Dr. Pandya has trained in neurosurgery, encountering many adventures along the way, including rotations in cardiac surgery in India, orthopedic surgery in Ecuador, reconstructive surgery at Stanford and Aerospace Medicine at NASA’s Johnson Space Center in Houston. As part of her work at NASA, Dr. Pandya delineated medical scenarios and optimized the Medical Kit contents for a Near-Earth Asteroid Mission, which was praised by NASA Astronaut Kjell Lindgren as “outstanding” and “invaluable towards the body of work for long-duration spaceflight.” In addition to NASA, Dr. Pandya has also worked at the European Astronaut Center’s Crew Medical Support Office in Germany and earned a Masters’ degree from the International Space University in Strasbourg, France.

In her spare time, Dr. Pandya is a motivational speaker, promoting entrepreneurship and big ideas. Her recently-launched podcast series *TalkMedTech* covers developments in medicine, technology and innovation. Previous talks include closing keynote speaker at the 2011 Congress of the Agency for the Science, Technology and Research as a guest of the Singapore government, alongside Nobel Laureates and Harvard Faculty. She has also spoken at TEDxEdmonton 2010, BIL2010, schools, conferences and workshops as far and wide as India, Scotland and South Korea.



Dr. Sarah Jane Pell is an Australian-based performance artist who incorporates themes of human-aquatic adaptation to other worlds and other extreme-performance interfaces in her work.

“Every space project needs an artist!” she declared as the opening speaker for the inaugural TEDx hosted by ISU, FIT and NASA Kennedy in 2012. Emboldened by positive support, Dr. Pell embarks on a game-changing expedition from sea, to summit, for space.

Uniquely engaged in art and science research intersecting the performing arts, human movement, and underwater diving, Dr. Pell’s work parallels human spaceflight and exploration. The artist positions herself as the experiment seeking to embody, and critique, the culture of exploration and redefine our visions of future worlds. She performs expressively – mostly underwater – and builds novel prototype apparatus to test and communicate extreme performance. Artifacts include sculptural, technical, poetic and media events. These build an arc of imagination to contribute new insights to further technology transfer and the human experience of discovery.

Dr. Pell’s work has been widely exhibited, performed, published and recognized internationally. A Freedman Foundation Travelling Art Scholar, Pell was the first artist to graduate from the International Space University and NASA Ames Singularity University. She led the NASA-sponsored Luna Gaia project, has flown artworks in space, participated and led EVA Training Simulation workshops, and designed interactive aquatic-robotic systems. She also contributes to futurist think tanks, interaction design, film and cinematic world building and early start-ups.

A trans-disciplinary pioneer, Pell was awarded Best PhD Art & Science 2007 by Leonardo AS, MIT and she is the first Australian to be awarded TED Fellow for exceptional talent and courage.

Dr. Pell served as Co-Chair of the European Space Agency (ESA) Topical Team Arts & Science [ETTAS]: developing an ESA Arts Initiative (2011-2014), and Senior Space Art Consultant to Icarus Interstellar: an organization dedicated to interstellar flight by 2100.

SCIENTIST-ASTRONAUT CANDIDATE AARON PERSAD

Aaron Persad is a Post-Doctoral Fellow in the Mechanical and Industrial Engineering Department at the University of Toronto, Canada. His work in the Thermodynamics and Kinetics Lab investigates several topics including: liquid-vapour phase change processes, surface and wetting phenomena, bubble nucleation, adsorption onto porous and non-porous media, energy transport and conversion, and the stability of confined fluids in near-freefall environments. He has over a decade of experience in research, writing grants, and managing labs and graduate students. He has designed Physical Science experiments for drop towers, parabolic flights, and the International Space Station. In addition to several peer-reviewed publications, he had also authored book chapters on evaporation kinetics and the microgravity environment.

Dr. Persad is also a member of European Space Agency's Microgravity Applications Program. He provides support to the program's international science teams in the form of theoretical and ground-based experimental studies. His experiments on evaporation and condensation provide insight into atmospheric and hydrological processes. As the Manager of Microgravity Operations at Integrated Spaceflight Services, Dr. Persad oversees the payload integration needs of researchers, many of whom are funded through NASA's Flight Opportunities Program. He has prior experience managing the Canadian Space Agency's parabolic flight campaigns. He also flew in the National Research Council of Canada's Falcon-20 reduced gravity aircraft where he helped to conduct research on droplet pinning.

Dr. Persad also holds an Engineering Science degree in biomedical engineering. In 2006, Dr. Persad and a PI from Canada's OSTEO space experiments studied the effects of Shuttle launch vibrations on stem cells derived from human umbilical cords. In 2010, Dr. Persad won the James Dyson Award in Canada for inventing a device with colleagues to autonomously detect malaria in unwashed blood. Dr. Persad teaches robotics and engineering communication practices at the University of Toronto. He is a member of the Space Generation Advisory Council, and co-founded TMS Robotics & Academics to teach young kids about space robotics in hands-on workshops.



SCIENTIST-ASTRONAUT CANDIDATE CASEY STEDMAN



Casey Stedman is an officer in the United States Air Force Reserve and a passionate advocate of space exploration. Commissioned in the Air Force in 2003, Casey has logged over 2,700 hours as a navigator in transport and reconnaissance aircraft.

Casey earned a BA in Geography from Central Washington University in 2003, and is now pursuing a Masters in Aeronautical Science from Embry-Riddle Aeronautical University Worldwide. His research focuses on Human Factors in Aviation, where he is investigating the application of Crew Resource Management to commercial spaceflight, studying methods to reduce human error.

In 2014, Casey led the 2nd Hawaii Space Exploration Analog and Simulation (HI-SEAS), a 120 day study to simulate living on the surface of Mars. He served as the mission commander, overseeing the 6 person international crew and the scientific objectives.

When not active with the Armed Forces, Casey promotes aviation and space exploration by public outreach engagements like the National Space Society, JPL's Solar System Ambassador program, and the Suborbital Applications Research Group.



SCIENTIST-ASTRONAUT CANDIDATE JONATHAN THOMAS



Jonathan Brian Thomas was born and raised in Macon, Georgia but considers The Big Island of Hawaii his home. He enjoys hiking, camping, deep-sea diving, skiing, skydiving, electronic dance music festivals, performing arts, and puppies.

Brian received a Bachelor of Science in Astronomy from the University of Hawaii in May, 2005. His work in Hawaii included NOAA's Earth System Research Laboratory on Mauna Loa in 2002 where he performed in-situ measurements of Ozone, Methane, CO and CO₂ levels, precipitation chemistry, LIDAR, and greenhouse gas sampling. He also held a position at Gemini Observatory on Mauna Kea in 2003 where he actively engaged in development of the NIRI near-infrared imager and GMOS multi-object spectrograph. He has a very wide-range of experience with advanced adaptive optical systems, high-end lasers and laboratory instrumentation, extreme high vacuum processes, and scientific cameras. Special projects include a co-authored paper on Astroseismology of the Beta Cephei star Nu-Eridani, published in 2003 in the *Monthly Notices of the Royal Astronomical Society* (MNRAS).

His special skills include OSHA and HazMat certification in 2004, advanced respiratory and CPR training in 2006, AAF skydive certification in 2010, and PADI Rescue Diver training in 2015. He will be attending the NASTAR Spaceflight and Spaceport Response Operations programs in late 2015, and the Commercial Spaceflight Education and Training (CSET) program at the National Test-Pilot School in Mojave, California in 2016, and plans to pursue his Master's degree in Flight Test and Evaluation (MSFT & E) thereafter.

SCIENTIST-ASTRONAUT CANDIDATE CALLUM WALLACH



Callum Wallach is a New Zealander who embodies that country's spirit of travel and adventure. Callum holds a BSc Hons degree from Victoria University, Wellington, in physiology and biochemistry and a degree-level diploma in computer science.

After graduating, Callum was hired by international consulting and technology firm, Anderson Consulting (now Accenture) where he specialised in designing large scale, distributed system architectures predominately in the health and welfare sectors. He eventually became a freelance computer consultant.

Returning to New Zealand, Callum, by chance, fell into acting. This culminated in roles in a number of major productions, including the long-running NZ soap opera, *Shortland Street*, the US production of the TV series *Spartacus*, and *Ash vs Evil Dead*, a black comedy currently in production, starring Lucy Lawless and Bruce Campbell. Born and mostly educated in Wellington, Callum (42) has a strong curiosity about, interest in and passion for nature and the environment and believes education, particularly in children, is key to the successful fulfillment of our role as custodians of the planet. Callum holds a black belt in karate and has been training in martial arts since he was seven. He is adept at judo, aikido and kung fu, having trained with Shaolin monks during his time in the UK. This makes him in demand as a movie and television stuntman.

Callum has a fascination for travel, adventure, and exploration and his professional success has enabled him to travel extensively. He has trekked, cycled, run, climbed, paddled, snowboarded and driven through some 60 countries, including a recent expedition to the Antarctic continent. A humanitarian at heart, Callum's philanthropy has a practical edge. He has raised funds for Oxfam by twice participating in the annual 100km Trailwalker event, was a volunteer member of the Auckland Land Search and Rescue team, and regularly donates his time to KidsCan, a charity helping children living in poverty and the SPCA. Always fascinated by space, his burning desire is to become an astronaut and share his love of science and adventure with the world.



PoSSUM Class 1501: Deniz Burnham, Pete Freeland, Jamie Guined, Hiedi Hammerstein, Paul McCall, Jonna Ocampo, Vasco Ribeiro, Jeffrey Scallan

