The Smead Program
AY 2018-19 Update
Recognition

- Penny Axelrad elected to the US National Academy of Engineering
- Marcus Holzinger became an Associate Fellow of AIAA
- Professor Dan Scheeres was elected as a Corresponding Member to the International Academy of Astronautics (IAA).
- Hanspeter Schaub elected as a Fellow of AIAA, and wins College Faculty Research Award: "The selection committee recognized your outstanding research in orbital mechanics, spacecraft dynamics and autonomous vehicle systems. In addition to your own contributions to advances in the field of aerospace engineering, you have inspired many graduate student researchers who you have mentored."
- Mahmoud Hussein was selected as PI for a $2.5M grant from DOE’s ARPA-E OPEN program, to develop a thermoelectric device with record-breaking efficiency (proposal title: “Nanomanufacturing of Nanophononic Devices: Ultra-High ZT Thermoelectrics for Efficient Conversion of Waste Heat”). Mahmoud was also elected a Fellow of the American Society of Mechanical Engineers.
Scholar Highlights

• Scholars attended conferences in Atlanta, Cambridge, Hawaii, Montana, Pasadena, Pittsburgh, and Germany, among other research-related travel

• **Andrew Harris** won the 2018 AIAA Guidance, Navigation and Control Graduate Award

• **Shaylah Mutschler** is mentoring two undergraduates through CU’s Discovery Learning Apprenticeship (DLA) and Summer Program for Undergraduate Research (SURP)

• New Fellowships:
  • **Damennick Henry** selected as a 2019 NASA Space Technology Research Fellow (NSTRF)
  • **Conor Benson** selected as a 2018 NSTRF
  • **Marielle Pellegrino & Jonathan Manni** visited Draper as part of their Fellowship

• **Moving on Up**
  • Both **Conor Benson & JoAnna Fulton** passed their comprehensive exams!
Events
Development
Aerospace on Campus, with The Wings Club & Aviation Week
Researchpalooza Winners and Presentation Videos

Feb. 6, 2019

Congratulations to the winners of the 5th Annual Researchpalooza! The one-day summit featured a series of 10-minute lightning presentations by students and faculty on their research.

Missed the event? Videos of the talks are available to watch, broken out into three segments: Morning, Afternoon, and the Lunch Keynote given by Sergio Pellegrino of Caltech and the inaugural Michael M. Byram Distinguished Visiting Professor.

The first, second, and third placing student presenters are below:

1. Scott Carnahan
   Astrodynamics and Satellite Navigation
   “Simulating Infrared Vision for Space Robots”

2. Aly Badran
   Aerospace Engineering Systems
   “Deep Learning CT Image Segmentations of High Temperature Ceramic Matrix Composites”

3. CK Venigalla
   Astrodynamics and Satellite Navigation
   “Multi-Spacecraft Trajectory Coordination Using Reachable Sets”

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From left - Scott Carnahan, Aly Badran, CK Venigalla
In the news...
Wanted: A Hypersonics Workforce

"If the U.S. is to retain leadership in hypersonics, a sustained increase in university research programs is critical."

Viewpoint by Brian Argrow
Chair, Smead Aerospace Engineering Sciences

“Boost-glide,” the method of using rocket propulsion to achieve high speed before an unpowered glide, is an apt metaphor for U.S. investment in hypersonics research and education. Recent interviews with government leaders and experts suggest that the U.S. no longer has the luxury of exploring hypersonic flight as an unchallenged leader. In addition to the need for long-term commitment to basic research and technology development, there is a more urgent requirement for rapid...

Read the full column at Aviation Week.
NASA enlists academia to develop autonomous space habitats

The systems could find a home on the Moon, Mars and beyond.

“As NASA faces pressure to get astronauts to the Moon and considers human exploration of Mars, it will need to sort out a few major details -- like how to keep extraterrestrial habitats functioning even when there aren't any human occupants. To do this, NASA selected two new, university-led Space Technology Research Institutes (STRIs) and tasked them with developing automated Smart Habitats, or SmartHabs.

One, the Habitats Optimized for Missions of Exploration (HOME), will develop autonomous systems, machine learning, robotic maintenance and onboard manufacturing for autonomous and self-maintained smart habitats. The HOME team includes researchers from the University of California, Davis; University of Colorado Boulder, Carnegie Mellon University, the Georgia Institute of Technology, Howard University, Texas A&M University and the University of Southern California -- as well as Sierra Nevada Corporation, Blue Origin and United Technology Aerospace Systems.

The other STRI, Resilient ExtraTerrestrial Habitats institute (RETHi), will focus on SmartHabs that use autonomous robotics to adapt and recover from disruptions. That team is comprised of Purdue University, University of Connecticut, Harvard University and the University of Texas at San Antonio.

Both teams will receive up to $15 million over a five-year period, and they could help us envision what longer-term stays on the Moon and Mars will look like.”
OSIRIS-REx arrives at Bennu

Taking the measure of an asteroid

Space probe scoops up CU Boulder graduates

The space probe OSIRIS-REx arrived at the asteroid Bennu today after traveling more than 1.98 million km (1.23 million miles) across the blackness of space. It may be far from Earth, but it’s hardly on its own. Guiding it every step of the way has been a team of accomplished scientists and engineers with major University of Colorado Boulder connections.

“CU Boulder graduates have been involved since almost day one,” said Ryan Ottolenghi, navigation, and control manager at Lockheed Martin Space.

"The 31 CU Boulder alumni pictured above are serving on the OSIRIS-REx Operational Team as employees of Lockheed Martin Space Systems, NASA Goddard, or Kentex, Inc. Design and Aerospace Engineering unless noted.

Smead Program
UNIVERSITY OF COLORADO BOULDER
“The Buffs Who Summer In Antarctica” in the Coloradan (Dec. 1, 2018)

“...Much like summer camps elsewhere, there is a certain unshakable camaraderie among the 500 or so people who return to populate McMurdo every year.

“It’s funny because you’ll hear someone say they’re not coming back, and then you’ll see them next year, as usual,” says Xinzhou Chu, a professor and researcher at CU’s Smead Aerospace Engineering Sciences and Cooperative Institute for Research in Environmental Sciences (CIRES). She has led the atmospheric laser project since 2010 and has been traveling to Antarctica since 1999.

Chu marvels at her students’ willingness to travel so far and endure so much in the name of research that can only be accomplished in polar conditions.

“Everything that they are doing contributes to getting a bigger picture of the makings of the atmosphere,” she said...”
BREAKING: United Federation of Planets and Starfleet Command announce selection of CU Boulder for Starfleet Academy’s HQ2

April 1, 2019

Stardate: 72246.57

The United Federation of Planets and Starfleet Command have chosen the University of Colorado Boulder to host a new Headquarters and Starfleet Academy (Starfleet HQ2) opening in Summer 2019 – specifically stardate 72649.31. With the Alpha Quadrant’s ever-changing dynamics – combined with significant growth in Academy applications and enrollment – Starfleet determined that a new base of operations was necessary. Starfleet Headquarters in San Francisco will focus primarily on science and exploration, while Starfleet HQ2 will work with existing Space & Cyber Commands currently operating in Colorado to provide continued defense of the Federation.

HQ2 will help Starfleet better work with the Romulans, Breen, and Borg, while also preparing a new generation to go even further into unchartered regions of our galaxy than ever before.

“Starfleet simply cannot achieve its mission without these new facilities and resources, which will enable us to continue our mission of scientific exploration and ensuring the safety of the Federation,” said Fleet Admiral Alynna Nechayev. “With the state of Colorado and CU Boulder already being a hub for aerospace, we knew it would be the perfect location to extend our operations.”

Starfleet HQ2 will have all of the same capabilities and course offerings that are available at HQ1. Cadets will be able to learn about warp field mechanics, transportation technology, xenobiology and xenolinguistics, temporal paradoxes, weapons and battle strategy, and many other domains. In partnership between CU Boulder and the Daystrom Institute, HQ2 will also facilitate research to support next-generation starship capabilities.

The new academy comes on the heels of a recent announcement by the Vulcan Science Academy to open its own facility off Pearl Street in downtown Boulder.

Expect to start seeing a lot more shuttlecrafts in the Front Range airspace in the coming months and years.
Introducing our Newest Smead Scholars...

Connor Morency  
(Advisor: Prof. Ken Jansen)

Samantha Sheppard  
(Advisor: Prof. John Farnsworth)

Jackson Jandreau  
(Advisor: Prof. Xinzhao Chu)