



Lunch-and-Learn Seminar



A Pitt Space Institute for the Final Frontier

Alan D. George, Ph.D., FIEEE
Department Chair and Mickle Chair Professor of ECE
Director of NSF SHREC Space Center



10-SEP-24

Outline

- My Relevant Background
- Goals for Today and Upcoming
- How Did We Get Here?
- Pitt: A Space University?
- How Do We Get There?
- Pitt Space Leaders, Faculty, Events, Education, etc.
- Conclusions and What's Next
- Comments and Questions



My Relevant Background



- ECE Educator in Space Engineering for >20 Years

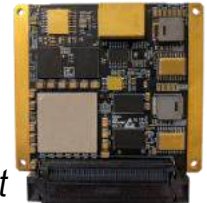


- Educated and trained dozens of Ph.D. and M.S. space engineers in ECE
- Focus upon ECE systems and apps (computing, sensing, apps, ops, etc.)
- All now excelling @ NASA, JPL, USAF/USSF, Astrobotic, LM, Voyager, etc.

- ECE Researcher in Space Engineering for >20 Years

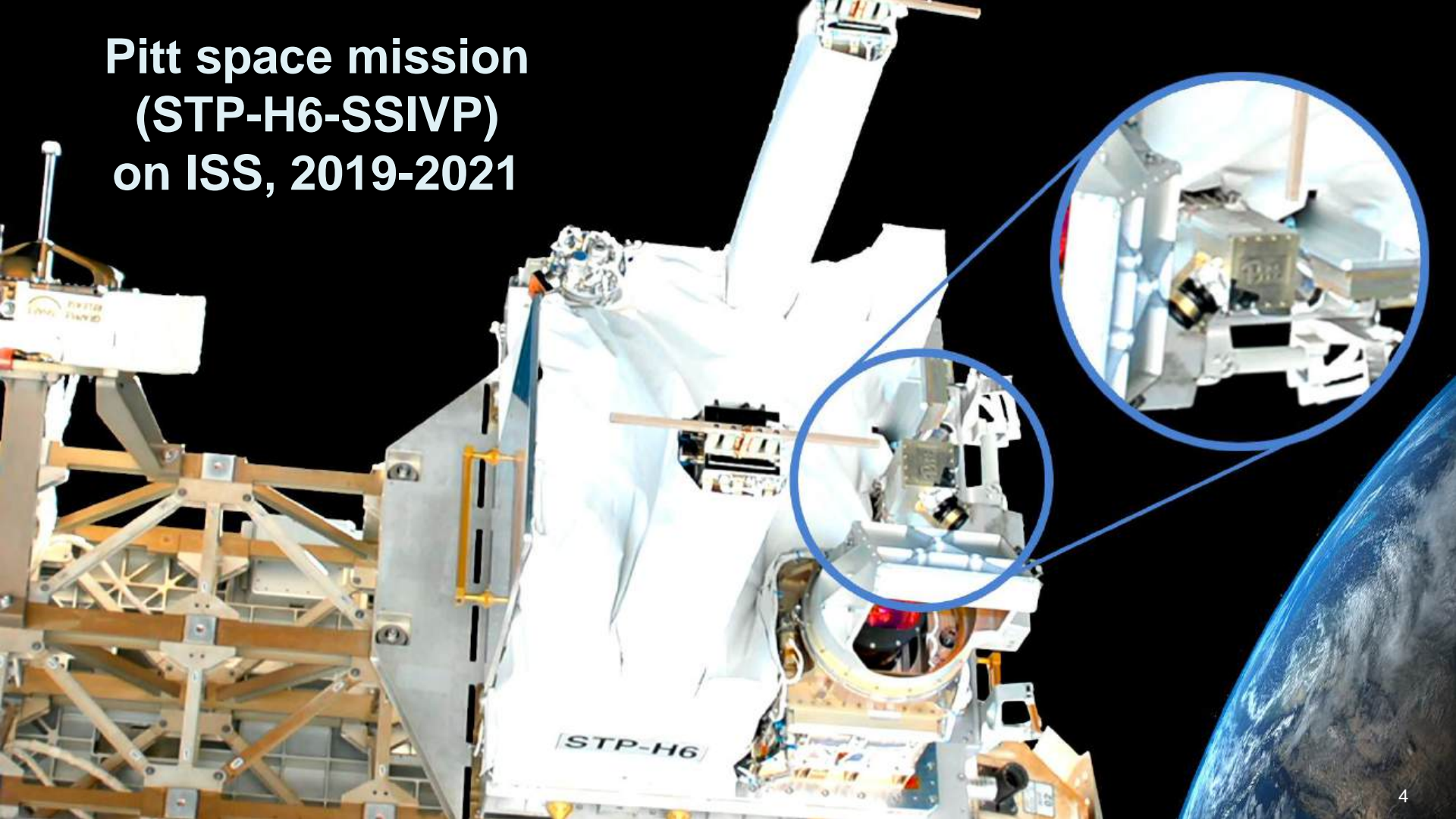


- Founded space lab in 2002, then NSF Space Center (SHREC) in 2006
- Moved space group and HQ of SHREC from UF to Pitt in 2017
- Led 4 and supported dozens of space experiments and missions
- *Including first-ever Pitt logo photographed in space 😊*



Rad-tolerant
SHREC Space Processor

**Pitt space mission
(STP-H6-SSIVP)
on ISS, 2019-2021**



NSF Space Center – SHREC



NSF Center for
Space, High-Performance & Resilient Computing



ABOUT

PARTNERS

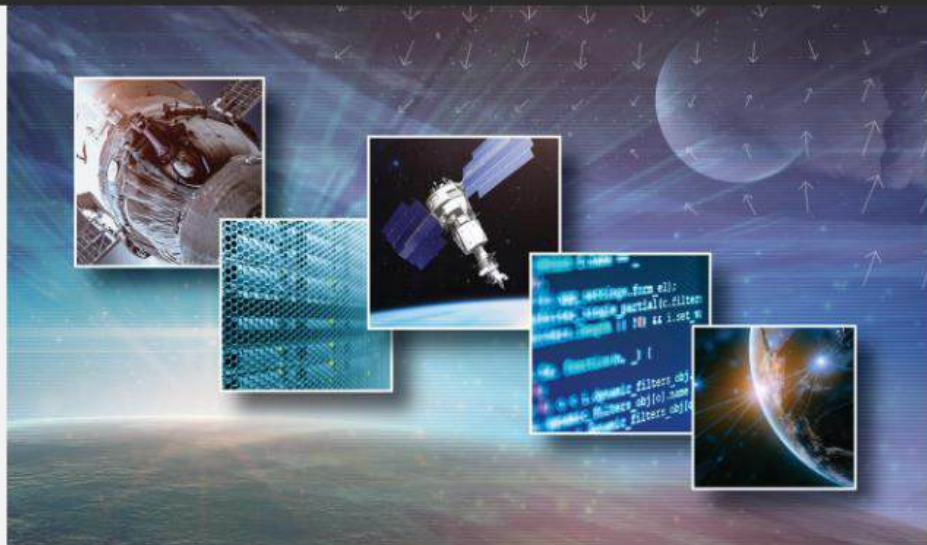
PEOPLE

PROJECTS

PUBLICATIONS

WORKSHOPS

CONTACT US



National Center

Founded in 2006, SHREC is the nation's leading academic research center in the field of computer and electrical engineering for mission-critical systems, from spacecraft to supercomputers.

[READ MORE ABOUT US](#)

www.nsf-shrec.org

Goals for Today and Upcoming



- **Launch of *Pitt Space* initiative**
 - Leverage core strengths in biomedicine, engineering, and science @ Pitt
 - Focus upon research and workforce development (education, training)
 - “Plant the flag” to establish Pitt as a Space University
- **Help faculty and students to:**
 - Become part of US space community
 - Connect and amplify their achievements
- **Build foundation for a formal Pitt or Pittsburgh Space Institute**
 - Serving needs of our university, community, region, and nation



How Did We Get Here?

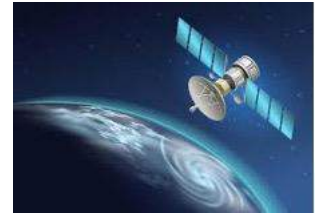
- Pitt was once a Space University, thanks to:
 - Dr. Samuel Langley, Pitt Prof. of Astronomy, 1867-91
 - Allegheny Observatory, world-renowned astrometric parallax program
 - Space Research Coordination Center, major funding from NASA in 1960s
 - But faded over time with changes of interests, priorities, administration
- Then, in 2020, faculty surveyed across most schools @ Pitt
 - Who is active or very interested in space research or education?
- Results surprisingly positive from > 100 faculty members
- Led to presentation in Sep. 2020 to Pitt Senior Leadership
 - Of course, timing not ideal in 2020 (pandemic), but seed was planted
 - Discussions continued, case grew stronger, much work in AY23-24, then ...



Background on Space Community



- **US space community undergoing major resurgence**
 - Greatest activity, excitement, growth since Apollo program
 - Space and defense agencies, NSF, industries large and small
 - For comms, navigation, weather, defense, science, medicine, etc.
 - Large gap in demand vs. supply for workforce development with R&D
- **Pitt not competitive, but could be with leverage and investment**
 - Fundamental building blocks already in place at Pitt
 - Major and growing space activities in SSOE, DSAS, and HS schools
 - Large NSF Center on space engineering research, including missions
 - Many faculty motivated by space topics, in SSOE (40+) and across campus (100+)
 - Untapped potential waiting to be fully realized @ Pitt and our neighbors



US and Global Space Economy



A New Space Economy on the Edge of Liftoff

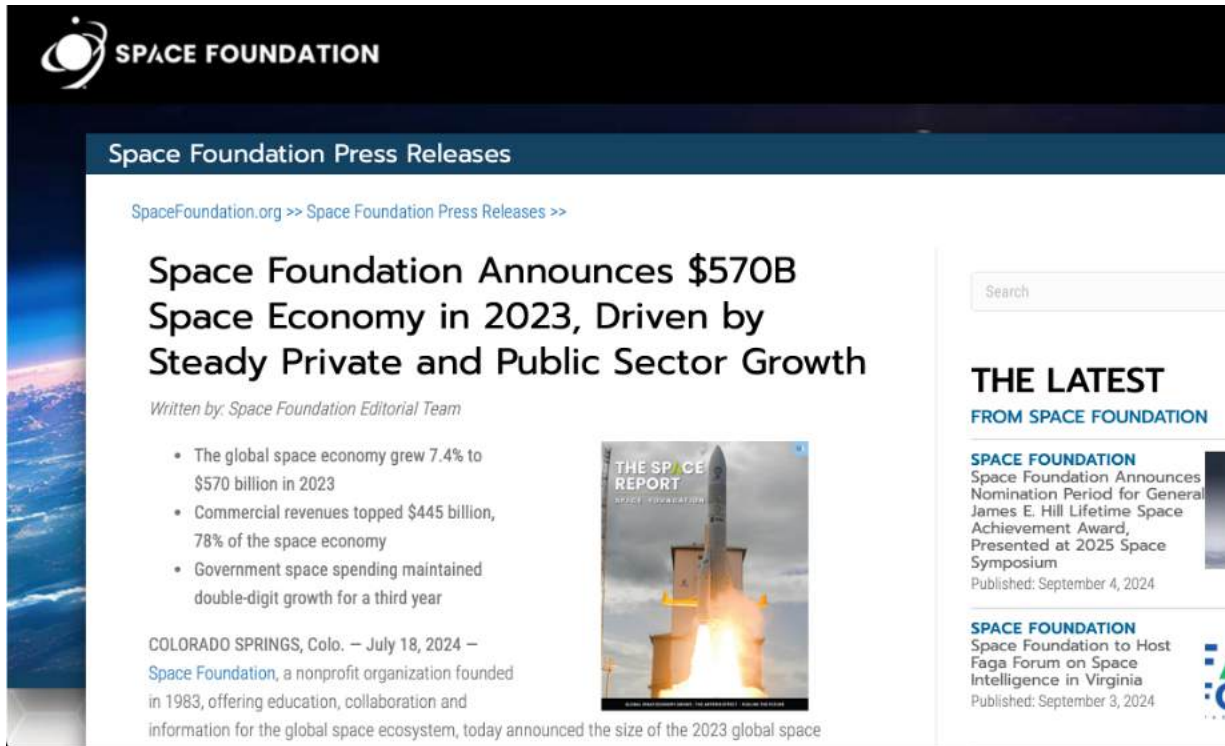
Jul 28, 2020

As NASA's Mars rover Perseverance blasts toward its historic mission to find evidence of life on the red planet, Morgan Stanley explores the market forces, technology and imagination driving a new space age. Journey with us to see the far-reaching benefits space may hold in store, both in our solar system and here on earth.

<https://www.morganstanley.com/Themes/global-space-economy>

A Growing Space Economy

<https://www.spacefoundation.org/2024/07/18/the-space-report-2024-q2>



SPACE FOUNDATION

Space Foundation Press Releases


SpaceFoundation.org >> Space Foundation Press Releases >>

Space Foundation Announces \$570B Space Economy in 2023, Driven by Steady Private and Public Sector Growth

Written by: Space Foundation Editorial Team

- The global space economy grew 7.4% to \$570 billion in 2023
- Commercial revenues topped \$445 billion, 78% of the space economy
- Government space spending maintained double-digit growth for a third year

COLORADO SPRINGS, Colo. – July 18, 2024 – [Space Foundation](#), a nonprofit organization founded in 1983, offering education, collaboration and information for the global space ecosystem, today announced the size of the 2023 global space



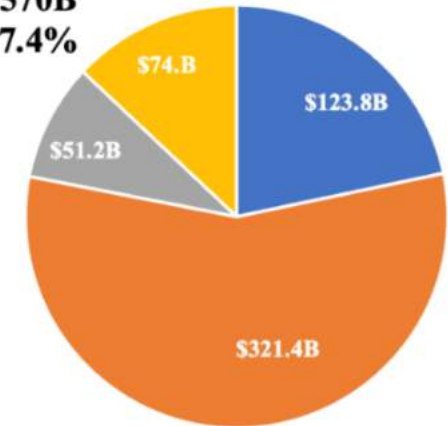
THE LATEST FROM SPACE FOUNDATION

SPACE FOUNDATION
Space Foundation Announces Nomination Period for General James E. Hill Lifetime Space Achievement Award, Presented at 2025 Space Symposium
Published: September 4, 2024

SPACE FOUNDATION
Space Foundation to Host Faga Forum on Space Intelligence in Virginia
Published: September 3, 2024

Global space activity by category, 2023

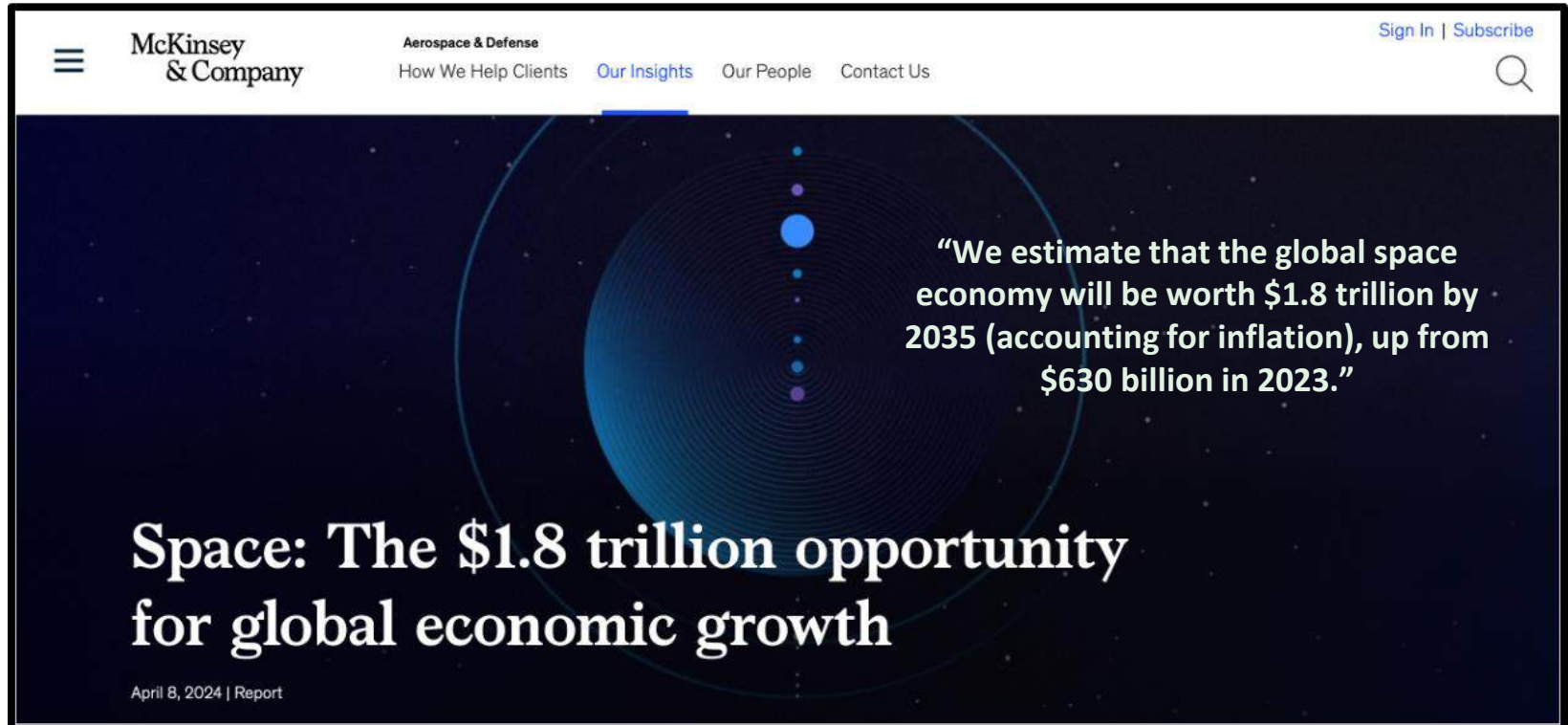
\$570B
+7.4%



- Commercial Infrastructure and Support Industries
- Commercial Space Products and Services
- Non-U.S. Government Space Budgets
- U.S. Government Space Budgets

Source: Space Foundation database

A Growing Space Economy



The screenshot shows the McKinsey & Company website for the Aerospace & Defense industry. The navigation bar includes 'How We Help Clients', 'Our Insights' (highlighted), 'Our People', and 'Contact Us'. A search icon is in the top right. The main content area features a dark blue background with a central graphic of a planet and orbiting lines. The headline reads 'Space: The \$1.8 trillion opportunity for global economic growth' with a date of 'April 8, 2024 | Report'. A quote states: 'We estimate that the global space economy will be worth \$1.8 trillion by 2035 (accounting for inflation), up from \$630 billion in 2023.'

McKinsey & Company

Aerospace & Defense

How We Help Clients **Our Insights** Our People Contact Us

Sign In | Subscribe

“We estimate that the global space economy will be worth \$1.8 trillion by 2035 (accounting for inflation), up from \$630 billion in 2023.”

Space: The \$1.8 trillion opportunity for global economic growth

April 8, 2024 | Report

Space Research Sponsors (sample)



Plus, hundreds of space industries, large and small, such as our neighbors →



Leading US Space Universities



■ Aspirational Peers

- Arizona State University
- Carnegie Mellon University
- Cornell University
- Georgia Institute of Technology
- Johns Hopkins University
- Massachusetts Institute of Tech
- Princeton University
- Stanford University
- Texas A&M University
- University of Arizona
- University of California, Los Angeles
- University of Colorado, Boulder
- University of Michigan
- University of Southern California
- University of Texas at Austin
- Vanderbilt University

Pitt: A Space University?

- **Could Pitt compete as a leading Space University?**
 - Strong core competency → YES
 - Broad space interests → YES
 - Relationships in space community → YES
 - Ancillary industries → YES
- **Major benefits that Pitt could reap as Space University?**
 - Excitement, recognition, funding, impact, ranking, recruiting
 - Major enhancement to research and education programs



Engineering



Biomedicine

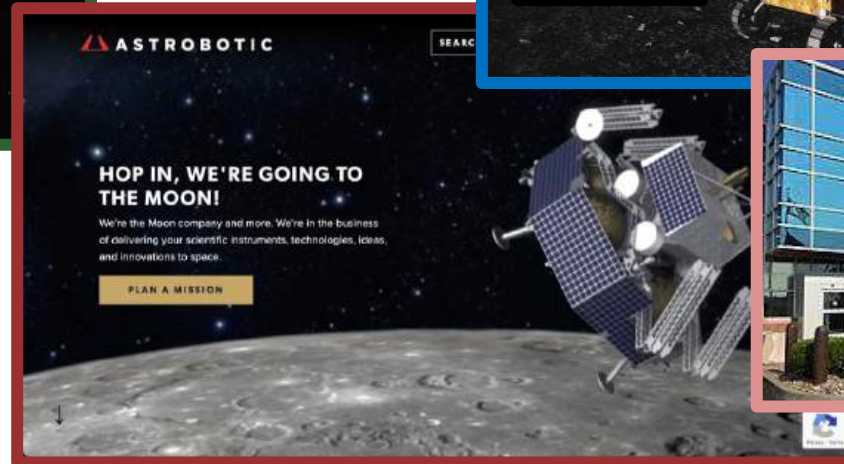


Science



Potential Local Partners

- Astrobotic, CMU-RI, CMU-SEI, KSC, NASA IV&V, TMC Tech, UPMC, etc.



How Do We Get There?



University of
Pittsburgh

Pitt Space

Education

Research

Facilities

Partners

People

Publications



Pitt Space Initiative

We provide world-class research and graduates in space engineering, health, and science to meet the growing needs of the U.S. space community.

RESEARCH

EDUCATION

www.space.pitt.edu

The Pitt Space Initiative

- **Effective Today, Sep. 10, “Pitt Space” is Officially Launched!**
 - Focus: Space Research & Workforce Development (education, training)
 - 3 core areas of strength: Space Engineering, Biomedicine, Science
- **Launching in Fall 2024 Semester**
 - Website, Social Media, Email Lists, Advisory Board(s), etc.
 - Seminar Series → 5 planned this semester, including today
 - Leadership → 3 senior directors, all very experienced in space R&D
 - Academics → developing suite of space courses and programs
 - Publications database → collection of Pitt space scholarship



Pitt Space Leadership

3 Space Advisors, Ready to Help Faculty Enter and Excel in US Space Community



Dr. Afshin Beheshti
Director
Space Biomedicine

*World-renowned expert,
just started at Pitt,
joining us via Zoom*



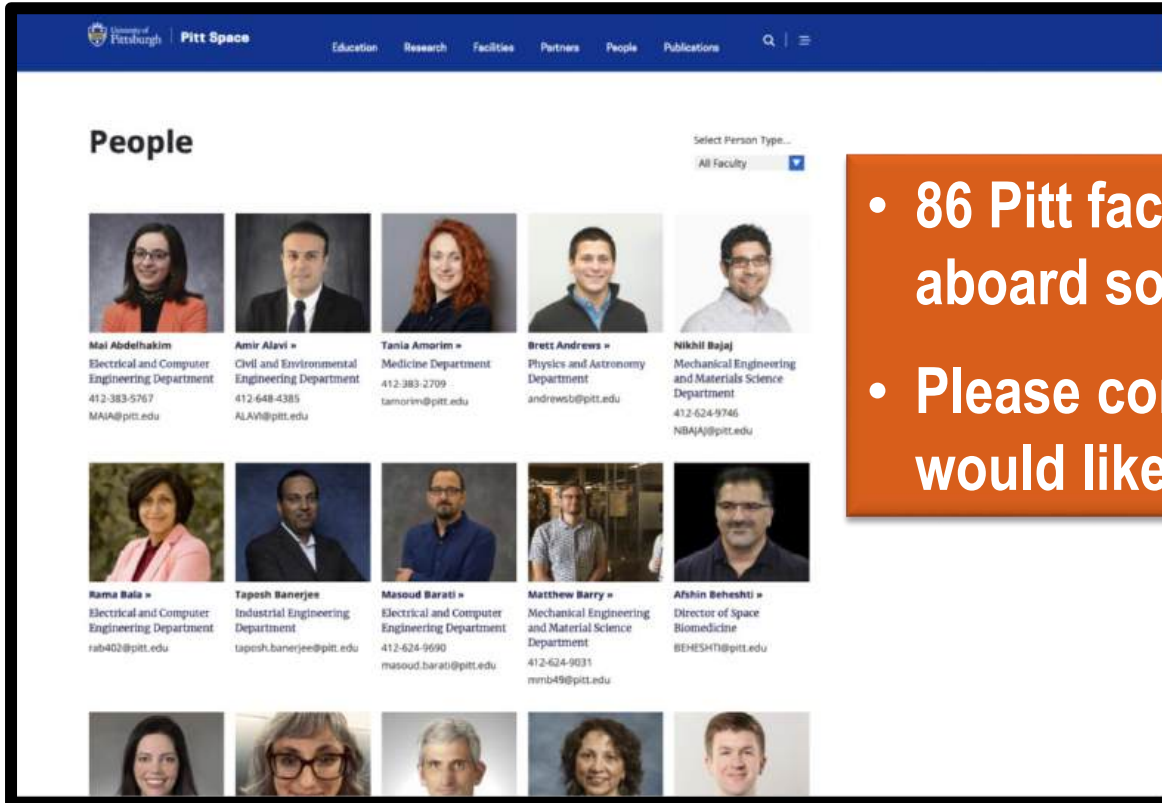
Dr. Alan George
Founder and Director
Space Engineering



Dr. Michael Ramsey
Director
Space Science

*World-renowned expert,
in Japan this week for
NASA/JAXA Meeting*

Pitt Space Faculty



The screenshot shows the 'People' page of the Pitt Space website. The page has a blue header with the University of Pittsburgh logo and 'Pitt Space' text. Navigation links include Education, Research, Facilities, Partners, People, and Publications. A search icon and a menu icon are also present. Below the header, the word 'People' is displayed in large black text. To the right of 'People' is a dropdown menu labeled 'Select Person Type...' with 'All Faculty' selected. The main content area displays a grid of faculty member profiles. Each profile consists of a headshot, a name, a department, a phone number, and an email address. The profiles are arranged in three rows. The first row contains five profiles, the second row contains five profiles, and the third row contains five profiles. The profiles are as follows:

Name	Department	Phone Number	Email Address
Mai Abdelhakim	Electrical and Computer Engineering Department	412-383-5767	MAIA@pitt.edu
Amir Alavi	Civil and Environmental Engineering Department	412-648-4385	ALAVI@pitt.edu
Tania Amorim	Medicine Department	412-383-2709	tamorim@pitt.edu
Brett Andrews	Physics and Astronomy Department		andrewsb@pitt.edu
Nikhil Bajaj	Mechanical Engineering and Materials Science Department	412-624-9746	NBAJA@pitt.edu
Rama Bala	Electrical and Computer Engineering Department		rb402@pitt.edu
Tapesh Banerjee	Industrial Engineering Department		tapesh.banerjee@pitt.edu
Masoud Barati	Electrical and Computer Engineering Department	412-624-9690	masoud.barati@pitt.edu
Matthew Barry	Mechanical Engineering and Material Science Department	412-624-9031	mmb49@pitt.edu
Afshin Beheshti	Director of Space Biomedicine		BEHESH7@pitt.edu

- 86 Pitt faculty members aboard so far
- Please contact us if you would like to join!

Breaking into Space Community

- Challenge for Faculty & Students to Enter US Space Pgm
 - Most opportunities expect space expertise
 - But space expertise requires space experience
 - So, can be difficult to first “get your foot in the door”



- Example: My First Morning at Pitt – Tuesday Jan. 3, 2017
 - Working in my office, along came a Pitt Ph.D. candidate
 - *6 months after, door opened to student’s dream career*



- Pitt Space brings education, expertise, facilities, support

Pitt Space News and Events



A second space age spanning omics, platforms and medicine across orbits



SHREC Enters the New Frontier of Space Research at Pitt



Ramsey Appointed to Future NASA Mission Science Team

[View All News](#) →

Sep
10

A Pitt Space Institute for the Final Frontier

Sep
24

Anesthesiology Research Rounds: Aerospace Medicine and Anesthesiology: Overlapping Physiology and Research Opportunities

Oct
08

Pitt Space Lunch and Learn Seminar

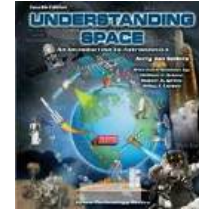
Dec
10

Pitt Space Lunch and Learn Seminar

[View All Events](#) →

■ New Courses

- *Intro to Space Engineering* ← graduate/senior, Fall 2024
- *Dependable Computing* ← graduate/senior, Fall 2024
- *Extreme Environment Electronics* ← graduate/senior, Spring 2025
- *Intro to Space Science and Intro to Space Biomedicine* (in development)
- More to be explored in Space Science, Biomedicine, and Engineering



■ New Programs

- Graduate Certificate in Space Engineering (pending final approval)
- Undergrad Minors in Space Engineering and in Astronomy (in development)
- Undergrad Certificate in Space Science (in development)
- More to be explored in Space Science, Biomedicine, and Engineering



Conclusions

- **With launch of Pitt Space, we are becoming next US Space University**
 - Organizing and leveraging space expertise, leadership, facilities, etc.
 - Broad, strong, and growing interest by faculty and students alike
- **Space research and workforce development are strongly correlated**
 - Agencies, companies, and institutes funding much space R&D
 - Same organizations eager to acquire space graduates and tech
 - Few R1/AAU universities well positioned to compete strongly
 - Pitt Space will serve Southwestern PA, tri-state region, and nation
- **Pitt Space (education, R&D) = Biomedicine + Science + Engineering**
 - Afshin Beheshti (Dir. Space Biomedicine), Mike Ramsey (Dir. Space Science), and I (Dir. Space Engineering) are very happy to meet and help on any topic



What Next?

- **Pitt Space Seminar Series** – *see website for details*
 - Sep. 24, aerospace medicine and anesthesiology, Dr. Julia Scarpa from Weill Cornell Medicine (seminar c/o Pitt-SOM)
 - Oct. 8, opportunities in space engineering and beyond, Dr. Michael Gazarik from NASA, BAE Systems, and U. Colorado
 - Nov. 12, opportunities in space science and beyond, speaker TBC
 - Dec. 10, opportunities in space biomedicine and beyond, Dr. Chris Mason from Weill Cornell Medicine
- **New Teams, Proposals, Grants, Courses, Facilities, Programs, etc.**
 - Afshin, Mike, I, and others in Pitt Space are ready to help or collaborate!

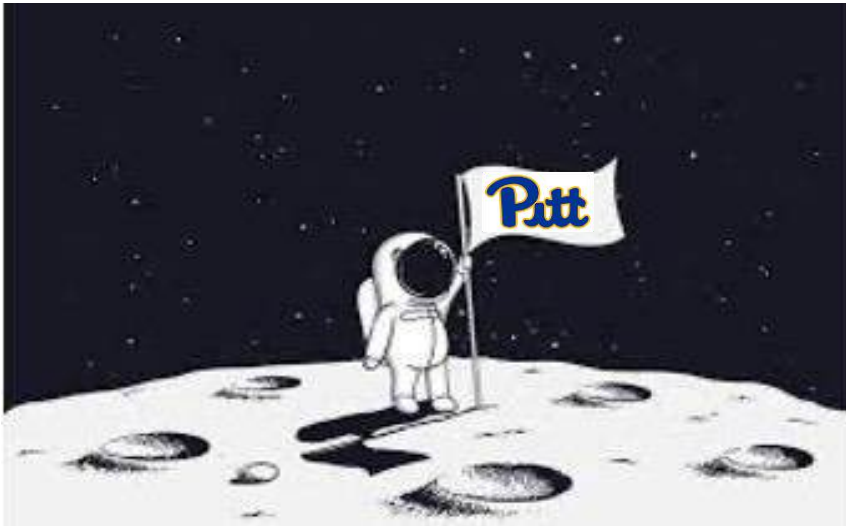


Leadership Recognition

- **Pitt Leadership**
 - Dr. Michele Manuel, SSOE Dean
 - Dr. Adam Leibovich, DSAS Dean
- **Industry Leadership**
 - Dr. Andrew Horchler, Astrobotic
 - Dr. Howie Choset, CMU-RI
 - Dr. John Wohlbiel, CMU-SEI
 - Dr. Scott Zemerick, TMC Technologies



Comments and Questions



Flag is Planted! Pitt Space is Hereby Launched!