Arizona NASA Space Grant Consortium

Thirty-Fifth Annual Statewide Student Research Symposium

Presentations by Space Grant Students from:

Arizona State University
Embry-Riddle Aeronautical University
Northern Arizona University
University of Arizona
Arizona Western College
Casa Grande Union High School
Central Arizona College
Glendale Community College
Phoenix College
Pima Community College

April 18th, 2026
Scottsdale, AZ

Arizona NASA Space Grant Consortium

Thirty-Fifth Annual Statewide Student Research Symposium

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2025-2026 Arizona NASA Space Grant Consortium
Statewide Student Research Symposium
April 18, 2026

Welcome to the 35th annual Arizona NASA Space Grant Statewide Student Research Symposium!

The Symposium consists of four parallel topical sessions, a morning break for coffee, afternoon lunch, and a student poster session at the end of the day. We encourage you to use these breaks and activities to network with one another, talk to peers and colleagues from other schools, and take time to make connections.

The Symposium will feature talks from 134 students. In-person talks will typically last ten minutes each, roughly divided as ~8 minutes for presentations and ~2 minutes for questions from the audience.

This symposium is made possible through a NASA grant awarded to the Arizona Space Grant Consortium. The efforts of managers, mentors, steering committee members and Space Grant representatives at Arizona State University, Embry-Riddle Aeronautical University, Northern Arizona University, the University of Arizona, Arizona Western College, Casa Grande Union High School, Central Arizona College, Glendale Community College, Phoenix College, and Pima Community College are acknowledged. Students with a variety of academic backgrounds have come together with their mentors to make the program a success, and this Symposium is a tribute to their dedication and spirit of inquiry.

The Arizona NASA Space Grant Student Research Symposium also recognizes the efforts of many university faculty, private sector, and federal researchers/mentors, who give selflessly of their time and energy to provide leading-edge research experiences to enrich the education of Arizona's Space Grant students. We thank them all for their past, present and future support.

Timothy Swindle, Director
Arizona Space Grant Consortium, U of A

Chandra Holifield Collins, Associate Director
U of A NASA Space Grant

Yancy Shirley, Assistant Director
U of A NASA Space Grant

Michelle Coe, Program Manager
Arizona Space Grant Consortium, U of A

Thomas Sharp, Associate Director
ASU NASA Space Grant

Desiree Crawl, Sr. Coordinator
ASU NASA Space Grant

Anne Boettcher, Associate Director
ERAU NASA Space Grant

Elliott Bryner, Associate Director
ERAU NASA Space Grant

Christopher Edwards, Associate Director
NAU NASA Space Grant

Nicholas Alfonso Diaz, Program Assistant Manager
NAU NASA Space Grant

Saturday, April 18, 2026

9:00-9:20 a.m. WELCOME & PLENARY

SKYSONG BUILDING 3, SYNERGY ROOM, LEVEL 1

Dr. Chandra Holifield Collins, Associate Director of the University of Arizona NASA Space Grant Program

Room	**Exploration Room** **SkySong Bldg 1, Level 3**	**Ingenuity Room** **SkySong Bldg 1, Level 3**	**Global Room** **SkySong Bldg 1, Level 2**	**Discovery Room** **SkySong Bldg 1, Level 3**
TIME **(MST)**	**Session A** **AERONAUTICS** **Moderators:** Anne Boettcher, ERAU Christoph Hader, UA (9:40 AM – 10:10 AM) --- **Session F** **EXPLORATION SYSTEMS ENGINEERING** **Moderators:** Anne Boettcher, ERAU Elliott Bryner, ERAU Christoph Hader, UA Ron Madler, ERAU (10:10 AM – 2:00 PM) --- **Session E** **EDUCATION AND PUBLIC OUTREACH** **Moderators:** Elliott Bryner, ERAU Ron Madler, ERAU (2:00 PM – 2:30 PM)	**Session B** **AEROSPACE TECHNOLOGY** **Moderators:** Elliott Bryner, ERAU Ron Madler, ERAU (9:40 AM – 10:40 AM) --- **Session G** **PLANETARY SCIENCE** **Moderators:** Christopher Edwards, NAU Thomas Sharp, ASU (11:10 AM – 2:40 PM)	**Session C** **ASTRONOMY & SPACE PHYSICS** **Moderators:** Maitrayee Bose, ASU Tim Swindle, UA Michele Zanolin, ERAU (9:40 AM – 3:00 PM)	**Session D** **EARTH AND ENVIRONMENTAL SCIENCE AND ENGINEERING** **Moderators:** Chandra Holifield Collins, UA Nicholas Alfonso Diaz, NAU (9:40 AM-2:00 PM) --- **Session H** **Topics in Math, Physics, and Chemistry** **Moderators:** Chandra Holifield Collins, UA Nicholas Alfonso Diaz, NAU (2:00 PM – 2:50 PM)

Room	Exploration Room SkySong Bldg 1, Level 3	Ingenuity Room SkySong Bldg 1, Level 3	Global Room SkySong Bldg 1, Level 2	Discovery Room SkySong Bldg 1, Level 3
9:40-9:50	[A-1] *Kaden Steiner* Numerical Investigation of Wave Packet Spreading Angles in Hypersonic Boundary Layers	[B-1] *Tyler Nielsen* Coconut: Student-Led Development and On-Orbit Operation of a 1U LoRa Amateur Radio CubeSat	[C-1] *Alison Bolanos Pina* Is Surface Roughness Indicative of Sediment Flow Morphology on Mars?	[D-1] *Aseem Rajopadhye* Developing Leaching Methodology to Identify Origins of Mo in BARB5 Shale Samples
9:50-10:00	[A-2] *Mae Carrington* Design of a dynamic surface prototype using continuous servos for boundary layer control	[B-2] *Christopher LeClair, Bruce Noble, Connor Shackelford* Electrical Capacitance to High-resolution Observation	[C-2] *Anna Brandigi* Direct Imaging of the Stellar Companion to the Hot Dust Star κ Tuc Aa	[D-2] *Taylor Alger* Cultivation of Alfalfa in MGS-1 Martian Simulant
10:00-10:10	[A-3] *Sydney Bayliff* Tomographic Reconstruction of Density Gradients Created by a Plasma Actuator	[B-3] *GCC ASCEND Team 2* SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!	[C-3] *Brittany Hollowell* Drivers of Nighttime CO2 Non-Local Thermodynamic Equilibrium	[D-3] *Kayla Courtright* Surface-Modified Cellulose Sponges for PFAS Removal: A Rapid Small Scale Column Test and Isotherm Study
10:10-10:20	[F-1] *Isabella O'Brien* Real Time Image Based Detection and Characterization of Optical Downlink from NASA's Laser Communications and Relay Demonstration	[B-4] *John Bruchhagen* Visualization of Shock Boundary Layer Interactions	[C-4] *Zephyr Kennan* Calculating potential cumulative carbon fixed and evolutionary stage for Earthlike planets in our solar neighborhood	[D-4] *Anneli Sorensen* Arctic Sea Ice Preservation
10:20-10:30	[F-2] *Tegan Barber* Data-driven analysis of geometric factors that impact LPBF part quality	[B-5] *Cambri Miller, Bruce Noble, Ella Ozatay, Cheyenne Valentine* EagleSat	[C-5] *Els Shepard* Identifying Locations for Grain Formation in Core Collapse Supernova Outflows	[D-5] *Ethan Herrington* Quantifying the optical properties of volcanic ash to improve satellite retrievals
10:30-10:40	[F-3] *Phillip Stahoviak* Using Machine Learning to Design Composite Materials with Tunable Bandgaps	[B-6] *Marcelo Brooks* Satellite Ground-Station Development	[C-6] *Camille Cioffi* Mass Loss and Pre-supernova Properties of Massive Stars	[D-6] *ASU ASCEND* High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for cubesat hardware
10:40-11:10	Mid-Morning Break & Refreshments, SkySong Building 1, Level 3 Hallway			
11:10-11:20	[F-4] *Carson Holmes, Michelle Madrigal* Investigation of Stress Concentrations in Stereolithographic Modeled Parts	[G-1] *Maezy Biemond* Investigating Potential Martian Biocrust	[C-7] *Harshita Prasad* Analyzing Aurora Observed by Instruments at Poker Flat, Alaska to Better Understand Geomagnetic Activity	[D-7] *Jacob Taylor* Simulations and Inversions for Drone-Based Time-Domain Electromagnetic Surveying for Groundwater Detection for Arizona and Mars Water Exploration

Room	Exploration Room SkySong Bldg 1, Level 3	Ingenuity Room SkySong Bldg 1, Level 3	Global Room SkySong Bldg 1, Level 2	Discovery Room SkySong Bldg 1, Level 3
11:20-11:30	[F-5] *Yaris Eidenbenz* Nanostructured BEA Zeolite Membranes for Enhanced Lithium-Ion Transport in Lithium-Ion Batteries	[G-2] *Angela Tatsch* Investigating the transport of volatile-bearing vapors in the crust of the Moon	[C-8] *Nayera Abdessalam* Probing Early Supermassive Black Hole Growth: C IV-Based Mass Estimates in z ~ 4.8 Quasars	[D-8] *Estrella Solis Mata* Alkali Salt-Modified Carbon Supports for Scalable Moisture Swing CO_2 Capture
11:30-11:40	[F-6] *Rose Hall* In Vivo Bone Strain Measurement in Simulated Reduced Gravity	[G-3] *Trisha Lucas* Solid State Diffusion of Volatiles on Pluto	[C-9] *Ari Chai, Jewel MacPherson* Stellar Polarimeter for Undergraduate Studies (SPUdS)	[D-9] *Samantha McLean* Building a Python Pipeline for Processing Remote Sensing Data of Yellowstone Thermal Areas and Quantifying Systematic Error
11:40-11:50	[F-7] *Madison Rix* Mechanical and Optical Architecture of a Laser Communication Relay Demonstration Beacon Test System	[G-4] *Audrey Smith* Sublimation of H2O and D2O Mixtures	[C-10] *Ambroise Juston* Birefringence Mirror Curvature	[D-10] *Ava Campbell* Hydrogen Production and Storage in $CaTiO_3$ Perovskite at Mantle-Related High Pressures
11:50-12:00	[F-8] *Rayna Hylden* Thin Film Solar Cell Performance on Metal Alloy Substrates	[G-5] *Cody Fischer* High-Resolution Regional Mapping of Crustal Magnetic Fields on Mars	[C-11] *Rohin Sant* How Accretion Influences Ionization Cones in Seyfert 2 Galaxies	[D-11] *Nandini Manepalli* Proteins that emerged after the oxygenation of Earth's atmosphere used less now-scarce manganese and iron-sulfur clusters, but not less heme
12:00-12:10	Return to SkySong Building 3, Synergy Rooms Lunch Break	[G-6] *Charly Bisson* Examining Coexistence in a Simulated Microbial Environment for Agnostic Life Detection	[C-12] *William O'Brien* Finding an Optimal Layout for the Long Wavelength Array Swarm Station at Meteor Crater	Return to SkySong Building 3, Synergy Rooms Lunch Break
12:10-12:20		[G-7] *Landri Howard, Mylene Luna, Peyton Posey, Hailianna Rodgers* Casa Grande Union High School ASCEND	[C-13] *Rebekah Boisvert* Mid-Infrared (4.5 μm) Observations of a Brown Dwarf Binary around a Sun-Like Star	
12:20-12:30	Return to SkySong Building 3, Synergy Rooms			
12:30-1:30	Lunch Break			
1:30-1:40	Return to sessions, SkySong Building 1			

Room	Exploration Room SkySong Bldg 1, Level 3	Ingenuity Room SkySong Bldg 1, Level 3	Global Room SkySong Bldg 1, Level 2	Discovery Room SkySong Bldg 1, Level 3
1:40-1:50	[F-9] *Tristan Britt* Evaluating Lunar Regolith as a Structural Material for In-Situ Resource Utilization	[G-8] *Austin Gadd* Impact-Induced Shock Metamorphism and Its Role in Structuring Microbial Habitats in Coconino Sandstone at Barringer Crater	[C-14] *Jackson Headon* Narrowing the Science Gap List of Habitable Worlds Observatory Targets	[D-12] *Tye Ropati* Fan and Fill: Reconstructing the Past through Sedimentology, Stratigraphy, and Geomorphology
1:50-2:00	[F-10] *Jillian Harder* Optical telescope design investigation for orbital research	[G-9] *Eli Resnick* Analog Life in Impact-induced Endolithic Niches (ALIEN)	[C-15] *Adler Williams* Measuring Masses and Kinematics for Two Highly Eccentric Massive Binaries	[D-13] *Tiffany Le* Tracking Water in the Desert
2:00-2:10	[E-1] *Sierra Monreal* A Consolidated Analysis of U.S. Aerospace Activity	[G-10] *Christine Quan* Habitability Constraints of Oxalotrophic Bacteria from Dryland and Marine Ecosystems	[C-16] *Grace Kaiser* Deuterated Formaldehyde as a Tracer of Core and Filament Evolution	[H-1] *John Anderson* Physics-Informed Long Short-Term Memory Neural Networks for Response Prediction and Parametric Identification of Nonlinear Dynamical Systems
2:10-2:20	[E-2] *Dominic Trujillo* STEM Kit Design for Early Aerospace Education	[G-11] *Aubrey Schrameck* Adaptive Segmentation and Automated Morphometric Analysis of Monogenetic Volcanic Cones in Distributed Fields	[C-17] *Gibson Bowling* Discovery of NIR-Variable Objects in the JWIDF	[H-2] *Peter Goodman* Assessing the Effect of Protein Structure on Amino Acid Evolution
2:20-2:30	[E-3] *Eyan Weissbluth* Evaluating STEM Researches knowledge of Philosophy of Science	[G-12] *Brad Tsosie* The Geochemical Buffet: Evaluating the Influence of Impact-Induced Mixing in Ejecta on Lithotrophic Microbial Diversity at Barringer Crater, Arizona	[C-18] *Bradley DiLorenzo, Clayton Larson* Analyzing Light Curves of Core Collapse Supernovae	[H-3] *Sawyer Star* Lorentz-Symmetry Breaking in Quantum Field Theory
2:30-2:40	Return to SkySong Building 3, Synergy Rooms	[G-13] *Isabel Kahn* Reanalyzing Habitability Claims for K2-18 b Through Forward Models and Retrieval Analysis	[C-19] *Rachel Honor* Catching Light Waves with SKYSURFIR: Measuring Offsets between NIRCam Detectors	[H-4] *Dario Walter-Cardona* Systems of Partial Differential Equations in Bumblebee Gravity
2:40-2:50		Return to SkySong Building 3, Synergy Rooms	[C-20A-B] *Ishaan Dhanwantry, Yunia Orina* It's Moving, It's Alive! High resolution view of IGR J16320 and MS 1603.6+2600	[H-5] *Tyler Brown* Simulated analyses of Roman Space Telescope weak lensing and galaxy clustering cosmology

Room	Exploration Room SkySong Bldg 1, Level 3	Ingenuity Room SkySong Bldg 1, Level 3	Global Room SkySong Bldg 1, Level 2	Discovery Room SkySong Bldg 1, Level 3
2:50-3:00	Return to SkySong Building 3, Synergy Rooms	Return to SkySong Building 3, Synergy Rooms	[C-20A-B] *Ishaan Dhanwantry, Yunia Orina* It's Moving, It's Alive! High resolution view of IGR J16320 and MS 1603.6+2600	Return to SkySong Building 3, Synergy Rooms
3:00-3:10	Return to SkySong Building 3, Synergy Rooms			
3:10-4:10	**ASCEND Poster Session** **SkySong Building 3, Synergy Rooms** Closing Session			

Program Schedule by Session
Organized by presenter's last name.

Session A: Aeronautics
Moderators:
Anne Boettcher, Embry-Riddle Aeronautical University
Christoph Hader, University of Arizona

[A-1] **Numerical Investigation of Wave Packet Spreading Angles in Hypersonic Boundary Layers**. Student: Kaden Steiner, Senior, Aerospace Engineering, University of Arizona. Mentor: Christoph Hader, Aerospace and Mechanical Engineering, University of Arizona.

[A-2] **Design of a dynamic surface prototype using continuous servos for boundary layer control**. Student: Mae Carrington, Senior, Aerospace Engineering, Arizona State University. Mentor: Gokul Pathikonda, Ira A Fulton Schools of Engineering, Arizona State University.

[A-3] **Tomographic Reconstruction of Density Gradients Created by a Plasma Actuator**. Student: Sydney Bayliff, Senior, Aerospace Engineering, University of Arizona. Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona.

Session B: Aerospace Technology
Moderators:
Elliott Bryner, Embry-Riddle Aeronautical University
Ron Madler, Embry-Riddle Aeronautical University

[B-1] **Coconut: Student-Led Development and On-Orbit Operation of a 1U LoRa Amateur Radio CubeSat**. Student: Tyler Nielsen, Senior, Computer Systems Engineering, Arizona State University. Mentor: Joe Dubois, Interplanetary Lab, Arizona State University.

[B-2] **Electrical Capacitance to High-resolution Observation**. Student: Christopher LeClair, Sophomore, Aerospace Engineering, Embry-Riddle Aeronautical University. Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University.

[B-2] **Electrical Capacitance to High-resolution Observation**. Student: Bruce Noble, Senior, Aerospace Engineering - Astronautics Track, Embry-Riddle Aeronautical University. Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University.

[B-2] **Electrical Capacitance to High-resolution Observation (ECHO)**. Student: Connor Shackelford, Junior, Aerospace Engineering, Embry-Riddle Aeronautical University. Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University.

[B-3] **GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!**. Student: Irwin Estrada Fernandez, Sophomore, Electrical Engineering, Glendale Community College. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

[B-3] **GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!**. Student: Caden Hess, Sophomore, Electrical Engineering, Glendale Community College. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

[B-3] **GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!**. Student: Adrian Jimenez, Sophomore, Electrical Engineering, Glendale Community College. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

[B-3] **GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!**. Student: James Petersen, Sophomore, Electrical Engineering, Glendale Community College. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

[B-3] **GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors!**. Student: Justin Thomas, Sophomore, AI and Machine Learning, Glendale Community College. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

[B-4] **Visualization of Shock Boundary Layer Interactions**. Student: John Bruchhagen, Senior, Aerospace Engineering, University of Arizona. Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona.

[B-5] **EagleSat**. Student: Cambri Miller, Senior, Aerospace Engineering, Embry-Riddle Aeronautical University. Mentor: Ahmed Sullyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University.

[B-5] **EagleSat**. Student: Bruce Noble, Senior, Aerospace Engineering - Astronautics Track, Embry-Riddle Aeronautical University. Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University.

[B-5] **EagleSat**. Student: Ela Ozatay, Senior, Aerospace Engineering - Astronautics, Embry-Riddle Aeronautical University. Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University.

[B-5] **EagleSat**. Student: Cheyenne Valentine, Junior, Aerospace Engineering - Astronautics, Embry-Riddle Aeronautical University. Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University.

[B-6] **Satellite Ground-Station Development**. Student: Marcelo Brooks, Senior, Computer Systems Engineering, Arizona State University. Mentor: Michael Goryll, School of Electrical, Computer and Energy Engineering, Arizona State University.

Session C: Astronomy and Space Physics
Moderators:
Maitrayee Bose, Arizona State University
Tim Swindle, University of Arizona
Michele Zanolin, Embry-Riddle Aeronautical University

[C-1] **Is Surface Roughness Indicative of Sediment Flow Morphology on Mars?**. Student: Alison Bolanos Pina, Junior, Earth and Space Exploration, Arizona State University. Mentor: Jacob Adler, School of Earth and Space Exploration, Arizona State University.

[C-2] **Direct Imaging of the Stellar Companion to the Hot Dust Star κ Tuc Aa**. Student: Anna Brandigi, Senior, Astronomy and Physics, University of Arizona. Mentor: Anna Brandigi, Steward Observatory, University of Arizona.

[C-3] **Drivers of Nighttime CO2 Non-Local Thermodynamic Equilibrium**. Student: Brittany Hollowell, Sophomore, Astronomical and Planetary Sciences and Earth and Environmental Sciences, Arizona State University. Mentor: Katrina Bossert, School of Earth and Space Exploration, Arizona State University.

[C-4] **Calculating potential cumulative carbon fixed and evolutionary stage for Earthlike planets in our solar neighborhood**. Student: Zephyr Kennan, Junior, Astronomy, Planetary Science, and Physics, Northern Arizona University. Mentors: Christopher Doughty and Michael Gowanlock, School of Informatics, Computing, and Cyber Systems, Northern Arizona University.

[C-5] **Identifying Locations for Grain Formation in Core Collapse Supernova Outflows**. Student: Els Shepard, Junior, Aerospace Engineering - Astronautics, Arizona State University. Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University.

[C-6] **Mass Loss and Pre-supernova Properties of Massive Stars**. Student: Camille Cioffi, Junior, Astronomy and East Asian Studies, University of Arizona. Mentor: Carl Fields, Steward Observatory, University of Arizona.

[C-7] **Analyzing Aurora Observed by Instruments at Poker Flat, Alaska to Better Understand Geomagnetic Activity**. Student: Harshita Prasad, Senior, Biomedical Sciences, Arizona State University. Mentor: Katrina Bossert, School of Earth and Space Exploration, Arizona State University.

[C-8] **Probing Early Supermassive Black Hole Growth: C IV-Based Mass Estimates in z ~ 4.8 Quasars**. Student: Nayera Abdessalam, Junior, Astronomy and Physics, University of Arizona. Mentor: Richard Green, Astronomy, University of Arizona.

[C-9] **Stellar Polarimeter for Undergraduate Studies (SPUdS)**. Student: Ari Chai, Sophomore, Space Physics, Embry-Riddle Aeronautical University. Mentor: Elizabeth Gretarsson, Physics and Astronomy Department, Embry-Riddle Aeronautical University.

[C-9] **Stellar Polarimeter for UnDergraduate Studies - SPUdS**. Student: Jewel MacPherson, Junior, Astronomy, Embry-Riddle Aeronautical University. Mentor: Noel Richardson, Physics and Astronomy, Embry-Riddle Aeronautical University.

[C-10] **Birefringence Mirror Curvature**. Student: Ambroise Juston, Senior, Aeronautical Engineering, Embry-Riddle Aeronautical University. Mentor: Elizabeth Gretarsson, Physics and Astronomy Department, Embry-Riddle Aeronautical University.

[C-11] **How Accretion Influences Ionization Cones in Seyfert 2 Galaxies**. Student: Rohin Sant, Senior, Physics and Astronomy, University of Arizona. Mentor: Jacob Isbell, Steward Observatory, University of Arizona.

[C-12] **Finding an Optimal Layout for the Long Wavelength Array Swarm Station at Meteor Crater**. Student: William O'Brien, Sophomore, Astrophysics and Physics, Arizona State University. Mentor: Daniel Jacobs, School of Earth and Space Exploration, Arizona State University.

[C-13] **Mid-Infrared (4.5 µm) Observations of a Brown Dwarf Binary around a Sun-Like Star**. Student: Rebekah Boisvert, Junior, Astronomy, University of Arizona. Mentor: Brittany Miles, Astronomy and Steward Observatory, University of Arizona.

[C-14] **Narrowing the Science Gap List of Habitable Worlds Observatory Targets**. Student: Jackson Headon, Senior, Astrophysics and Physics, Arizona State University. Mentor: Jennifer Patience, School of Earth and Space Exploration, Arizona State University.

[C-15] **Measuring Masses and Kinematics for Two Highly Eccentric Massive Binaries**. Student: Adler Williams, Junior, Astronomy, Embry-Riddle Aeronautical University. Mentor: Noel Richardson, Physics and Astronomy, Embry-Riddle Aeronautical University.

[C-16] **Deuterated Formaldehyde as a Tracer of Core and Filament Evolution**. Student: Grace Kaiser, Sophomore, Astronomy and Mathematics, University of Arizona. Mentor: Yancy Shirley, Astronomy, University of Arizona.

[C-17] **Discovery of NIR-Variable Objects in the JWIDF**. Student: Gibson Bowling, Junior, Physics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[C-18] **Analyzing Light Curves of Core Collapse Supernovae**. Student: Bradley DiLorenzo, First-Year, Space Physics, Embry-Riddle Aeronautical University. Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University.

[C-18] **Analyzing Light Curves of Core Collapse Supernovae**. Student: Clayton Larson, High School Student, Basis High School, Prescott. Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University.

[C-19] **Catching Light Waves with SKYSURFIR: Measuring Offsets between NIRCam Detectors**. Student: Rachel Honor, Junior, Astrophysics and Physics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[C-20A-B] **It's Moving, It's Alive! High resolution view of IGR J16320 and MS 1603.6+2600**. Student: Ishaan Dhanwantry, Sophomore, Astronomy, Embry-Riddle Aeronautical University. Mentor: Pragati Pradhan, Physics and Astronomy, Embry-Riddle Aeronautical University.

[C-20A-B] **It's Moving, It's Alive! High resolution view of IGR J16320 and MS 1603.6+2600**. Student: Yunia Orina, Junior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Pragati Pradhan, Physics and Astronomy, Embry-Riddle Aeronautical University.

Session D: Earth and Environmental Science and Engineering
Moderators:
Nicholas Alfonso Diaz, Northern Arizona University
Chandra Holifield Collins, University of Arizona

[D-1] **Developing Leaching Methodology to Identify Origins of Mo in BARB5 Shale Samples**. Student: Aseem Rajopadhye, Senior, Astrobiology and Biogeosciences, Arizona State University. Mentor: Ariel Anbar, School of Molecular Sciences, Arizona State University.

[D-2] **Cultivation of Alfalfa in MGS-1 Martian Simulant**. Student: Taylor Alger, Junior, Microbiology, Northern Arizona University. Mentor: Lorena Caballero, Biological Sciences, Northern Arizona University.

[D-3] **Surface-Modified Cellulose Sponges for PFAS Removal: A Rapid Small Scale Column Test and Isotherm Study**. Student: Kayla Courtright, Senior, Chemical Engineering, University of Arizona. Mentor: Vasiliki Karanikola, Chemical and Environmental Engineering, University of Arizona.

[D-4] **Arctic Sea Ice Preservation**. Student: Anneli Sorensen, Junior, Aerospace Astronautical Engineering, Arizona State University. Mentor: Steven Desch, School of Earth and Space Exploration, Arizona State University.

[D-5] **Quantifying the optical properties of volcanic ash to improve satellite retrievals**. Student: Ethan Herrington, Junior, Mechanical Engineering, Northern Arizona University. Mentor: Jean-Francois Smekens, Astronomy and Planetary Science, Northern Arizona University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for cubesat hardware**. Student: Divyam Bhasker, Senior, Astrophysics, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Marcelo Brooks, Senior, Computer Systems Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Madelynn Bunn, Sophomore, Geography, Journalism and Mass Communication, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Emily Geen, First-Year, Electrical Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Alex Jaber, Sophomore, Electrical Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Pranav Mandava, Post-Baccalaureate, Computer Science, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Tyler Nielsen, Senior, Computer Systems Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Genaro Rivera, Junior, Mechanical Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Zaib Shaikh, Junior, Mechanical Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Alexandra Soto-Lopez, Senior, Electrical Engineering, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-6] **High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware**. Student: Elizabeth Thorley, Senior, Mathematics, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-7] **Simulations and Inversions for Drone-Based Time-Domain Electromagnetic Surveying for Groundwater Detection for Arizona and Mars Water Exploration**. Student: Jacob Taylor, Senior, Computer Science and Environmental and Water Resource Economics, University of Arizona. Mentor: Stefano Nerozzi, Lunar and Planetary Laboratory, University of Arizona.

[D-8] **Alkali Salt-Modified Carbon Supports for Scalable Moisture Swing CO_2 Capture**. Student: Estrella Solis Mata, Senior, Chemistry, Northern Arizona University. Mentor: Jennifer Wade, Mechanical Engineering, Northern Arizona University.

[D-9] **Building a Python Pipeline for Processing Remote Sensing Data of Yellowstone Thermal Areas and Quantifying Systematic Error**. Student: Samantha McLean, Senior, Physics and Astrophysics, Northern Arizona University. Mentor: Greg Vaughan, United States Geological Survey, Northern Arizona University.

[D-10] **Hydrogen Production and Storage in $CaTiO_3$ Perovskite at Mantle-Related High Pressures**. Student: Ava Campbell, Senior, Chemistry, Arizona State University. Mentor: Dan Shim, School of Earth and Space Exploration, Arizona State University.

[D-11] **Proteins that emerged after the oxygenation of Earth's atmosphere used less now-scarce manganese and iron-sulfur clusters, but not less heme**. Student: Nandini Manepalli, Junior, Molecular and Cellular Biology and Biochemistry, University of Arizona. Mentor: Sawsan Wehbi, Genetics Graduate Interdisciplinary Program, University of Arizona.

[D-12] **Fan and Fill: Reconstructing the Past through Sedimentology, Stratigraphy, and Geomorphology**. Student: Tye Ropati, Senior, Geological Sciences, Arizona State University. Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University.

[D-13] **Tracking Water in the Desert**. Student: Tiffany Le, Senior, Statistics and Data Science, University of Arizona. Mentor: Dana Lapides, USDA ARS, Southwest Watershed Research Center, Other Institution.

Session E: Education and Public Outreach

Elliott Bryner, Embry-Riddle Aeronautical University
Ron Madler, Embry-Riddle Aeronautical University

[E-1] **A Consolidated Analysis of U.S. Aerospace Activity**. Student: Sierra Monreal, Junior, Aerospace Engineering - Astronautics, Arizona State University. Mentor: Ross Garelick Bell, The Aerospace States Association, Arizona State University.

[E-2] **STEM Kit Design for Early Aerospace Education**. Student: Dominic Trujillo, Senior, Aerospace Engineering - Aeronautics, Arizona State University. Mentor: Jennifer Wong, Engineering Academic and Student Affairs, Arizona State University.

[E-3] **Evaluating STEM Researches knowledge of Philosophy of Science**. Student: Eyan Weissbluth, Senior, Astrophysics, Arizona State University. Mentor: Tuna Yildirim, Physics, Arizona State University.

Session F: Exploration Systems Engineering

Anne Boettcher, Embry-Riddle Aeronautical University
Elliott Bryner, Embry-Riddle Aeronautical University
Christoph Hader, University of Arizona
Ron Madler, Embry-Riddle Aeronautical University

[F-1] **Real Time Image Based Detection and Characterization of Optical Downlink from NASA's Laser Communications and Relay Demonstration**. Student: Isabella O'Brien, Senior, Electrical Engineering, Arizona State University. Mentor: Philip Mauskopf, School of Earth and Space Exploration, Arizona State University.

[F-2] **Data-driven analysis of geometric factors that impact LPBF part quality**. Student: Tegan Barber, Junior, Mechanical Engineering, University of Arizona. Mentor: Hannah Budinoff, Systems and Industrial Engineering, University of Arizona.

[F-3] **Using Machine Learning to Design Composite Materials with Tunable Bandgaps**. Student: Phillip Stahoviak, Junior, Mechatronics and Robotics, Northern Arizona University. Mentor: Subhayen De, Mechanical Engineering, Northern Arizona University.

[F-4] **Investigation of Stress Concentrations in Stereolithographic Modeled Parts**. Student: Carson Holmes, Junior, Mechanical Engineering - Propulsion, Embry-Riddle Aeronautical University. Mentor: David Lanning, Aerospace Engineering, Embry-Riddle Aeronautical University.

[F-4] **Investigation of Stress Concentrations in Stereolithographic Modeled Parts**. Student: Michelle Madrigal, Senior, Mechanical Engineering, Embry-Riddle Aeronautical University. Mentor: David Lanning, Aerospace Engineering, Embry-Riddle Aeronautical University.

[F-5] **Nanostructured BEA Zeolite Membranes for Enhanced Lithium-Ion Transport in Lithium-Ion Batteries**. Student: Yaris Eidenbenz, Senior, Material Science Engineering, Arizona State University. Mentor: Jerry Lin, Fulton School of Energy, Matter and Transport, Arizona State University.

[F-6] **In Vivo Bone Strain Measurement in Simulated Reduced Gravity**. Student: Rose Hall, Sophomore, Aerospace Engineering, University of Arizona. Mentor: David Margolis, Orthopedic Surgery, University of Arizona.

[F-7] **Mechanical and Optical Architecture of a Laser Communication Relay Demonstration Beacon Test System**. Student: Madison Rix, Junior, Aerospace Engineering - Astronautics and Exploration Systems Design, Arizona State University. Mentor: Philip Mauskopf, Department of Physics, Arizona State University.

[F-8] **Thin Film Solar Cell Performance on Metal Alloy Substrates**. Student: Rayna Hylden, Junior, Materials Science and Engineering, Arizona State University. Mentor: Nick Rolston, School of Electrical, Computer and Energy Engineering, Arizona State University.

[F-9] **Evaluating Lunar Regolith as a Structural Material for In-Situ Resource Utilization**. Student: Tristan Britt, Senior, Systems Engineering, University of Arizona. Mentor: Jekan Thanga, Aerospace and Mechanical Engineering, University of Arizona.

[F-10] **Optical telescope design investigation for orbital research**. Student: Jillian Harder, Sophomore, Astronomy, Northern Arizona University. Mentor: Keith Nowicki, Physics, Northern Arizona University.

Session G: Planetary Science

Christopher Edwards, Northern Arizona University
Thomas Sharp, Arizona State University

[G-1] **Investigating Potential Martian Biocrust**. Student: Maezy Biemond, Senior, Astronomy, Northern Arizona University. Mentors: Christopher Doughty and Michael Gowanlock, School of Informatics, Computing, and Cyber Systems, Northern Arizona University.

[G-2] **Investigating the transport of volatile-bearing vapors in the crust of the Moon**. Student: Angela Tatsch, Senior, Geophysics and Planetary Geosciences, University of Arizona. Mentor: Jessica Barnes, Lunar and Planetary Laboratory, University of Arizona.

[G-3] **Solid State Diffusion of Volatiles on Pluto**. Student: Trisha Lucas, Junior, Chemistry, Northern Arizona University. Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University.

[G-4] **Sublimation of H2O and D2O Mixtures**. Student: Audrey Smith, Junior, Astronomy, Northern Arizona University. Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University.

[G-5] **High-Resolution Regional Mapping of Crustal Magnetic Fields on Mars**. Student: Cody Fischer, Junior, Mechanical Engineering, University of Arizona. Mentor: Lon Hood, Lunar and Planetary Laboratory, University of Arizona.

[G-6] **Examining Coexistence in a Simulated Microbial Environment for Agnostic Life Detection**. Student: Charly Bisson, Senior, Astrobiology, Arizona State University. Mentor: Cole Mathis, School of Complex Adaptive Systems, Arizona State University.

[G-7] **Casa Grande Union High School ASCEND**. Student: Landri Howard, High School Student, Casa Grande Union High School. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[G-7] **Casa Grande Union High School ASCEND**. Student: Mylene Luna, High School Student, Casa Grande Union High School. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[G-7] **Casa Grande Union High School ASCEND**. Student: Peyton Posey, High School Student, Software Engineering, Casa Grande Union High School. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[G-7] **Casa Grande Union High School ASCEND**. Student: Hailianna Rodgers, Sophomore, Software Engineering, Casa Grande Union High School. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[G-8] **Impact-Induced Shock Metamorphism and Its Role in Structuring Microbial Habitats in Coconino Sandstone at Barringer Crater**. Student: Austin Gadd, Senior, Astronomy, Northern Arizona University. Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University.

[G-9] **Analog Life in Impact-induced Endolithic Niches (ALIEN)**. Student: Eli Resnick, Sophomore, Astronomy, Northern Arizona University. Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University.

[G-10] **Habitability Constraints of Oxalotrophic Bacteria from Dryland and Marine Ecosystems**. Student: Christine Quan, Senior, Biological Sciences, Arizona State University. Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University.

[G-11] **Adaptive Segmentation and Automated Morphometric Analysis of Monogenetic Volcanic Cones in Distributed Fields**. Student: Aubrey Schrameck, Senior, Data Science, Northern Arizona University. Mentor: Jean-Francois Smekens, Astronomy and Planetary Science, Northern Arizona University.

[G-12] **The Geochemical Buffet: Evaluating the Influence of Impact-Induced Mixing in Ejecta on Lithotrophic Microbial Diversity at Barringer Crater, Arizona**. Student: Brad Tsosie, Junior, Biology, Northern Arizona University. Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University.

[G-13] **Reanalyzing Habitability Claims for K2-18 b Through Forward Models and Retrieval Analysis**. Student: Isabel Kahn, Junior, Astrophysics, Arizona State University. Mentor: Luis Welbanks, School of Earth and Space Exploration, Arizona State University.

Session H: Topics in Math, Physics, and Chemistry
Nicholas Alfonso Diaz, Northern Arizona University
Chandra Holifield Collins, University of Arizona

[H-1] **Physics-Informed Long Short-Term Memory Neural Networks for Response Prediction and Parametric Identification of Nonlinear Dynamical Systems**. Student: John Anderson, Senior, Aerospace Engineering, Embry-Riddle Aeronautical University. Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University.

[H-2] **Assessing the Effect of Protein Structure on Amino Acid Evolution**. Student: Peter Goodman, Senior, Statistics and Data Science, University of Arizona. Mentor: Joanna Masel, Ecology and Evolutionary Biology, University of Arizona.

[H-3] **Lorentz-Symmetry Breaking in Quantum Field Theory**. Student: Sawyer Star, Senior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University.

[H-4] **Systems of Partial Differential Equations in Bumblebee Gravity**. Student: Dario Walter-Cardona, Junior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Quentin Bailey, Physics and Astronomy, Arizona State University.

[H-5] **Simulated analyses of Roman Space Telescope weak lensing and galaxy clustering cosmology**. Student: Tyler Brown, Senior, Astronomy, University of Arizona. Mentor: Tim Eifler, Steward Observatory, University of Arizona.

Aerospace STEM Challenges to Educate New Discoverers (ASCEND)
Poster Session

Arizona State University: High-altitude analysis of the Regener-Pfotzer maximum while providing a testbed for CubeSat hardware. Mentor: Tom Sharp, School of Earth and Space Exploration, Arizona State University.

Alexandra Soto-Lopez, Senior, Electrical Engineering, Arizona State University
Alex Jaber, Sophomore, Electrical Engineering, Arizona State University
Divyam Bhasker, Senior, Astrophysics, Arizona State University
Elizabeth Thorley, Senior, Mathematics, Arizona State University
Emily Geen, First-Year, Electrical Engineering, Arizona State University
Genaro Rivera, Junior, Mechanical Engineering, Arizona State University
Marcelo Brooks, Senior, Computer Systems Engineering, Arizona State University
Madelynn Bunn, Sophomore, Geography, Journalism and Mass Communication, Arizona State University
Pranav Mandava, Post-Baccalaureate, Computer Science, Arizona State University
Tyler Nielsen, Senior, Computer Systems Engineering, Arizona State University
Zaib Shaikh, Junior, Mechanical Engineering, Arizona State University

Arizona Western College: The Effects of Microalgae Chlorella Vulgaris Under Stratospheric Conditions. Mentor: Josue Juarez, Engineering, Arizona Western College.

Brandon Mendoza, Sophomore, Electrical Engineering, Arizona Western College
Cristian Gonzalez, First-Year, Engineering, Arizona Western College
Christopher Miranda, Sophomore, Aerospace Engineering, Arizona Western College
Maritriny Sarabia, Sophomore, Mechanical Engineering, Arizona Western College
Nathan Rossiter, First-Year, Structural Engineering, Arizona Western College
Victor Bibriesca, Senior, Engineering, Arizona Western College

Central Arizona College: Spring 2026 High Altitude Payloads. Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College.

Dillon Perez, Sophomore, Cybersecurity, Central Arizona College
Edgar Ellis, First-Year, Cybersecurity, Central Arizona College
Emmanuel Canales, Sophomore, Electrical Engineering, Central Arizona College
Fernando Herrera Ortiz, Sophomore, Civil Engineering, Central Arizona College
Javier Contreras, Sophomore, Aerospace Engineering, Central Arizona College
Kacy Vick, First-Year, Administration of Justice, Central Arizona College
Phoenix Coca, Sophomore, Engineering, Central Arizona College
Ryan Williams, Sophomore, Engineering, Central Arizona College

Casa Grande Union High School: CGUHS ASCEND. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

Hailianna Rodgers, High School Student, Software Engineering, Casa Grande Union High School
Landri Howard, High School Student, Casa Grande Union High School
Mylene Luna, High School Student, Casa Grande Union High School
Peyton Posey, High School Student, Software Engineering, Casa Grande Union High School

Embry-Riddle Aeronautical University: Payload Stability and Long-Range Tracking. Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University.

- **Benjamin Knoell**, Senior, Aerospace Engineering - Astronautical Concentration, Embry-Riddle Aeronautical University
- **Santiago Nuno**, Junior, Aerospace Engineering - Aeronautical Concentration, Embry-Riddle Aeronautical University
- **Tommy Boston**, Junior, Aerospace Engineering - Astronautical Concentration, Embry-Riddle Aeronautical University

Glendale Community College: NASA ASCEND State Penitentiary: New Sensors and Live Data Transmission. Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College.

- **Aso Van Story**, Sophomore, Electrical Engineering, Glendale Community College
- **Ethan Seitter**, Sophomore, Software Engineering, Glendale Community College
- **David Coulthard**, Sophomore, Mechanical Engineering, Glendale Community College
- **Jesse Martinez Hernandez**, Sophomore, Aerospace Engineering, Glendale Community College

Glendale Community College: GCC ASCEND Team 2: SpaceJunkies I2C Modules, Bluetooth Data Link, and New Sensors! Mentors: Tim Frank and Rick Sparber, Glendale Community College.

- **Adrian Jimenez**, Sophomore, Electrical Engineering, Glendale Community College
- **Caden Hess**, Sophomore, Electrical Engineering, Glendale Community College
- **Irwin Estrada Fernandez**, Sophomore, Electrical Engineering, Glendale Community College
- **James Petersen**, Sophomore, Electrical Engineering, Glendale Community College
- **Justin Thomas**, Sophomore, AI and Machine Learning, Glendale Community College

Phoenix College: Not a UFO: Atmospheric Data Collection. Mentor: Eddie Ong, Physical Sciences, Phoenix College.

- **Emmeline Landis**, Sophomore, Computer Science, Phoenix College
- **Ethan Pierson**, Senior, Mathematics, Phoenix College
- **Jose Ocampo**, Sophomore, Electrical Engineering, Phoenix College
- **Preston Furulie**, Senior, Information Technology, Phoenix College

Pima Community College: Investigation of Life Sustainability Under Varying Conditions Comparing Life Conditions in the Upper Atmosphere to the Earth's Surface. Mentor: AnnMarie Condes, Chemistry, Pima Community College.

- **Ana Bustamante**, Sophomore, Physics, Pima Community College
- **Edith Carrillo**, Sophomore, Science, Pima Community College
- **Omar Aguiar Carrillo**, Sophomore, Applied Mathematics, Pima Community College

University of Arizona ASCEND!: Profiling High-Altitude Electromagnetic Radiation with a General Data Logger. Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona

- **Colin Brown**, Senior, Optical Sciences and Engineering, University of Arizona
- **Edward Vanica**, Junior, Aerospace and Mechanical Engineering, University of Arizona
- **Ella Miller**, Sophomore, Mechanical Engineering, University of Arizona
- **Isabel Wee**, Senior, Industrial Engineering, University of Arizona
- **Kane Mattison**, Junior, Aerospace Engineering, University of Arizona
- **Razak Adamu**, Senior, Aerospace Engineering, University of Arizona
- **Robert Holtz**, Senior, Economics, University of Arizona

2025-2026 Arizona NASA Space Grant Student Abstracts

Organized by presenter's last name.

Abdessalam, Nayera (Junior, Astronomy and Physics, University of Arizona). Mentor: Richard Green, Astronomy, University of Arizona. [C-8]

PROBING EARLY SUPERMASSIVE BLACK HOLE GROWTH: C IV-BASED MASS ESTIMATES IN Z ~ 4.8 QUASARS

Supermassive black holes are special objects in space because they pull in enormous amounts of surrounding gas, forming a hot, luminous disk that can outshine entire galaxies. These high-energy systems are called quasars and by studying the light they emit, we can estimate black hole masses and better understand how they evolve over cosmic time. Using optical spectroscopy, we analyze a sample of distant quasars (about 12 billion years ago) to estimate black hole masses from the emission lines of ionized carbon (C IV). We compare these estimates to historically more reliable hydrogen-based measurements, extending standard calibration tests to significantly higher redshifts than previously explored. We find that systematic differences between the two methods are consistent with known correction factors, and that applying these corrections brings the estimates into better agreement. This work helps refine mass estimation techniques and improves our understanding of early black hole growth.

Adamu, Razak (Senior, Aerospace Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

UNIVERSITY OF ARIZONA ASCEND!: PROFILING HIGH-ALTITUDE ELECTROMAGNETIC RADIATION WITH A GENERAL DATA LOGGER

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

Aguiar Carrillo, Omar (Sophomore, Applied Mathematics, Pima Community College). Mentor: AnnMarie Condes, Chemistry, Pima Community College. [ASCEND-Poster Session]

INVESTIGATION OF LIFE SUSTAINABILITY UNDER VARYING CONDITIONS COMPARING LIFE CONDITIONS IN THE UPPER ATMOSPHERE TO THE EARTH'S SURFACE

The upper atmosphere is an unhospitable environment for survival. Altitudes exceed over 100 km, pressure reaches as low as 10^-11 atm, and temperatures can be below -100° C, making it extremely difficult for living organisms to survive. This study investigates a eukaryotic microorganism called "yeast" from the genus Saccharomyces cerevisiae. Approximately 1,500 species are known to exist. The single-celled fungi has significant importance on Earth. S. cerevisiae is an important organism in modern cell biology research and is a thoroughly studied eukaryotic microorganism. Cultures are used to understand the biology of the eukaryotic cell and ultimately human biology. Knowing this, yeast is the microorganism selected for this research looking at viability in varying conditions and sustainability of life. Parameters; temperature, pressure, and altitude are collected from the Earth's surface to the upper atmosphere to investigate the viability of S.cerevisiae.

Alger, Taylor (Junior, Microbiology, Northern Arizona University). Mentor: Lorena Caballero, Biological Sciences, Northern Arizona University. [D-2]

CULTIVATION OF ALFALFA IN MGS-1 MARTIAN SIMULANT

The possibility of manned missions to Mars is no longer an if, but a when. With the harsh conditions the astronauts might face, humanity must prepare several solutions to ensure they have the necessary resources. In situ resource utilization (IRSU) offers one such solution where local Martian resources are utilized. This study builds upon a previous investigation that examined the impact of green compost on the growth of various plants, including kale (Brassica oleracea var. Acephala), chicory (Cichorium intybus L.), and watercress (Nasturtium officinale), in MGS-1 Martian Simulant. All species produced the most biomass in a relogith-compost ratio of 40:60, but were able to germinate in 100% MGS-1. A study by Kasiviswanathan et al. found that alfalfa (Medicago sativa) germinates well in MGS-1, but does not fully develop. This study aims to keep the sprouts alive for the longest time possible by changing factors like light, temperature, humidity, and watering.

Anderson, John (Senior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [H-1]

PHYSICS-INFORMED LONG SHORT-TERM MEMORY NEURAL NETWORKS FOR RESPONSE PREDICTION AND PARAMETRIC IDENTIFICATION OF NONLINEAR DYNAMICAL SYSTEMS

Closed-form analytical solutions are often infeasible in structural dynamics, particularly for nonlinear systems like the damped Duffing oscillator. Accordingly, these systems must be solved numerically, potentially leading to numerical issues and high computational costs. In addition, while system structure may be known, system parameters still need to be identified. Traditionally, methods such as optimization and curve fitting address this. However, these methods suffer the aforementioned issues, especially in dynamically complex systems. To address this, we propose a physics-informed Long Short-Term Memory (PI-LSTM) framework leveraging the known system structure for response prediction and parameter identification. The approach addresses issues introduced by the difficulty of training neural networks on nonlinear dynamics and broadband forcing, which increases spectral complexity and reduces temporal smoothness. Results show that the PI-LSTM approach can accurately estimate model parameters and improve prediction accuracy of system responses when compared to non-informed LSTM models.

Barber, Tegan (Junior, Mechanical Engineering, University of Arizona). Mentor: Hannah Budinoff, Systems and Industrial Engineering, University of Arizona. [F-2]

DATA-DRIVEN ANALYSIS OF GEOMETRIC FACTORS THAT IMPACT LPBF PART QUALITY

LPBF (Laser Powder Bed Fusion) is a form of 3D printing that enables engineers to quickly create complex geometries with high precision. It also allows engineers to predict deformation and stress, which is essential to ensure structural integrity and prevent structural defects. In this study, geometric features including total geometry volume, bounding box volume and height were analyzed to identify which parameters most influence deformation and stress in LPBF parts. Forty geometrically unique 3D models of topology optimized parts were selected and processed to create LPBF finite element analysis simulations using Ti-6Al-4V. There was a weak correlation between part height and maximum deformation. Additionally, support area had little influence on the maximum stress. Additional studies are required to identify potential stronger correlations between the variables, such as including more variables that could influence deformation and stress, as well as analyzing a larger quantity of parts.

Bayliff, Sydney (Senior, Aerospace Engineering, University of Arizona). Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona. [A-3]

TOMOGRAPHIC RECONSTRUCTION OF DENSITY GRADIENTS CREATED BY A PLASMA ACTUATOR

Plasma based actuation is used in many fluid applications, including separation control and noise mitigation. One common, but poorly understood utilization in high-Mach flows is the Localized Arc Filament Plasma Actuator (LAFPA), which generates a localized discharge with a spatially and temporally varying density field. Tomographic reconstruction techniques enable analysis of such complex flows by creating a 3D field from 2D images. This project employs Schlieren imaging with tomographic reconstruction to build a volumetric density gradient field generated by a LAFPA. Images acquired at multiple viewing angles of the LAFPA are converted into projection data and assembled into sinograms. An inverse Radon transform is applied to the sinograms to reconstruct the 2D fields, which are stacked to produce the final 3D density gradient field. This data will be used to characterize the transient 3D topology and instabilities of this flow perturbation.

Bhasker, Divyam (Senior, Astrophysics, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Bibriesca, Victor (Senior, Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

THE EFFECTS OF MICROALGAE CHLORELLA VULGARIS UNDER STRATOSPHERIC CONDITIONS

This project investigates how algae respond to near-space environmental conditions, including low pressure, low temperature, and increased ultraviolet (UV) radiation. A high-altitude balloon platform will be used to carry algae samples to near-space, where they will be exposed to these extreme conditions while environmental data such as temperature, pressure, and UV intensity are recorded. After recovery, the algae will be analyzed to determine changes in growth rate, color, and overall health compared to a control sample kept on the ground. The goal is to understand the resilience of algae in extreme environments.

Biemond, Maezy (Senior, Astronomy, Northern Arizona University). Mentors: Christopher Doughty and Michael Gowanlock, School of Informatics, Computing, and Cyber Systems, Northern Arizona University. [G-1]

INVESTIGATING POTENTIAL MARTIAN BIOCRUST

Scientists using data from the NASA Perseverance Rover on Mars recently showed several lines of evidence to support the possibility that life may have existed in the designated Bright Angel Formation. The Rover used its XRF (X-Ray Fluorescence) instrument to record the elemental composition of a specific sample found within this region that showed a spike of elements associated with terrestrial microbial life. Here we test the validity of this technique by collecting XRF samples of known life (stromatolites and cyanobacteria) from the Nankoweap formation in the Grand Canyon to see if life has a different stoichiometric biosignature than areas without life. Further, we have visually identified other possible life (biocrust) from the rover data and have used similar chemical techniques to attempt to validate it.

Bisson, Charly (Senior, Astrobiology, Arizona State University). Mentor: Cole Mathis, School of Complex Adaptive Systems, Arizona State University. [G-6]

EXAMINING COEXISTENCE IN A SIMULATED MICROBIAL ENVIRONMENT FOR AGNOSTIC LIFE DETECTION

Agnostic biosignatures indicate life without depending on specific biochemistry, widening the scope of life detection efforts. Considering that cell physiology is known to change with size (allometric scaling), a biosignature proposed by previous work is the systematic change in internal elemental composition with particle size, as cells sequester nutrients to the ability and need dictated by their volume. Coexistence among species is required, though, in order for these size-based differences to be detectable. I investigated this proposed biosignature using a differential equation-based model which represents a microbial ecosystem composed of multiple species of microbes differing only in cell volume by species and an environmental resource concentration moderated by constant inflow and outflow rates. Stable coexistence within this model was unable to be achieved, even when modulating cell mortality rates. This exploration of ecosystem dynamics helps characterize stable coexistence, specifically the importance of interspecies interactions, advancing both ecological and astrobiological interests.

Boisvert, Rebekah (Junior, Astronomy, University of Arizona). Mentor: Brittany Miles, Astronomy and Steward Observatory, University of Arizona. [C-13]

MID-INFRARED (4.5 MM) OBSERVATIONS OF A BROWN DWARF BINARY AROUND A SUN-LIKE STAR

Brown dwarfs are Jupiter-sized substellar objects that bridge the gap between stars and planets. These objects are colder than stars, possessing atmospheres rich in molecules such as CO, CH4, and H2O. HD 130948A, a Sun-like star, hosts a brown dwarf binary. In this project, we reduced mid-infrared (4.5 micron) images of the binary obtained with LBT/LMIRcam to determine its characteristics. Using aperture photometry, previous observations, and models, we estimated both the brightness of the brown dwarfs and their atmospheric characteristics. From these techniques, we find that the pair is approximately 3 orders of magnitude dimmer than the host star and place limits on the cloudiness of their atmospheres. Because the 4.5 micron wavelength is the longest wavelength that has been used to observe this system so far, these results also provide new constraints on the chemical composition of the brown dwarfs' atmospheres.

Bolanos Pina, Alison (Junior, Earth and Space Exploration, Arizona State University). Mentor: Jacob Adler, School of Earth and Space Exploration, Arizona State University. [C-1]

IS SURFACE ROUGHNESS INDICATIVE OF SEDIMENT FLOW MORPHOLOGY ON MARS?

Dating sedimentary landforms on Mars remains a major challenge due to limited direct age constraints. This study explores whether surface roughness can provide insight into surface formation and modification over time. From 79 laboratory mudflow experiments conducted under Mars-like pressure conditions, digital elevation models (DEMs) and orthomosaics were generated through photogrammetry in Agisoft Metashape. Using the Kreslavsky and Head (2000) profile curvature method, roughness was calculated at three spatial baselines (L2, L4, L8) and mapped into RGB composites that capture where each scale of roughness dominates across a surface. Median roughness values were computed across all experiments as a measure robust to outliers. Results show the magnitude of roughness varies with baseline, and that some flow features are more easily distinguished using surface roughness than slope or elevation. We discuss the implications of our findings for determining emplacement processes for larger flows on Mars.

Boston, Tommy (Junior, Aerospace Engineering - Astronautical Concentration, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-Poster Session]

PAYLOAD STABILITY AND LONG-RANGE TRACKING

ASCEND! is an Arizona Space Grant Consortium statewide workforce development program organized under NASA's Space Grant consortium. The payloads reach a maximum altitude of 100,000 ft and allow schools to fly any desired sensors. In Spring 2026, ERAU ASCEND! created a payload that aims to increase the reliability of data collection by transmitting sensor data to a ground station. A GPS unit was placed on the payload that transmits coordinates and altitude. The ground station uses these coordinates to compute the range azimuth, and elevation along which to direct the antenna. The sensor data being received this semester will be utilized in an onboard stabilization system with a reaction wheel. The goal is to allow for the reaction wheel to stabilize the payload for a camera recording the ascent of the balloon for comparison between the stabilization systems of previous semesters.

Bowling, Gibson (Junior, Physics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [C-17]

DISCOVERY OF NIR-VARIABLE OBJECTS IN THE JWIDF

The sensitivity and angular resolution of the James Webb Space Telescope's (JWST) Near-Infrared Camera (NIRCam) lend themselves to extragalactic variability studies. We present the results of the first JWST/NIRCam variability search of the IRAC Dark Field (JWIDF) at 4.4 microns. Three-epoch medium-deep images were used to find objects with $\geq 3\sigma$ magnitude variations and construct a sample of 21 variable candidates. Analyses of the sample's colors and morphologies are suggestive of flickering active galactic nuclei (AGN), transient supernovae in the outskirts of galaxies, and merger-induced starbursts. A number of variable candidates have point-source light profiles and colors characteristic of AGN: these attributes, along with small angular diameters and faint magnitudes, are consistent with populations of high-redshift variable quasars. Analyses are limited by currently-available data, and long-wavelength observations will provide constraints on the physical properties of these objects.

Brandigi, Anna (Senior, Astronomy and Physics, University of Arizona). Mentor: Thomas Stuber, Steward Observatory, University of Arizona. [C-2]

DIRECT IMAGING OF THE STELLAR COMPANION TO THE HOT DUST STAR κ TUC AA

Hot exozodiacal dust (HEZD) is an unexplained phenomenon consisting of submicrometer-sized dust grains in close vicinity to main sequence stars. Its presence jeopardizes future exoplanet imaging missions, and thus its origin and behavior must be understood. The nearby HEZD system κ Tucanae A has a unique architecture; its recently discovered low-mass companion follows a highly eccentric orbit and swings through the region where the HEZD is located every eight years. It could thus be the dynamic source of the dust production and possibly offer a new avenue of explaining HEZD. Using observations with the infrared imager SPHERE at the Very Large Telescope, we constrained the position and brightness of the moving companion, thereby improving the orbit solution and spectral type. This enables us to perform dynamical investigations of the interplay between the companion star and HEZD with unprecedented accuracy.

Britt, Tristan (Senior, Systems Engineering, University of Arizona). Mentor: Jekan Thanga, Aerospace and Mechanical Engineering, University of Arizona. [F-9]

EVALUATING LUNAR REGOLITH AS A STRUCTURAL MATERIAL FOR IN-SITU RESOURCE UTILIZATION

The lack of readily available construction materials in space makes transporting resources from Earth prohibitively expensive. This project investigates the feasibility of using lunar regolith as a structural material for in-situ resource utilization (ISRU). By applying heat to regolith, it can be sintered into brick-like forms capable of supporting structural loads and withstanding the lunar environment. This study evaluates the mechanical properties and viability of these materials through digital data analysis and simulation. Key factors include strength, durability, and environmental performance. The results aim to determine whether lunar regolith can serve as a practical and scalable solution for building infrastructure on the Moon, reducing reliance on Earth-supplied materials.

Brooks, Marcelo (Senior, Computer Systems Engineering, Arizona State University). Mentor: Michael Goryll, School of Electrical, Computer and Energy Engineering, Arizona State University. [B-6]

SATELLITE GROUND-STATION DEVELOPMENT

The utilization of LoRa is becoming widespread in modern satellite communications due to its long-range as well as low power consumption. In accordance with the International Amateur Radio Union, Coconut, a 1U CubeSat and the most recently completed satellite by the Sun Devil Satellite Lab at Arizona State University, was allotted the 437.4MHz frequency band for radio transmission. Reconfiguration of the satellite ground-station used in previous CubeSat missions was required for safe electrical operation, automated antenna alignment, and ease-of-use in current and future ASU satellites. Operation of the ground station's signal filters were validated through the frequency response of the band-pass filters and low-noise-amplifiers in use, sufficiently low gain was found outside of the 400MHz to 500MHz range and a low noise-figure. Adjustments made included dedicated electrical hardware development to control radio transmission and reception using microcontroller-driven operation of radio frequency switching, power amplification, and multiple radio modules.

Brooks, Marcelo (Senior, Computer Systems Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Brown, Colin (Senior, Optical Sciences and Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

UNIVERSITY OF ARIZONA ASCEND!: PROFILING HIGH-ALTITUDE ELECTROMAGNETIC RADIATION WITH A GENERAL DATA LOGGER

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

Brown, Tyler (Senior, Astronomy, University of Arizona). Mentor: Tim Eifler, Steward Observatory, University of Arizona. [H-5]

SIMULATED ANALYSES OF ROMAN SPACE TELESCOPE WEAK LENSING AND GALAXY CLUSTERING COSMOLOGY

The Roman Space Telescope is NASA's next astrophysics flagship mission, scheduled to launch in September 2026. In cosmology, the pipeline to analyze cosmological parameters is called CoCoA (Cobaya-CosmoLike Architecture). CoCoA models the observables as a function of the underlying physics and systematics models and evaluates their probabilities given data. In order to test CoCoA, we generated 12 data vectors with varying cosmological parameters and physics, such as wCDM, to simulate Roman Space Telescope data. I then ran simulated likelihood analyses for synthetic Roman data vectors that include weak lensing, galaxy clustering, and their cross-correlation to generate posterior probability distributions of cosmological parameters. The datavector's input was blinded, and the goal of the challenge was to recover said input parameters. Using Monte Carlo Markov Chain methods on the University of Arizona's High-Performance Computers, I analyzed all 12 data vectors and studied the tension between the different data vector distributions using "Tensiometer".

Bruchhagen, John (Senior, Aerospace Engineering, University of Arizona). Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona. [B-4]

VISUALIZATION OF SHOCK BOUNDARY LAYER INTERACTIONS

Shock boundary layer interactions are highly relevant in compressible supersonic flow. High-speed flows are susceptible to unsteadiness and separation (airflow detaching from a surface). This makes it difficult to perform high-speed maneuvers due to unstable forces. Understanding and visualizing these interactions can give more insight into how to better mitigate these obstacles. This project investigates how these interactions can be visualized and characterized, more specifically, different methods and which applications each is best suited for. The two methods studied were Z-type Schlieren and self-aligned focusing Schlieren. Both capture density gradients in air using light refraction. Regular Z-type Schlieren captures the entire test section, while focusing Schlieren captures a reduced depth of field that can isolate specific regions of interest. Mean and standard deviation images were used to analyze both methods. The results show that both methods are effective in the visualization of supersonic flow, each having specific applications.

Bunn, Madelynn (Sophomore, Geography, Journalism and Mass Communication, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils payload is designed to conduct high-altitude atmospheric profiling using a temperature, pressure, humidity and gas sensor equipped payload. This iteration has expanded into two distinct missions. The science focused mission is to study atmospheric radiation intensity and identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Moreover, it paves the path to harmonize our data with solar and cosmic radiation. On the engineering side of the payload, the primary mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Bustamante, Ana (Sophomore, Physics, Pima Community College). Mentor: AnnMarie Condes, Chemistry, Pima Community College. [ASCEND-Poster Session]

INVESTIGATION OF LIFE SUSTAINABILITY IN THE UPPER ATMOSPHERE AND THE EARTH'S SURFACE

The upper atmosphere is an unhospitable environment for survival. Altitudes exceed over 100 km, pressure reaches as low as 10^-11 atm, and temperatures can be below -100° C, making it extremely difficult for living organisms to survive. This study investigates a eukaryotic microorganism called "yeast" from the genus Saccharomyces cerevisiae. Approximately 1,500 species are known to exist. The single-celled fungi has significant importance on Earth. S. cerevisiae is an important organism in modern cell biology research and is a thoroughly studied eukaryotic microorganism. Cultures are used to understand the biology of the eukaryotic cell and ultimately human biology. Knowing this, yeast is the microorganism selected for this research looking at viability in varying conditions and sustainability of life. Parameters; temperature, pressure, and altitude are collected from the Earth's surface to the upper atmosphere to investigate the viability of S.cerevisiae.

Campbell, Ava (Senior, Chemistry, Arizona State University). Mentor: Dan Shim, School of Earth and Space Exploration, Arizona State University. [D-10]

HYDROGEN PRODUCTION AND STORAGE IN $CaTiO_3$ PEROVSKITE AT MANTLE-RELATED HIGH PRESSURES

Global surveys show widespread hydrogen accumulations in diverse geological environments, suggesting unidentified deep-mantle hydrogen production processes. Titanium-bearing $CaSiO_3$ perovskite inclusions in diamonds indicate $CaTiO_3$ is an important mantle component. $CaTiO_3$ perovskite can split water into molecular hydrogen and oxygen under UV light at 1 bar. Early results in this study show that heat can replace UV light at high pressures. We varied the pressure (5-15 GPa), temperature (673-1023 K), and time (0.5-8 hours) conditions of the $CaTiO_3$ water-splitting reaction in a multi-anvil press. We measured Raman and infrared spectroscopy. Results indicate that water splitting is enhanced by the combined effects of heat and pressure. Observed frequency shifts likely reflect changes in H_2 storage sites within $CaTiO_3$ perovskite. The mantle hosts abundant perovskite-structured phases with transition metals–particularly iron–such as bridgmanite and davemaoite. Our findings suggest water splitting may occur in the deep mantle, especially near subducting slabs where heating releases water.

Canales, Emmanuel (Sophomore, Electrical Engineering, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

CENTRAL ARIZONA COLLEGE: SPRING 2026 HIGH ALTITUDE PAYLOADS

Central Arizona College created two high-altitude balloon payloads in Spring 2026 that aim to continue a 5-year long data collection process. The first payload is the main payload that will be collecting temperature, humidity, and altitude. This payload is an improved mechanical design that will protect all electrical components from external harm. The second payload aims to collect acceleration through three different axes to test the capabilities of its respective mechanical design. The mechanical design has been improved to give a more solid structure while still having flexibility in the critical joints that hold together the payload by use of TPU 95A HF filament. A Long-Range radio has also been included in the second payload to receive data from the payload as it collects data so long as the payload is within range of the base location.

Carrillo, Edith (Sophomore, Science, Pima Community College). Mentor: AnnMarie Condes, Chemistry, Pima Community College. [ASCEND-Poster Session]

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Carrington, Mae (Senior, Aerospace Engineering, Arizona State University). Mentor: Gokul Pathikonda, Ira A Fulton Schools of Engineering, Arizona State University. [A-2]

DESIGN OF A DYNAMIC SURFACE PROTOTYPE USING CONTINUOUS SERVOS FOR BOUNDARY LAYER CONTROL

Boundary layer formation and separation is essential for predicting fluid flows and understanding turbulence. This project aims to address a gap in knowledge of boundary layers by engineering a dynamic surface that would allow topology manipulation to control the pressure gradient along a surface. This is the third iteration of the surface which utilizes rotational servos to create linear translations of a flexible top surface. This modular system is comprised of "boards" which each consist of 30 servos and 2 servo drivers and has four layers for the overall design: a PCB, servos, top plate, and a flexible top layer to mimic desired topology. A completed board with constructed and tested electronics, physical build, and coded controller was completed at the end of March 2026. Future directions include scaling the modular system to over 100 boards and 4,000 servos and using it to describe boundary layer characteristics.

Chai, Ari (Sophomore, Space Physics, Embry-Riddle Aeronautical University). Mentor: Elizabeth Gretarsson, Physics and Astronomy Department, Embry-Riddle Aeronautical University. [C-9]

STELLAR POLARIMETER FOR UNDERGRADUATE STUDIES (SPUDS)

We are upgrading the 16-in Meade LX200 telescope at Embry-Riddle Aeronautical University's Prescott observatory by adding a polarimeter, enabling the study of polarized starlight. Unlike unpolarized light which contains all orientations of its electric field at the same time, polarized light is restricted to a single orientation of oscillation. Using a polarimeter to measure the degree and angle of polarized starlight allows us to study the properties of the star it originated from and the material the light travelled through to become polarized. Our polarimeter contains six linearly polarized filters fitting into a rotating filter wheel, and each filter is angled 30 degrees apart from the last, giving us a range of data about the angle of polarization. We plan to use our polarimeter to study hot Be and Wolf-Rayet stars, and the magnetic fields of galaxies hosting supernova explosions.

Cioffi, Camille (Junior, Astronomy and East Asian Studies, University of Arizona). Mentor: Carl Fields, Steward Observatory, University of Arizona. [C-6]

MASS LOSS AND PRE-SUPERNOVA PROPERTIES OF MASSIVE STARS

Accurate stellar evolution modeling is essential for understanding stars. Models combine observationally and theoretically motivated inputs to produce realistic evolutionary tracks, but many important physical processes remain uncertain. To remedy this, astronomers calibrate free parameters to match observations. Stellar mass loss is often implemented in models using a standard prescription motivated by decades-old empirical data. Recent studies have shown that these standard rates cause higher mass loss rates than expected for red supergiants. We implement updated rates into MESA stellar evolution models to better represent this critical process in massive stars. We find that these new rates produce higher mass progenitors than the standard prescription, which can impact its explosion and compact remnant properties. We aim to incorporate these mass loss rates into a large grid of high resolution massive star models, providing a broadly accessible resource for collaborative studies of stellar evolution and science that builds on it.

Coca, Phoenix (Sophomore, Engineering, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

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Contreras, Javier (Sophomore, Aerospace Engineering, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

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Coulthard, David (Sophomore, Mechanical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [ASCEND-Poster Session]

GCC NASA ASCEND STATE PENITENTIARY: NEW SENSORS AND LIVE DATA TRANSMISSION

During the Fall 2025 semester, Glendale Community College teams 1 and 2 were instructed in developing a payload that could withstand a flight of over 100,000 ft into the atmosphere, while equipping the payload with an accelerometer, barometer, GNSS, and camera for data acquisition, analysis, and evaluation. This Spring 2026 semester payload builds off of that foundation by expanding the data collection capabilities of the Flight Data Recorder through new sensors integrated into the board via hardware and software, and that can transmit data in real-time via Bluetooth, all without compromising data collection. Additions to the board included a Bluetooth, modem, I2C temperature and humidity sensors, and analog UV sensors. In turn, this has had the effect of fostering real-world applicable skills, such as internal department cooperation, communication, and problem solving towards a common goal.

Courtright, Kayla (Senior, Chemical Engineering, University of Arizona). Mentor: Vasiliki Karanikola, Chemical and Environmental Engineering, University of Arizona. [D-3]

SURFACE-MODIFIED CELLULOSE SPONGES FOR PFAS REMOVAL: A RAPID SMALL SCALE COLUMN TEST AND ISOTHERM STUDY

Limited groundwater supplies are becoming increasingly more polluted by the “forever chemicals”, poly- and perfluorinated substances (PFAS). However, current removal methods such as reverse osmosis, ion exchange resins, and granulated activated carbon are costly and all face unique operational challenges. This study presents the design, validation, and experimentation of a rapid small scale column testing (RSSCT) system to evaluate the removal of long- and short- chained PFAS by reusable, low-cost, modified cellulose sponge sorbents. Adsorption isotherms were also conducted with four PFAS, (PFOA, PFOS, PFBA, PFBS) to examine adsorption affinity and determine the maximum equilibrium sorption capacity of the modified sorbents. Liquid chromatography with tandem mass spectrometry (LC-MS) was used to analyze samples and create breakthrough curves of each column from the RSSCTs during experiments and quantify the adsorption capabilities of the sorbents during continuous operation.

Dhanwantry, Ishaan (Sophomore, Astronomy, Embry-Riddle Aeronautical University). Mentor: Pragati Pradhan, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-20-A-B]

IT’S MOVING, IT’S ALIVE! HIGH RESOLUTION VIEW OF IGR J16320 AND MS 1603.6+2600

X-ray binaries are extreme environments in the universe. These systems consist of a compact object, such as a black hole or neutron star, and a companion star. The main types of X-ray binaries are high mass X-ray binaries (HMXBs) and low mass X-ray binaries (LMXBs), which differ by the mass of the companion star. We are studying sources of X-ray variability in one HMXB, IGR J16320-4751, and one LMXB, MS 1603.6+2600. The causes of X-ray variability in IGR J16320-4751 are either stochastic or periodic, with clumpy wind causing the stochastic variability and a potential accretion wake forming at later phases causing the periodic variability. X-ray variability in MS 1603.3+2600 is caused by the accretion disk around the neutron star dipping at inconsistent times, resulting in the pulsar-like characteristics emanating from this stellar source. For both sources, we are comparing data from NuSTAR, NICER, and Chandra.

DiLorenzo, Bradley (First-Year, Space Physics, Embry-Riddle Aeronautical University). Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-18]

ANALYZING LIGHT CURVES OF CORE COLLAPSE SUPERNOVAE

Light curves from core-collapse supernovae (CCSNe) have been used within the Laser Interferometer Gravitational-Wave Observatory (LIGO) collaboration to estimate the moment when the shock front emerges from the stellar surface. However, the broader potential of CCSNe light curves includes estimations of physical properties of the progenitor star derived from the luminosity data, which has yet to be worked through by the LIGO collaboration. This project advances that direction by employing light curves generated from explicit physical models of electromagnetic emission developed by Eli Waxman (Weizmann Institute of Science) and Chris Freyer (Los Alamos National Laboratory). Although these models provide detailed predictions, they contain ambiguities in which different combinations of the input parameters generate the same light curve. The project goal is to interpolate these light curves with the physically generated curves from the models of Waxman and Freyer and extract possible data about the physical properties of the progenitor.

Eidenbenz, Yaris (Senior, Material Science Engineering, Arizona State University). Mentor: Jerry Lin, Fulton School of Energy, Matter and Transport, Arizona State University. [F-5]

NANOSTRUCTURED BEA ZEOLITE MEMBRANES FOR ENHANCED LITHIUM-ION TRANSPORT IN LITHIUM-ION BATTERIES

This study investigates the limitations of conventional polypropylene separators in lithium-ion batteries, particularly their inability to regulate lithium-ion transport and prevent dendrite formation. Dendrites are needle-like lithium structures that can grow from one electrode to the other, puncturing the separator and causing internal short circuits that may lead to fires. Pure silica BEA (Beta) zeolite membranes are explored as an alternative due to their well-defined pore structure, high thermal stability, and potential to guide ion transport. By incorporating nanostructured BEA membranes, this work aims to improve ion selectivity and enhance battery safety and performance. These membranes are synthesized via hydrothermal methods, dispersed into a BEA-poly(vinyl alcohol) (PVA) binder-based slurry to enable uniform coating onto electrodes, and evaluated through coin cell assembly and electrochemical testing.

Ellis, Edgar (First-Year, Cybersecurity, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

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Estrada Fernandez, Irwin (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [B-3, ASCEND-Poster Session]

GCC ASCEND TEAM 2: SPACEJUNKIES I2C MODULES, BLUETOOTH DATA LINK, AND NEW SENSORS!

During the Fall 2025 semester, GCC ASCEND built two payloads that both flew to 100,000 feet and returned with temperature, pressure, and acceleration data. This Spring 2026 semester, we will expand on that success by integrating I2C components into our board, including a radio receiver and a temperature and humidity sensor. The I2C radio receiver will help map how signal strength between the payload and nearby radio stations changes. The I2C temperature and humidity sensor will allow comparison with readings from our analog temperature sensors. We are also adding an Iridium modem and an I2C Bluetooth module. To meet Arizona Near Space Research weight constraints, we will have our two payloads communicate via Bluetooth using GNSS and Iridium modem data. This approach helps manage mass while enabling a data link that can transmit GNSS coordinates via satellite, allowing us to track our payload independently and improve reliability during flight operations.

Fischer, Cody (Junior, Mechanical Engineering, University of Arizona). Mentor: Lon Hood, Lunar and Planetary Laboratory, University of Arizona. [G-5]

HIGH-RESOLUTION REGIONAL MAPPING OF CRUSTAL MAGNETIC FIELDS ON MARS

The early Martian magnetic field played a key role in shielding the planet's atmosphere from charged particles that drive atmospheric erosion. The dynamo responsible for generating and maintaining this global magnetic field has since ceased, leaving behind magnetized rock formations within the planet's crust. Magnetic fields produced by these rocks have been measured by a magnetometer onboard NASA's Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft. Using this data, detailed regional maps of crustal magnetic fields were generated by considering orbits along neighboring, parallel tracks at periapsis altitudes less than 170 km. This mapping approach also employed comparative analysis to identify and exclude unreliable orbital measurements. A global map of Mars was constructed by combining 16 high-resolution regional maps, revealing the distribution of crustal magnetic field activity across the planet. These maps revealed patterns of crustal magnetization that informed the duration and evolution of the Martian dynamo.

Furulie, Preston (Senior, Information Technology, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-Poster Session]

NOT A UFO: ATMOSPHERIC DATA COLLECTION

The objectives for the Fall 2025 and Spring 2026 launches are to collect data on Earth's atmosphere and vehicle launch parameters, and to train students in the ways of STEM endeavors. The launch was successful. During the launches, the PC NASA ASCEND team acquired data for the following: 1) GPS date-time, 2) temperature, 3) pressure, 4) UV radiation level, 5) Geiger Counter radiation, 6) dust particle sensor, 7) CO2 sensor, and humidity sensor. The results and the data acquired from the launches will be shown in our poster.

Gadd, Austin (Senior, Astronomy, Northern Arizona University). Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University. [G-8]

IMPACT-INDUCED SHOCK METAMORPHISM AND ITS ROLE IN STRUCTURING MICROBIAL HABITATS IN COCONINO SANDSTONE AT BARRINGER CRATER

Meteorite impacts in sedimentary targets like Coconino Sandstone, a fine-grained quartz sandstone formation at Barringer Crater, can increase and decrease microbial habitats from the variable effects of shock metamorphism on porosity. Preserved at Barringer Crater, there is highly shocked, flour-like Coconino Ejecta, and less shocked Coconino with preserved sedimentary bedding. The variability in shock produced two distinct microbial habitats. I'm comparing microbial community structure to determine the effect of rock structure on microbial diversity. We're using the XRD and FTIR to identify high-shock mineral phases, then DNA extractions for sequencing to determine differences in microbial communities. I hypothesize that our moderately shocked Coconino Sandstone sample hosts a more diverse microbial community because the rock's structure provides protection from UV Radiation and desiccation. Given the ubiquity of impact craters on terrestrial bodies in our Solar System, this work will help determine future sites on other planetary bodies to study potential habitability.

Geen, Emily (First-Year, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

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Gonzalez, Cristian (First-Year, Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

THE EFFECTS OF MICROALGAE CHLORELLA VULGARIS UNDER STRATOSPHERIC CONDITIONS

With regards to the NASA Transition Authorization Act of 2017, the first human will be sent to Mars by 2033. And no matter how the timeline may change, oxygen generation will be crucial for future space missions; hence a microalgae culture was to be tested within the ASCEND project in order to obtain information in comparison to a controlled engineered environment. This includes an exogenously treated microalgae of chlorella vulgaris with niacin and zeaxanthin to increase stress tolerance and have an accessory pigment to absorb UV light for the photosynthesis process. This strain of microalgae was based on a prior project; Exogenous Niacin and Zeaxanthin treatment to increase the stress tolerance and light absorbance capacity of microalgae Chlorella Vulgaris under an engineered Martian environment.

Goodman, Peter (Senior, Statistics and Data Science, University of Arizona). Mentor: Joanna Masel, Ecology and Evolutionary Biology, University of Arizona. [H-2]

ASSESSING THE EFFECT OF PROTEIN STRUCTURE ON AMINO ACID EVOLUTION

Evolutionary Biologists capture molecular evolution using substitution models, which represent the likelihood or rate of change at sites in the genetic code. These models are essential components of phylogenetic inference, as improved substitution models lead to more accurate phylogenies and branch length estimates. We used recent developments in data availability and computational tools for substitution model inference to investigate the impact of protein structure on substitution models. Using predicted protein structures from the AlphaFold database, we partitioned orthologous genes from five taxonomic groups by their solvent accessibility and trained substitution models on the partitions. The exchangeability values derived from these partitioned substitution models differed more between accessible surface area than between taxa. We then used these structurally aware substitution models to infer phylogenetic trees with individual genes, seeing no significant improvement in tree accuracy compared with a standard approach, despite better likelihood values from the structurally aware models.

Hall, Rose (Sophomore, Aerospace Engineering, University of Arizona). Mentor: David Margolis, Orthopedic Surgery, University of Arizona. [F-6]

IN VIVO BONE STRAIN MEASUREMENT IN SIMULATED REDUCED GRAVITY

Understanding how bone strength changes in reduced-gravity environments is essential for maintaining astronaut health during long-duration space missions. This project supports the development of implantable sensors that measure bone strain as an indicator of bone health. The focus of this study is to evaluate bone healing by measuring mechanical strength through torsional testing. Fractured sheep bones with implanted sensors were subjected to controlled loading and tested to determine the maximum torque at failure. Differences in torque capacity were used to track bone strength and health. These results provide a baseline for comparing sensor data and demonstrate that strain-based monitoring systems can serve as effective indicators of bone strength. Ultimately, this research supports the development of tools for real-time monitoring of bone health, helping reduce bone loss and improve astronaut safety in reduced-gravity environments.

Harder, Jillian (Sophomore, Astronomy, Northern Arizona University). Mentor: Keith Nowicki, Physics, Northern Arizona University. [F-10]

OPTICAL TELESCOPE DESIGN INVESTIGATION FOR ORBITAL RESEARCH

This research explores multi-mirror optical telescope designs for orbital research. Using the optical modeling software Zemax OpticStudio, multiple optical geometries and optical families were evaluated to optimize image quality and minimize aberrations across a wide field of view. This work evaluates system performance using conic constants, spot diagrams, and numerical optimization techniques to assess suitability for remote sensing applications. The results show that incorporating an Offner Relay into the telescope design significantly reduces optical aberrations compared to simpler configurations. These findings demonstrate the effectiveness of advanced multi-mirror systems in improving imaging performance and support the development of compact, high-resolution telescopes for future space-based observation missions.

Headon, Jackson (Senior, Astrophysics and Physics, Arizona State University). Mentor: Jennifer Patience, School of Earth and Space Exploration, Arizona State University. [C-14]

NARROWING THE SCIENCE GAP LIST OF HABITABLE WORLDS OBSERVATORY TARGETS

The Habitable Worlds Observatory (HWO) is the next major NASA flagship space telescope mission after the Nancy Roman Space Telescope specifically designed to search for Earth-like exoplanets. With the mission set to launch sometime after 2040, NASA's Exoplanet Exploration Program (ExEP) has developed a list of over 160 most probable stars to contain Earth analogs orbiting them, also developing a " Science Gap List" of current versus expected observation capabilities to further advance exoplanet studies. To help the development of HWO and current precursor studies, we have selected around 25 F, G, and K type stars from the ExEP target list to further analyze their likelihood of hosting suitable Earth-like exoplanets. Using the Large Binocular Telescope's (LBT) PEPSI instrument, we specifically track key age and activity indicators in the 3900 Å - 7000 Å, identifying Ca H, Ca K, Hα, and Li across a mixture of our targets.

Herrera Ortiz, Fernando (Sophomore, Civil Engineering, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

CENTRAL ARIZONA COLLEGE: SPRING 2026 HIGH ALTITUDE PAYLOADS

Central Arizona College created two high-altitude balloon payloads in Spring 2026 that aim to continue a 5-year long data collection process. The first payload is the main payload that will be collecting temperature, humidity, and altitude. This payload is an improved mechanical design that will protect all electrical components from external harm. The second payload aims to collect acceleration through three different axes to test the capabilities of its respective mechanical design. The mechanical design has been improved to give a more solid structure while still having flexibility in the critical joints that hold together the payload by use of TPU 95A HF filament. A Long-Range radio has also been included in the second payload to receive data from the payload as it collects data so long as the payload is within range of the base location.

Herrington, Ethan (Junior, Mechanical Engineering, Northern Arizona University). Mentor: Jean-Francois Smekens, Astronomy and Planetary Science, Northern Arizona University. [D-5]

QUANTIFYING THE OPTICAL PROPERTIES OF VOLCANIC ASH TO IMPROVE SATELLITE RETRIEVALS

In aviation, volcanic ash poses a significant threat as it can melt and coat internal engine surfaces. However, this risk can be mitigated by detecting ash plumes with satellite instruments, which requires careful characterization of the optical properties of ash particles. We developed a method to measure the optical properties of volcanic ash by suspending ash samples in potassium bromide (KBr) pellets and measuring their spectral transmittance. Initially, we encountered setbacks with the KBr pellets, including water contamination, insufficient press pressure, and uneven sealing in the die. We have since produced stable KBr pellets, although we still observe some water contamination. This can be improved by using a vacuum pump during the creation process. While further improvements are needed, our method shows great promise compared to traditional methods, which are very difficult to replicate. In contrast, our method is a fully repeatable and robust approach for characterizing volcanic ash.

Hess, Caden (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [B-3, ASCEND-Poster Session]

GCC ASCEND TEAM 2: SPACEJUNKIES I2C MODULES, BLUETOOTH DATA LINK, AND NEW SENSORS!

During the Fall 2025 semester, GCC ASCEND built two payloads that both flew to 100,000 feet and returned with temperature, pressure, and acceleration data. This Spring 2026 semester, we will expand on that success by integrating I2C components into our board, including a radio receiver and a temperature and humidity sensor. The I2C radio receiver will help map how signal strength between the payload and nearby radio stations changes. The I2C temperature and humidity sensor will allow comparison with readings from our analog temperature sensors. We are also adding an Iridium modem and an I2C Bluetooth module. To meet Arizona Near Space Research weight constraints, we will have our two payloads communicate via Bluetooth using GNSS and Iridium modem data. This approach helps manage mass while enabling a data link that can transmit GNSS coordinates via satellite, allowing us to track our payload independently and improve reliability during flight operations.

Hollowell, Brittany (Sophomore, Astronomical and Planetary Sciences and Earth and Environmental Sciences, Arizona State University). Mentor: Katrina Bossert, School of Earth and Space Exploration, Arizona State University. [C-3]

Drivers of Nighttime CO2 Non-Local Thermodynamic Equilibrium

This study investigates the drivers of nighttime CO_2 non-local thermodynamic equilibrium (NLTE) in the polar lower thermosphere. Daytime NLTE is well understood to be influenced by solar radiation, but nighttime NLTE is far less understood. Our goal is to quantify whether nighttime NLTE is a consistent signature of aurora or a result of coupling between aurora and atmospheric dynamics. We find that nighttime NLTE increases are often associated with auroral activity and atmospheric gravity waves. We use the AIRS NLTE index (Bossert et al., 2023), which is derived from CO_2 4.26-µm emissions, to find a link between NLTE and electron densities, as measured by Poker Flat Incoherent Scatter Radar. Additionally, we have developed a classification system to identify nighttime CO_2 NLTE increases suspected to be driven by auroral particle precipitation and gravity wave-driven perturbations; these drivers will be further investigated in future work.

Holmes, Carson (Junior, Mechanical Engineering - Propulsion, Embry-Riddle Aeronautical University). Mentor: David Lanning, Aerospace Engineering, Embry-Riddle Aeronautical University. [F-4]

Investigation of Stress Concentrations in Stereolithographic Modeled Parts

Additive manufacturing via stereolithography (SLA) is increasingly used in aerospace and mechanical applications due to versatility and rapid prototyping. However, the mechanical behavior of SLA-printed parts with stress concentrations remains insufficiently characterized. This research investigates how localized stresses and printing parameters influence tensile strength and fracture behavior of SLA-printed resin specimens. Test specimens with double semicircular notches were designed using Peterson's notch analysis to achieve a theoretical stress concentration factor (K_t) of 2.2. Unnotched SLA specimens were tested as controls. Experimental results show that curing temperature significantly affects tensile strength, with specimens cured at 80 °C outperforming those cured at manufacturer recommended conditions. Measured effective K_t values were lower than theoretical predictions, indicating that SLA parts do not follow classical stress concentration theory. Data suggests local plasticity, notch strengthening, and strain-dependent stiffening, linked to rubber modified thermoset resins. These findings highlight the need for revised design considerations for structural applications.

Holtz, Robert (Senior, Economics, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

University of Arizona ASCEND!: Profiling High-Altitude Electromagnetic Radiation with a General Data Logger

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

Honor, Rachel (Junior, Astrophysics and Physics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [C-19]

Catching Light Waves with SKYSURFIR: Measuring Offsets between NIRCam Detectors

The aim of Project SKYSURFIR is to use JWST archival data to build upon the work done by Project SKYSURF, which used archival data from HST to measure, characterize, and model sky surface brightness in these images. We are working on constraining our models of extragalactic background light (light from all galaxies throughout cosmic time) and Zodiacal light (light originating from within the solar system) at near-infrared wavelengths. This will help improve the science capabilities of JWST by determining, for a given wavelength, the contribution of various types of background light in an image. An important part of understanding the background light contribution is understanding the systematics of detectors on JWST. I measured offsets in sky surface brightness measurements between the eight NIRCam short-wavelength detectors and found no significant differences. This indicates that our sky surface brightness measurements are not dependent on the location of the sample within the image.

Howard, Landri (High School Student, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [G-7, ASCEND-Poster Session]

CASA GRANDE UNION HIGH SCHOOL ASCEND

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. The system is built around an Arduino Uno slaved to a Mega. This payload is using a TMP36 temperature sensor, UV sensor, BME280 environmental sensor, and GPS module, all to collect data up to 100,000 feet into the atmosphere. These sensors are all connected to the Mega for processing and then data is to be sent to the Uno to be written to the SD card. Power is supplied by two 9V lithium batteries regulated through a Buck-Boost converter, with an external amp meter for monitoring. This payload is complemented by the RunCam Orange 5 Camera for Earth Observation. Previous missions focused on innovative enclosure design and dual payloads, incorporating internal temperature monitoring. This research serves to help students advance their understanding of the atmosphere and future scientific and technological applications.

Hylden, Rayna (Junior, Materials Science and Engineering, Arizona State University). Mentor: Nick Rolston, School of Electrical, Computer and Energy Engineering, Arizona State University. [F-8]

THIN FILM SOLAR CELL PERFORMANCE ON METAL ALLOY SUBSTRATES

Perovskites (PVSKs) are low-cost, sustainable, and efficient materials for solar cells. By coating PVSKs on nickel-titanium shape memory alloy (SMA) substrates, photovoltaic systems for space exploration can be optimized for low weight, deformation recovery, and high power conversion efficiency. This work compares the performance of PVSKs coated on glass and SMA substrates when under simultaneous stress from light and heat. Scanning electron microscopy (SEM) shows that SMA-based samples consistently form high-quality PVSK structures comparable to their glass counterparts. By measuring the emission spectra of the samples with photoluminescence spectroscopy (PL), the bandgaps of the perovskites are calculated and their relative performance before, during, and after stress can be relatively compared. Results ultimately show that SMA-based PVSK solar cells are viable renewable energy sources for space exploration systems, enabling high efficiency systems through low-weight and low-cost technologies.

Jaber, Alex (Sophomore, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Jimenez, Adrian (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [B-3, ASCEND-Poster Session]

GCC ASCEND TEAM 2: SPACEJUNKIES I2C MODULES, BLUETOOTH DATA LINK, AND NEW SENSORS!

During the Fall 2025 semester, GCC ASCEND built two payloads that both flew to 100,000 feet and returned with temperature, pressure, and acceleration data. This Spring 2026 semester, we will expand on that success by integrating I2C components into our board, including a radio receiver and a temperature and humidity sensor. The I2C radio receiver will help map how signal strength between the payload and nearby radio stations changes. The I2C temperature and humidity sensor will allow comparison with readings from our analog temperature sensors. We are also adding an Iridium modem and an I2C Bluetooth module. To meet Arizona Near Space Research weight constraints, we will have our two payloads communicate via Bluetooth using GNSS and Iridium modem data. This approach helps manage mass while enabling a data link that can transmit GNSS coordinates via satellite, allowing us to track our payload independently and improve reliability during flight operations.

Juston, Ambroise (Senior, Aeronautical Engineering, Embry-Riddle Aeronautical University). Mentor: Elizabeth Gretarsson, Physics and Astronomy Department, Embry-Riddle Aeronautical University. [C-10]

BIREFRINGENCE MIRROR CURVATURE

This presentation explores the characterization of AlGaAs mirror coatings for use in Laser Interferometer Gravitational-Wave Observatory (LIGO), with an emphasis on the relationship between coating curvature and birefringence. Experimental data show that the coated samples exhibit measurable curvature, accompanied by a spatial variation in birefringence that forms concentric circular patterns radiating outward from the initial point of contact during fabrication. This behavior is consistent with strain distributions introduced during the growth process, where the AlGaAs layer is suspended by small support “flags” and deposited onto a substrate. External modeling efforts support the hypothesis. The resulting internal stresses are believed to produce both the observed deformation and the radial birefringence structure. By correlating curvature measurements with birefringence maps, this study provides insight into how fabrication-induced strain impacts optical performance, with implications for reducing noise and improving sensitivity in precision gravitational wave detectors.

Kahn, Isabel (Junior, Astrophysics, Arizona State University). Mentor: Luis Welbanks, School of Earth and Space Exploration, Arizona State University. [G-13]

REANALYZING HABITABILITY CLAIMS FOR K2-18 B THROUGH FORWARD MODELS AND RETRIEVAL ANALYSIS

Recent observations of the sub-Neptune exoplanet K2-18 b have generated interest due to suggestions of liquid water on its surface and possible biosignature gases in its atmosphere. This study investigates whether alternative abiotic atmospheric compositions can reproduce the observed spectra. One-dimensional atmospheric models of K2-18 b were constructed using the PICASO modeling framework, and synthetic transmission spectra were generated through radiative transfer calculations. These spectra were compared with James Webb Space Telescope observations by computing χ^2 values to assess the goodness of fit across different atmospheric compositions. Focusing on ammonia (NH_3), a potential indicator of a liquid-water ocean, initial results show that a wide range of NH_3 abundances produce similarly good fits, suggesting ammonia is not well constrained. To further evaluate atmospheric composition, an atmospheric retrieval is being performed to generate probability distributions for molecular abundances. This analysis will help determine which species are well constrained and which remain uncertain.

Kaiser, Grace (Sophomore, Astronomy and Mathematics, University of Arizona). Mentor: Yancy Shirley, Astronomy, University of Arizona. [C-16]

DEUTERATED FORMALDEHYDE AS A TRACER OF CORE AND FILAMENT EVOLUTION

Starless cores are the potential birthplaces of stars and planets and thus determine their initial conditions. Most starless cores reside within filaments in molecular clouds. The goal of this project is to understand the evolution of these cores and filaments by observing trends in the deuteration ratios of formaldehyde. Deuterium fractionation, where the HDCO/H2CO ratio increases by several orders of magnitude compared to the D/H ratio in cold dense gas, is a tracer of core and filament evolutionary history. We determined the HDCO/H2CO ratio using observations with the Arizona Radio Observatory 12m telescope. We compare these ratios to various aspects of the cores, such as location and density, to study their relative rates of evolution.

Kennan, Zephyr (Junior, Astronomy, Planetary Science, and Physics, Northern Arizona University). Mentors: Christopher Doughty and Michael Gowanlock, School of Informatics, Computing, and Cyber Systems, Northern Arizona University. [C-4]

CALCULATING POTENTIAL CUMULATIVE CARBON FIXED AND EVOLUTIONARY STAGE FOR EARTHLIKE PLANETS IN OUR SOLAR NEIGHBORHOOD

We propose a novel method for estimating possible biological evolutionary stage on exoplanets based on the hypothesis that biological evolutionary state is a linear function of cumulative carbon fixed (photosynthesis) on an entire planet. We explore the implications of this hypothesis using spatially explicit climate simulations of TRAPPIST-1e, a tidally locked planet within the habitable zone of a red dwarf star ~40 light years away. Since T1e's mean estimated age is 7.6 Gyr, we estimate it to be at a potential microbial, but not multicellular life stage. Following recent data from the James Webb Space Telescope on atmospheric constraints on TRAPPIST-1e, the NPP model is then reapplied to updated continental models to better reflect realistic findings. This new model is compared to the recent findings, as well as the Photochem model, developed to predict atmospheric mixing and temperatures.

Knoell, Benjamin (Senior, Aerospace Engineering - Astronautical Concentration, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-Poster Session]

PAYLOAD STABILITY AND LONG-RANGE TRACKING

ASCEND! is an Arizona Space Grant Consortium statewide workforce development program organized under NASA's Space Grant consortium. The payloads reach a maximum altitude of 100,000 ft and allow schools to fly any desired sensors. In Spring 2026, ERAU ASCEND! created a payload that aims to increase the reliability of data collection by transmitting sensor data to a ground station. A GPS unit was placed on the payload that transmits coordinates and altitude. The ground station uses these coordinates to compute the range azimuth, and elevation along which to direct the antenna. The sensor data being received this semester will be utilized in an onboard stabilization system with a reaction wheel. The goal is to allow for the reaction wheel to stabilize the payload for a camera recording the ascent of the balloon for comparison between the stabilization systems of previous semesters.

Landis, Emmeline (Sophomore, Computer Science, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-Poster Session]

NOT A UFO: ATMOSPHERIC DATA COLLECTION

The objectives for the Fall 2025 and Spring 2026 launches are to collect data on Earth's atmosphere and vehicle launch parameters, and to train students in the ways of STEM endeavors. The launch was successful. During the launches, the PC NASA ASCEND team acquired data for the following: 1) GPS date-time, 2) temperature, 3) pressure, 4) UV radiation level, 5) Geiger Counter radiation, 6) dust particle sensor, 7) CO_2 sensor, and humidity sensor. The results and the data acquired from the launches will be shown in our poster.

Larson, Clayton (High School Student, Basis High School, Prescott). Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-18]

ANALYZING LIGHT CURVES OF CORE COLLAPSE SUPERNOVAE

Light curves from core-collapse supernovae (CCSNe) have been used within the Laser Interferometer Gravitational-Wave Observatory (LIGO) collaboration to estimate the moment when the shock front emerges from the stellar surface. However, the broader potential of CCSNe light curves includes estimations of physical properties of the progenitor star derived from the luminosity data, which has yet to be worked through by the LIGO collaboration. This project advances that direction by employing light curves generated from explicit physical models of electromagnetic emission developed by Eli Waxman (Weizmann Institute of Science) and Chris Freyer (Los Alamos National Laboratory). Although these models provide detailed predictions, they contain ambiguities in which different combinations of the input parameters generate the same light curve. The project goal is to interpolate these light curves with the physically generated curves from the models of Waxman and Freyer and extract possible data about the physical properties of the progenitor.

Le, Tiffany (Senior, Statistics and Data Science, University of Arizona). Mentor: Dana Lapides, USDA ARS, Southwest Watershed Research Center, Other Institution. [D-13]

TRACKING WATER IN THE DESERT

Surface water in streams supports aquatic organisms and riparian vegetation. However, surface water availability is changing with shifting climate conditions, and these changes remain poorly understood due to limited observations. Here, we leverage a unique camera-based dataset of daily flow observations that spans over two decades to evaluate surface water dynamics in the San Pedro River in Southern Arizona. Despite being the largest undammed river in the Southwest, its flow regime remains sensitive to land-use pressures and climate variability. We identified drivers of surface water presence patterns and detected shifts in the trends and variability in flow persistence over time at different locations. We found that, while annual flow persistence was variable, monsoon season persistence decreased over time, governed by rising monsoon season temperatures and decreasing precipitation. These higher monsoon season temperatures may diminish flow persistence through increased evaporative demand and plant water use, with implications for management and conservation.

LeClair, Christopher (Sophomore, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University. [B-2]

ELECTRICAL CAPACITANCE TO HIGH-RESOLUTION OBSERVATION

The majority of spacecraft require a liquid propellant for their propulsion systems. However, current propellant mass gauging technology becomes less accurate over the course of the mission. Over time, liquid propellants transition from their usable liquid phase to an unusable gaseous phase, a process known as boil-off. The unrestrained propellant also moves freely within the propellant tanks, making it difficult to measure the exact amount of propellant present. Methods like bookkeeping and settling burns develop errors over time and become less reliable as the quantity of propellant decreases. Electrical Capacitance to High-resolution Observation (ECHO) makes accurate propellant mass measurements by integrating electrical capacitance tomography and machine learning. By placing electrodes along the interior walls of propellant tanks and measuring between the electrodes, ECHO reconstructs cross sections of the interior of the propellant tank with higher accuracy than traditional reconstruction techniques.

Lucas, Trisha (Junior, Chemistry, Northern Arizona University). Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University. [G-3]

SOLID STATE DIFFUSION OF VOLATILES ON PLUTO

Pluto's icy surface is made up of extremely volatile molecules, such as N2, CO, and CH4. The little solar power Pluto receives allows for these volatiles to sublimate and recondense elsewhere in colder regions on the planet, leading to constant structural evolution. When a pure species of ice is contaminated with another, as occurs on Pluto, changes in its qualities are expected. However, the physics and chemistry of how these different solids diffuse through each other are poorly understood. This study aimed to use the Astrophysical Materials Laboratory at NAU to experimentally create layered ice samples involving the most volatile species, N2, and measure its diffusion. Results show that different regimes occur when N2 diffuses through different species. Understanding how these solids move through each other will improve the assumptions made for surface models of Pluto, and broadly impact research on solid state diffusion.

Luna, Mylene (High School Student, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [G-7, ASCEND-Poster Session]

CASA GRANDE UNION HIGH SCHOOL ASCEND

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. The system is built around an Arduino Uno slaved to a Mega. This payload is using a TMP36 temperature sensor, UV sensor, BME280 environmental sensor, and GPS module, all to collect data up to 100,000 feet into the atmosphere. These sensors are all connected to the Mega for processing and then data is to be sent to the Uno to be written to the SD card. Power is supplied by two 9V lithium batteries regulated through a Buck-Boost converter, with an external amp meter for monitoring. This payload is complemented by the RunCam Orange 5 Camera for Earth Observation. Previous missions focused on innovative enclosure design and dual payloads, incorporating internal temperature monitoring. This research serves to help students advance their understanding of the atmosphere and future scientific and technological applications

MacPherson, Jewel (Junior, Astronomy, Embry-Riddle Aeronautical University). Mentor: Noel Richardson, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-9]

STELLAR POLARIMETER FOR UNDERGRADUATE STUDIES - SPUDS

We are upgrading the 16-in Meade LX200 telescope at Embry-Riddle Aeronautical University's Prescott observatory by adding a polarimeter, enabling the study of polarized starlight. Unlike unpolarized light which contains all orientations of its electric field at the same time, polarized light is restricted to a single orientation of oscillation. Using a polarimeter to measure the degree and angle of polarized starlight allows us to study the properties of the star it originated from and the material the light travelled through to become polarized. Our polarimeter contains six linearly polarized filters fitting into a rotating filter wheel, and each filter is angled 30 degrees apart from the last, giving us a range of data about the angle of polarization. We plan to use our polarimeter to study hot Be and Wolf-Rayet stars, and the magnetic fields of galaxies hosting supernova explosions.

Madrigal, Michelle (Senior, Mechanical Engineering, Embry-Riddle Aeronautical University). Mentor: David Lanning, Aerospace Engineering, Embry-Riddle Aeronautical University. [F-4]

INVESTIGATION OF STRESS CONCENTRATIONS IN STEREOLITHOGRAPHIC MODELED PARTS

Additive manufacturing via stereolithography (SLA) is increasingly used in aerospace and mechanical applications due to versatility and rapid prototyping. However, the mechanical behavior of SLA-printed parts with stress concentrations remains insufficiently characterized. This research investigates how localized stresses and printing parameters influence tensile strength and fracture behavior of SLA-printed resin specimens. Test specimens with double semicircular notches were designed using Peterson's notch analysis to achieve a theoretical stress concentration factor (Kt) of 2.2. Unnotched SLA specimens were tested as controls. Experimental results show that curing temperature significantly affects tensile strength, with specimens cured at 80 °C outperforming those cured at manufacturer recommended conditions. Measured effective Kt values were lower than theoretical predictions, indicating that SLA parts do not follow classical stress concentration theory. Data suggests local plasticity, notch strengthening, and strain-dependent stiffening, linked to rubber modified thermoset resins. These findings highlight the need for revised design considerations for structural applications.

Mandava, Pranav (Post-Baccalaureate, Computer Science, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Manepalli, Nandini (Junior, Molecular and Cellular Biology and Biochemistry, University of Arizona). Mentor: Sawsan Wehbi, Genetics Graduate Interdisciplinary Program, University of Arizona. [D-11]

PROTEINS THAT EMERGED AFTER THE OXYGENATION OF EARTH'S ATMOSPHERE USED LESS NOW-SCARCE MANGANESE AND IRON-SULFUR CLUSTERS, BUT NOT LESS HEME

Many proteins bind transition metals, which catalyze biological reactions by transferring electrons. Some metal-binding proteins are ancient, dating back to the last universal common ancestor, while others evolved more recently. Here, we compare the transition metal preferences of ancient protein sequences to those that emerged more recently, to understand whether the adoption of different transition metals is driven by supply or biological functional demand. Preliminary results suggest that older protein sequences are more likely to bind manganese, which was abundant in the early, oxygen-depleted Earth, supporting the supply hypothesis. However, younger protein sequences are more likely to bind iron, via heme, despite its scarcity following the oxygenation of Earth's atmosphere. This underscores the significance of functional demand for iron adoption, at least in the form of heme. Biomarkers that track what is demanded by life are likely to be more reliable than those that track more contingent facts about availability.

Martinez Hernandez, Jesse (Sophomore, Aerospace Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [ASCEND-Poster Session]

GCC NASA ASCEND STATE PENITENTIARY: NEW SENSORS AND LIVE DATA TRANSMISSION

During the Fall 2025 semester, Glendale Community College teams 1 and 2 were instructed in developing a payload that could withstand a flight of over 100,000 ft into the atmosphere, while equipping the payload with an accelerometer, barometer, GNSS, and camera for data acquisition, analysis, and evaluation. This Spring 2026 semester payload builds off of that foundation by expanding the data collection capabilities of the Flight Data Recorder through new sensors integrated into the board via hardware and software, and that can transmit data in real-time via Bluetooth, all without compromising data collection. Additions to the board included a Bluetooth, modem, I2C temperature and humidity sensors, and analog UV sensors. In turn, this has had the effect of fostering real-world applicable skills, such as internal department cooperation, communication, and problem solving towards a common goal.

Mattison, Kane (Junior, Aerospace Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

UNIVERSITY OF ARIZONA ASCEND!: PROFILING HIGH-ALTITUDE ELECTROMAGNETIC RADIATION WITH A GENERAL DATA LOGGER

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

McLean, Samantha (Senior, Physics and Astrophysics, Northern Arizona University). Mentor: Greg Vaughan, United States Geological Survey, Northern Arizona University. [D-9]

BUILDING A PYTHON PIPELINE FOR PROCESSING REMOTE SENSING DATA OF YELLOWSTONE THERMAL AREAS AND QUANTIFYING SYSTEMATIC ERROR

Thermal remote sensing of Yellowstone National Park is crucial for the monitoring of 71 thermal areas distributed across Yellowstone's 2.2 million acres. NASA's Landsat satellites capture these remote sensing data, which provide information on the heat output (Geothermal Radiance) of individual thermal areas. However, the current data processing method requires extensive manual manipulation for each image date and is ineffective for images with partial or total cloud coverage. As a result of this limitation, although Landsat has collected thermal images of Yellowstone every 8–16 days from 2014 to 2025, only 38 dates are usable for analysis. This limitation highlights the need for automated data processing to reduce time and enable the use of partially cloudy images to analyze unobscured thermal areas. This project develops preliminary Python code for a more efficient data processing pipeline and uses previously processed images to constrain systematic uncertainty from emissivity and temperature assumptions.

Mendoza, Brandon (Sophomore, Electrical Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

THE EFFECTS OF MICROALGAE CHLORELLA VULGARIS UNDER STRATOSPHERIC CONDITIONS

This project investigates how algae respond to near-space environmental conditions, including low pressure, low temperature, and increased ultraviolet (UV) radiation. A high-altitude balloon platform will be used to carry algae samples to near-space, where they will be exposed to these extreme conditions while environmental data such as temperature, pressure, and UV intensity are recorded. After recovery, the algae will be analyzed to determine changes in growth rate, color, and overall health compared to a control sample kept on the ground. The goal is to understand the resilience of algae in extreme environments.

Miller, Ella (Sophomore, Mechanical Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

UNIVERSITY OF ARIZONA ASCEND!: PROFILING HIGH-ALTITUDE ELECTROMAGNETIC RADIATION WITH A GENERAL DATA LOGGER

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

Miller, Cambri (Senior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Ahmed Sullyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University. [B-5]

EAGLESAT

The EagleSat program provides undergraduate students with hands-on experience in various areas of spacecraft development through the design, building, and testing of CubeSats. These CubeSats are tailored to meet the requirements of the NASA CubeSat Launch Initiative, and align with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. In December 2025, EagleSat 2 was deployed from the International Space Station. EagleSat 2's mission is to study the effects of solar radiation on various types of Random Access Memory (RAM). Now, EagleSat is working to develop 4 new experiments to test the degradation of solar panels, analog to digital converters, lenses for laser interferometers, and solid-state drives.

Miranda, Christopher (Sophomore, Aerospace Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

THE EFFECTS OF MICROALGAE CHLORELLA VULGARIS UNDER STRATOSPHERIC CONDITIONS

With regards to the NASA Transition Authorization Act of 2017, the first human will be sent to Mars by 2033. And no matter how the timeline may change, oxygen generation will be crucial for future space missions; hence a microalgae culture was to be tested within the ASCEND project in order to obtain information in comparison to a controlled engineered environment. This includes an exogenously treated microalgae of chlorella vulgaris with niacin and zeaxanthin to increase stress tolerance and have an accessory pigment to absorb UV light for the photosynthesis process. This strain of microalgae was based on a prior project; Exogenous Niacin and Zeaxanthin treatment to increase the stress tolerance and light absorbance capacity of microalgae Chlorella Vulgaris under an engineered Martian environment.

Monreal, Sierra (Junior, Aerospace Engineering - Astronautics, Arizona State University). Mentor: Ross Garelick Bell, The Aerospace States Association, Arizona State University. [E-1]

A CONSOLIDATED ANALYSIS OF U.S. AEROSPACE ACTIVITY

This project presents a comprehensive analysis of aerospace activity across U.S. states through developing a ranking system based on a range of key factors. Drawing on insights gathered from over 15 conversations with legislators, lieutenant governors, and aerospace industry leaders, key indicators of state-level aerospace success were identified, including NASA funding, Department of Defense (DoD) funding, aerospace and defense (A&D) employment, GDP growth, and the presence of spaceport infrastructure. Using these metrics, a comparative database was constructed to evaluate and rank states based on their aerospace activity. The weighting of each parameter was informed by stakeholder input to reflect priorities relevant to policymakers and industry leaders. In addition to the overall ranking, smaller, focused ranking scales were developed based specifically on DoD spending and on combined jobs and GDP metrics. This analysis provides a data-driven tool to better understand regional strengths and inform strategic decision-making in the U.S. aerospace sector.

Nielsen, Tyler (Senior, Computer Systems Engineering, Arizona State University). Mentor: Joe Dubois, Interplanetary Lab, Arizona State University. [B-1]

COCONUT: STUDENT-LED DEVELOPMENT AND ON-ORBIT OPERATION OF A 1U LORA AMATEUR RADIO CUBESAT

Coconut is a 1U CubeSat developed and operated by the Sun Devil Satellite Laboratory (SDSL) at Arizona State University. Launched to the ISS on the Cygnus NG-24 mission in April 2026, Coconut serves as a proof-of-concept for student-led design and integration of a low-cost, long-range satellite communication system built on inexpensive, low-power LoRa modules. This mission utilizes a store-and-forward system on the 70cm amateur radio band with managed uplink slots. Data is later downlinked from the satellite using SDSL's UHF Ground Station in Tempe. Built by students at SDSL, the satellite features custom-designed hardware, including the Electrical Power System (EPS), Flight Computer, and Radio systems. Electrical hardware is centered around an RP2040-based flight computer integrated with Magnetoresistive Random-Access Memory (MRAM) for radiation-tolerant program and data storage. The primary flight software utilizes the Pico SDK with FreeRTOS, providing a robust multi-threaded environment for system operation.

Nielsen, Tyler (Senior, Computer Systems Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND’s version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Noble, Bruce (Senior, Aerospace Engineering - Astronautics Track, Embry-Riddle Aeronautical University). Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University. [B-2]

ELECTRICAL CAPACITANCE TO HIGH-RESOLUTION OBSERVATION

The majority of spacecraft require a liquid propellant for their propulsion systems. However, current propellant mass gauging technology becomes less accurate over the course of the mission. Over time, liquid propellants transition from their usable liquid phase to an unusable gaseous phase, a process known as boil-off. The unrestrained propellant also moves freely within the propellant tanks, making it difficult to measure the exact amount of propellant present. Methods like bookkeeping and settling burns develop errors over time and become less reliable as the quantity of propellant decreases. Electrical Capacitance to High-resolution Observation (ECHO) makes accurate propellant mass measurements by integrating electrical capacitance tomography and machine learning. By placing electrodes along the interior walls of propellant tanks and measuring between the electrodes, ECHO reconstructs cross sections of the interior of the propellant tank with higher accuracy than traditional reconstruction techniques.

Noble, Bruce (Senior, Aerospace Engineering - Astronautics Track, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University. [B-5]

EAGLESAT

The EagleSat program provides undergraduate students with hands-on experience in various areas of spacecraft development through the design, building, and testing of CubeSats. These CubeSats are tailored to meet the requirements of the NASA CubeSat Launch Initiative, and align with NASA’s scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. In December 2025, EagleSat 2 was deployed from the International Space Station. EagleSat 2’s mission is to study the effects of solar radiation on various types of Random Access Memory (RAM). Now, EagleSat is working to develop 4 new experiments to test the degradation of solar panels, analog to digital converters, lenses for laser interferometers, and solid-state drives.

Nuno, Santiago (Junior, Aerospace Engineering - Aeronautical Concentration, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-Poster Session]

PAYLOAD STABILITY AND LONG-RANGE TRACKING

ASCEND! is an Arizona Space Grant Consortium statewide workforce development program organized under NASA’s Space Grant consortium. The payloads reach a maximum altitude of 100,000 ft and allow schools to fly any desired sensors. In Spring 2026, ERAU ASCEND! created a payload that aims to increase the reliability of data collection by transmitting sensor data to a ground station. A GPS unit was placed on the payload that transmits coordinates and altitude. The ground station uses these coordinates to compute the range azimuth, and elevation along which to direct the antenna. The sensor data being received this semester will be utilized in an onboard stabilization system with a reaction wheel. The goal is to allow for the reaction wheel to stabilize the payload for a camera recording the ascent of the balloon for comparison between the stabilization systems of previous semesters.

O'Brien, William (Sophomore, Astrophysics and Physics, Arizona State University). Mentor: Daniel Jacobs, School of Earth and Space Exploration, Arizona State University. [C-12]

FINDING AN OPTIMAL LAYOUT FOR THE LONG WAVELENGTH ARRAY SWARM STATION AT METEOR CRATER

The planned construction of the Long Wavelength Array Swarm station at Meteor Crater requires a proposed antenna distribution layout that will maximize the 'goodness' of the Point Spread Function of the resulting array. By utilizing a Python code, simulations of said layout were viewed and analyzed for effectiveness at completing this task, with 'goodness' being defined as how closely the resulting Point Spread Function resembled a point source. Ensuring proper antenna size (~2x2 meters) and area for the layout (~100 meter diameter area) allows for simulation of approximate real-world spatial conditions, permitting for direct usage of proposed antenna locations. Through testing of various layouts while improving methods for design over time, various structures have been proposed, tested for effectiveness, and will be considered for usage at the site of the station.

O'Brien, Isabella (Senior, Electrical Engineering, Arizona State University). Mentor: Philip Mauskopf, School of Earth and Space Exploration, Arizona State University. [F-1]

REAL TIME IMAGE BASED DETECTION AND CHARACTERIZATION OF OPTICAL DOWNLINK FROM NASA'S LASER COMMUNICATIONS AND RELAY DEMONSTRATION

Spectrum availability is a pressing bottleneck in modern radiofrequency systems. The global, rapid proliferation of satellites providing services to earth and space urgently demands a strong alternative solution. Through NASA's Laser Communications Relay Demonstration (LCRD) experiment, our team utilizes optical wavelengths that exist outside of the radio bandwidth range enabling delivery of the fastest data rates in earth-to-space communication. In the Fall of 2025, we developed a precise infrared-laser receiver system utilizing a wide-aperture scope, a Python image processing and tracking GUI, and a beamsplitter assembly to direct photons to a readable pulse output. Over multiple attempts of contact, successful data capture occurred at high rates of up to 720Mbps with LCRD's payload aboard STPSat-6, 40,400 kilometers away. The success of our attempt demonstrates magnificent opportunities to transmit immense amounts of data over short contact windows, advancing the potential of information transmitted over NASA's modern day space missions.

Ocampo, Jose (Sophomore, Electrical Engineering, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-Poster Session]

NOT A UFO: ATMOSPHERIC DATA COLLECTION

The objectives for the Fall 2025 and Spring 2026 launches are to collect data on Earth's atmosphere and vehicle launch parameters, and to train students in the ways of STEM endeavors. The launch was successful. During the launches, the PC NASA ASCEND team acquired data for the following: 1) GPS date-time, 2) temperature, 3) pressure, 4) UV radiation level, 5) Geiger Counter radiation, 6) dust particle sensor, 7) CO2 sensor, and humidity sensor. The results and the data acquired from the launches will be shown in our poster.

Orina, Yunia (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Pragati Pradhan, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-20-A-B]

IT'S MOVING, IT'S ALIVE! HIGH RESOLUTION VIEW OF IGR J16320 AND MS 1603.6+2600

X-ray binaries are extreme environments in the universe. These systems consist of a compact object, such as a black hole or neutron star, and a companion star. The main types of X-ray binaries are high mass X-ray binaries (HMXBs) and low mass X-ray binaries (LMXBs), which differ by the mass of the companion star. We are studying sources of X-ray variability in one HMXB, IGR J16320-4751, and one LMXB, MS 1603.6+2600. The causes of X-ray variability in IGR J16320-4751 are either stochastic or periodic, with clumpy wind causing the stochastic variability and a potential accretion wake forming at later phases causing the periodic variability. X-ray variability in MS 1603.3+2600 is caused by the accretion disk around the neutron star dipping at inconsistent times, resulting in the pulsar-like characteristics emanating from this stellar source. For both sources, we are comparing data from NuSTAR, NICER, and Chandra.

Ozatay, Ela (Senior, Aerospace Engineering - Astronautics, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University. [B-5]

EAGLESAT

The EagleSat program provides undergraduate students with hands-on experience in various areas of spacecraft development through the design, building, and testing of CubeSats. These CubeSats are tailored to meet the requirements of the NASA CubeSat Launch Initiative, and align with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. In December 2025, EagleSat 2 was deployed from the International Space Station. EagleSat 2's mission is to study the effects of solar radiation on various types of Random Access Memory (RAM). Now, EagleSat is working to develop 4 new experiments to test the degradation of solar panels, analog to digital converters, lenses for laser interferometers, and solid-state drives.

Perez, Dillon (Sophomore, Cybersecurity, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

CENTRAL ARIZONA COLLEGE: SPRING 2026 HIGH ALTITUDE PAYLOADS

Central Arizona College created two high-altitude balloon payloads in Spring 2026 that aim to continue a 5-year long data collection process. The first payload is the main payload that will be collecting temperature, humidity, and altitude. This payload is an improved mechanical design that will protect all electrical components from external harm. The second payload aims to collect acceleration through three different axes to test the capabilities of its respective mechanical design. The mechanical design has been improved to give a more solid structure while still having flexibility in the critical joints that hold together the payload by use of TPU 95A HF filament. A Long-Range radio has also been included in the second payload to receive data from the payload as it collects data so long as the payload is within range of the base location.

Petersen, James (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [B-3, ASCEND-Poster Session]

GCC ASCEND TEAM 2: SPACEJUNKIES I2C MODULES, BLUETOOTH DATA LINK, AND NEW SENSORS!

During the Fall 2025 semester, GCC ASCEND built two payloads that both flew to 100,000 feet and returned with temperature, pressure, and acceleration data. This Spring 2026 semester, we will expand on that success by integrating I2C components into our board, including a radio receiver and a temperature and humidity sensor. The I2C radio receiver will help map how signal strength between the payload and nearby radio stations changes. The I2C temperature and humidity sensor will allow comparison with readings from our analog temperature sensors. We are also adding an Iridium modem and an I2C Bluetooth module. To meet Arizona Near Space Research weight constraints, we will have our two payloads communicate via Bluetooth using GNSS and Iridium modem data. This approach helps manage mass while enabling a data link that can transmit GNSS coordinates via satellite, allowing us to track our payload independently and improve reliability during flight operations.

Pierson, Ethan (Senior, Mathematics, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-Poster Session]

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Posey, Peyton (High School Student, Software Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [G-7, ASCEND-Poster Session]

CASA GRANDE UNION HIGH SCHOOL ASCEND

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. The system is built around an Arduino Uno slaved to a Mega. This payload is using a TMP36 temperature sensor, UV sensor, BME280 environmental sensor, and GPS module, all to collect data up to 100,000 feet into the atmosphere. These sensors are all connected to the Mega for processing and then data is to be sent to the Uno to be written to the SD card. Power is supplied by two 9V lithium batteries regulated through a Buck-Boost converter, with an external amp meter for monitoring. This payload is complemented by the RunCam Orange 5 Camera for Earth Observation. Previous missions focused on innovative enclosure design and dual payloads, incorporating internal temperature monitoring. This research serves to help students advance their understanding of the atmosphere and future scientific and technological applications.

Prasad, Harshita (Senior, Biomedical Sciences, Arizona State University). Mentor: Katrina Bossert, School of Earth and Space Exploration, Arizona State University. [C-7]

Analyzing Aurora Observed by Instruments at Poker Flat, Alaska to Better Understand Geomagnetic Activity

Solar storms and associated solar weather directly generate aurora, which is correlated both with magnetic field fluctuations above ~200 nT and with bursts of high electron density. Energetic particle precipitation into Earth's atmosphere creates the aurora; in this case, aurora in the near-infrared is generated by atmospheric particles and interaction with the planet's magnetosphere. Electron enhancements captured in incoherent scatter radar (ISR), magnetic field fluctuations detected by magnetometers, and aurora visualized through an infrared imager are analyzed and compared for clear nightly hours of the 2021-2022 winter in Poker Flat, Alaska. Discrepancies between data from three instruments is documented. Seasonal analysis is followed by case studies of several nights during which instruments recorded interesting activity for an in-depth characterization of auroral events. Studying auroral activity is important for understanding how geomagnetic storms impact areas of human life, including government space operations, radio communications, GPS-guided farming, and satellite technology.

Quan, Christine (Senior, Biological Sciences, Arizona State University). Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University. [G-10]

Habitability Constraints of Oxalotrophic Bacteria from Dryland and Marine Ecosystems

Oxalate is a prevalent and naturally occurring organic compound found in the environment, yet its accumulation in the geologic record is unexpectedly low compared to the abundance of oxalate-producing organisms. Oxalotrophic bacteria in soils are hypothesized to limit oxalate accumulation through the oxalate-carbonate pathway, but their prevalence in other environments has not been extensively documented. To better understand the role of oxalotrophic bacteria in the global carbon cycle, we have isolated and characterized several bacterial strains from dryland soil and hydrothermal vent plume samples thought to be enriched in oxalate minerals. Dryland isolates demonstrated higher temperature tolerance and preference than previously documented. Significance testing showed that oxalate concentration contributed to changes in growth for both the dryland and marine isolates at their optimal temperatures. Our findings suggest that oxalotrophy is more environmentally widespread than previously recognized, which holds important implications for potential biogeochemical cycling on other planetary bodies.

Rajopadhye, Aseem (Senior, Astrobiology and Biogeosciences, Arizona State University). Mentor: Ariel Anbar, School of Molecular Sciences, Arizona State University. [D-1]

Developing Leaching Methodology to Identify Origins of Mo in BARB5 Shale Samples

Molybdenum (Mo) is a bio-essential trace element primarily used in the nitrogen cycle, whose historical bioavailability, while still currently unclear, can be shown by the rock record. Samples from the 3.2 Ga BARB5 core, likely deposited in a deep-water setting, show varying levels of Mo enrichment. To see whether the Mo present in the samples is primarily authigenic (bioavailable) or detrital (non-bioavailable), acid leaching would be employed. The acids selected have varying dissolving strengths. For weaker acids, partial leaching occurs, where mainly sulfides, carbonates, and oxides are targeted, phases which would contain authigenic deposits of Mo. For stronger acids, everything is dissolved in a process called full digestion, and bulk composition can be obtained. Testing of these acid leaching methodologies was conducted upon SDO-1 reference samples and Mo yield was compared to select the most effective combinations of strength and dissolution time to be used in future BARB5 research.

Resnick, Eli (Sophomore, Astronomy, Northern Arizona University). Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University. [G-9]

ANALOG LIFE IN IMPACT-INDUCED ENDOLITHIC NICHES (ALIEN)

Detecting life on Mars first requires us to understand life in similar, or analog environments on Earth. The endolithic niches in this study are important Mars analogs because endolithic microbes (microbes within rocks) have a stable habitat, shielding them from harmful UV radiation, a feature particularly useful on Mars with its thin atmosphere and weak magnetic field. I am studying microbial communities in the analog environment of Barringer Crater, AZ, by analyzing microbial diversity and distribution as a function of mineralogical variability across the Kaibab impact breccia, a mix of fragmented rocks (clasts) host in melted or pulverized fine-grained material (matrix). Methods include; X-ray diffraction and Fourier Transform Infrared spectroscopy for mineralogical characterization and 16s rRNA sequencing for microbial analyses. The breccia matrix has higher permeability and fluid flow compared to the breccia clast, therefore, I expect the matrix to host a greater diversity of endolithic microorganisms than the clast.

Rivera, Genaro (Junior, Mechanical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Rix, Madison (Junior, Aerospace Engineering - Astronautics and Exploration Systems Design, Arizona State University). Mentor: Philip Mauskopf, Department of Physics, Arizona State University. [F-7]

MECHANICAL AND OPTICAL ARCHITECTURE OF A LASER COMMUNICATION RELAY DEMONSTRATION BEACON TEST SYSTEM

As space missions demand faster and more efficient data transfer, laser communication systems are becoming increasingly important. This project focuses on understanding how light moves through the Azora Optical Ground Station testbed used to support NASA's Laser Communications Relay Demonstration (LCRD). The goal is to break down how the system is physically arranged and how optical signals are guided through components like the ground telescope, beacon, and JaZeye receiver. To do this, I analyzed the mechanical layout and optical pathways as well as used the photodiode measurements and infrared imaging to verify alignment and signal detection. The system successfully demonstrated stable signal tracking and efficient light routing through beam splitters for both imaging and fiber coupling. The work shows how important precise alignment and system design are for reliable optical communication. It contributes to improving future space-based communication systems.

Rodgers, Hailianna (Sophomore, Software Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [G-7, ASCEND-Poster Session]

CASA GRANDE UNION HIGH SCHOOL ASCEND

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. The system is built around an Arduino Uno slaved to a Mega. This payload is using a TMP36 temperature sensor, UV sensor, BME280 environmental sensor, and GPS module, all to collect data up to 100,000 feet into the atmosphere. These sensors are all connected to the Mega for processing and then data is to be sent to the Uno to be written to the SD card. Power is supplied by two 9V lithium batteries regulated through a Buck-Boost converter, with an external amp meter for monitoring. This payload is complemented by the RunCam Orange 5 Camera for Earth Observation. Previous missions focused on innovative enclosure design and dual payloads, incorporating internal temperature monitoring. This research serves to help students advance their understanding of the atmosphere and future scientific and technological applications.

Ropati, Tye (Senior, Geological Sciences, Arizona State University). Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University. [D-12]

FAN AND FILL: RECONSTRUCTING THE PAST THROUGH SEDIMENTOLOGY, STRATIGRAPHY, AND GEOMORPHOLOGY

The sedimentary deposits of the Safford Basin record the transition from closed basins to integrated river systems associated with significant incision of basin fill deposits, which are capped by a thin layer of gravels. This has been interpreted as evidence for a climatic shift; alternatively, this could be explained by alluvial fan progradation as subsidence from Basin and Range tectonics ceased. This project explores the relationship between the alluvial gravels and basin fill by mapping facies contacts from key exposures. We looked for evidence of adjacent coarse and fine deposits, which supports lateral facies migration over a strictly vertical change. Using LiDAR data, exposures were located and visited to characterize the stratigraphic architecture. Interfingering of fine beds with gravels suggests that progradation in response to declining subsidence is the most supported explanation. This work provides insight into basin-level processes involved in landscape evolution and sedimentation modulated by tectonic/climatic changes.

Rossiter, Nathan (First-Year, Structural Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

THE EFFECTS OF MICROALGAE CHLORELLA VULGARIS UNDER STRATOSPHERIC CONDITIONS

With regards to the NASA Transition Authorization Act of 2017, the first human will be sent to Mars by 2033. And no matter how the timeline may change, oxygen generation will be crucial for future space missions; hence a microalgae culture was to be tested within the ASCEND project in order to obtain information in comparison to a controlled engineered environment. This includes an exogenously treated microalgae of chlorella vulgaris with niacin and zeaxanthin to increase stress tolerance and have an accessory pigment to absorb UV light for the photosynthesis process. This strain of microalgae was based on a prior project; Exogenous Niacin and Zeaxanthin treatment to increase the stress tolerance and light absorbance capacity of microalgae Chlorella Vulgaris under an engineered Martian environment.

Sant, Rohin (Senior, Physics and Astronomy, University of Arizona). Mentor: Jacob Isbell, Steward Observatory, University of Arizona. [C-11]

HOW ACCRETION INFLUENCES IONIZATION CONES IN SEYFERT 2 GALAXIES

Active galactic nuclei (AGN) have an impact on their host galaxies via feedback mechanisms. One example is the ionization cone, which is an outflow of ionized gas starting near the nucleus. In this project, we investigate the relationship between the opening angles of ionization cones in Seyfert AGN and their Eddington ratios. A correlation is expected from theory (e.g., Venanzi et al. 2020) but has not been directly observed until now. Using the Véron-Cetty and Asmus AGN catalogues, we identify galaxies with observations through the Hubble Space Telescope (HST) or the SDSS MaNGA survey. For each galaxy, we consider [O III] emission line as representative of the cone. We measure the opening angles of the cones for the HST images and obtain corresponding Eddington ratios from literature sources. We find a positive correlation between AGN accretion activity and ionization cone geometry, with a Spearman coefficient of 0.7.

Sarabia, Maritriny (Sophomore, Mechanical Engineering, Arizona Western College). Mentor: Josue Juarez, Engineering, Arizona Western College. [ASCEND-Poster Session]

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Schrameck, Aubrey (Senior, Data Science, Northern Arizona University). Mentor: Jean-Francois Smekens, Astronomy and Planetary Science, Northern Arizona University. [G-11]

ADAPTIVE SEGMENTATION AND AUTOMATED MORPHOMETRIC ANALYSIS OF MONOGENETIC VOLCANIC CONES IN DISTRIBUTED FIELDS

Distributed volcanic fields preserve thousands of spatially isolated monogenetic vents whose morphologies encode eruptive style and post-eruptive modification, but comparative analysis has been limited by small samples and inconsistent methods. We present an automated, adaptive workflow that segments volcanic edifices and extracts standardized morphometric and asymmetry metrics from 1-m DEMs, enabling large-scale, reproducible analysis. Applied to the San Francisco Volcanic Field, the pipeline delineates crater and cone boundaries using radial sampling and slope-break detection, then computes geometric, statistical, and ratio-based descriptors suitable for multivariate and machine-learning analyses. Tests on >300 cones show robust boundary identification and stable measurements across varied terrains. The resulting database addresses prior limitations by integrating primary morphology with secondary asymmetry indicators, supporting regional clustering, eruptive-style prediction, and future extension to other terrestrial fields and extraterrestrial volcanic cones on the moon and Mars.

Seitter, Ethan (Sophomore, Software Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [ASCEND-Poster Session]

GCC NASA ASCEND STATE PENITENTIARY: NEW SENSORS AND LIVE DATA TRANSMISSION

During the Fall 2025 semester, Glendale Community College teams 1 and 2 were instructed in developing a payload that could withstand a flight of over 100,000 ft into the atmosphere, while equipping the payload with an accelerometer, barometer, GNSS, and camera for data acquisition, analysis, and evaluation. This Spring 2026 semester payload builds off of that foundation by expanding the data collection capabilities of the Flight Data Recorder through new sensors integrated into the board via hardware and software, and that can transmit data in real-time via Bluetooth, all without compromising data collection. Additions to the board included a Bluetooth, modem, I2C temperature and humidity sensors, and analog UV sensors. In turn, this has had the effect of fostering real-world applicable skills, such as internal department cooperation, communication, and problem solving towards a common goal.

Shackelford, Connor (Junior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Siwei Fan, Aerospace Engineering, Embry-Riddle Aeronautical University. [B-2]

ELECTRICAL CAPACITANCE TO HIGH-RESOLUTION OBSERVATION (ECHO)

The majority of spacecraft require a liquid propellant for their propulsion systems. However, current propellant mass gauging technology becomes less accurate over the course of the mission. Over time, liquid propellants transition from their usable liquid phase to an unusable gaseous phase, a process known as boil-off. The unrestrained propellant also moves freely within the propellant tanks, making it difficult to measure the exact amount of propellant present. Methods like bookkeeping and settling burns develop errors over time and become less reliable as the quantity of propellant decreases. Electrical Capacitance to High-resolution Observation (ECHO) makes accurate propellant mass measurements by integrating electrical capacitance tomography and machine learning. By placing electrodes along the interior walls of propellant tanks and measuring between the electrodes, ECHO reconstructs cross sections of the interior of the propellant tank with higher accuracy than traditional reconstruction techniques.

Shaikh, Zaib (Junior, Mechanical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Shepard, Els (Junior, Aerospace Engineering - Astronautics, Arizona State University). Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University. [C-5]

IDENTIFYING LOCATIONS FOR GRAIN FORMATION IN CORE COLLAPSE SUPERNOVA OUTFLOWS

Using a 15 M⨀ progenitor three-dimensional core-collapse supernova model with asymmetric explosion geometry, we explore a method for identifying the locations or regions in the stellar outflow where stardust grains form. We use multiple isotope measurements done in the laboratory to investigate origins of stardust in the progenitor star environment. The Mg isotope space (δ25Mg, δ26Mg) in the supernova model output reveals two distinct trends: a branch with slope ~1 and a loop (enriched in δ25Mg, depleted in δ26Mg). These trends correspond to physical regions in the supernova: a ring in the x-y plane and a sphere with similar radius. Therefore, we classify silicate stardust grains as either near-loop or near-branch. The Si isotope model data under predicts 29Si, likely due to abundance cutoffs in data processing. On the other hand, one oxide stardust grain plots near the loop, with the bulk of oxide grains falling near the branch.

Smith, Audrey (Junior, Astronomy, Northern Arizona University). Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University. [G-4]

SUBLIMATION OF H_2O AND D2O MIXTURES

Investigating sublimation of complex mixtures of H_2O and D_2O in the evolution of comets and icy bodies in the outer solar system. Comets and Kuiper Belt objects (KBOs) contain significant amounts of water ice, with varying ratios of H_2O, D_2O, and HDO. The vapor pressure of these isotopologues influences sublimation rates, outgassing processes, and deuterium-to-hydrogen (D/H) ratios. Using a quartz crystal microbalance, we measure the sublimation flux of these volatile ices in the free molecular flow regime. Deuterated isotopologues have lower vapor pressures than H_2O, leading to preferential sublimation of H_2O ice in a mixture. This process affects the observed D/H ratios and may contribute to isotopic fractionation.

Solis Mata, Estrella (Senior, Chemistry, Northern Arizona University). Mentor: Jennifer Wade, Mechanical Engineering, Northern Arizona University. [D-8]

ALKALI SALT-MODIFIED CARBON SUPPORTS FOR SCALABLE MOISTURE SWING CO_2 CAPTURE

Direct air capture (DAC) is a promising strategy for removing atmospheric CO_2, but this requires scalable low-cost sorbents capable of reversible operation under ambient conditions. In this study, polymer-free carbon supports were impregnated with a range of alkali-based salts, including carbonates, bicarbonates, and hydroxides (e.g., K_2CO_3, $KHCO_3$, Na_2CO_3, Rb_2CO_3, and KOH), to evaluate their moisture swing performance. Sorbents were synthesized via aqueous impregnation and characterized using BET surface area and X-ray diffraction (XRD). Moisture swing experiments revealed that potassium-based systems exhibited rapid and reversible CO_2 adsorption and desorption, while sodium-based and control samples showed minimal activity. This behavior is attributed to moisture-driven speciation between carbonate, bicarbonate, and hydroxide forms, enabling reversible CO_2 binding. These findings highlight alkali salt-modified, polymer-free carbon supports as promising, scalable, and sustainable materials for energy-efficient CO_2 capture applications.

Sorensen, Anneli (Junior, Aerospace Astronautical Engineering, Arizona State University). Mentor: Steven Desch, School of Earth and Space Exploration, Arizona State University. [D-4]

ARCTIC SEA ICE PRESERVATION

As Arctic sea ice continues to decline at unprecedented rates, more preservation strategies are required to maintain polar albedo. This research utilizes the CICE model to simulate the long-term impacts of targeted ice thickening. By modeling a 10-year period, this study compares a standard Arctic control run against an experimental "test" environment where a set volume of water is added to the ice surface during key freezing periods. The simulation tracks critical variables, including ice thickness, surface albedo, melt onset timing, and ice salinity. Preliminary first-year results indicate measurable improvements in ice retention and thickness in localized regions, specifically near Greenland and the Beaufort Sea. These findings are being validated through a collaborative partnership with the company Real Ice, whose field-testing data currently corroborates our model's output, showing increased ice longevity in treated areas. Ongoing research will expand this analysis across the broader Arctic circle.

Soto-Lopez, Alexandra (Senior, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

HIGH-ALTITUDE ANALYSIS OF THE REGENER-PFOTZER MAXIMUM WHILE PROVIDING A TESTBED FOR CUBESAT HARDWARE

The ASU StratoDevils build satellite payloads for launch on high-altitude balloons as part of the AZ Space Grant ASCEND program. Our payload is designed to profile temperature, pressure, humidity and gas composition in the atmosphere. This payload iteration included two distinct missions. The science mission measures atmospheric radiation intensity to identify the Regener-Pfotzer maximum while also correlating radiation intensity with layers of the atmosphere. Our engineering mission is to increase the ability for ASCEND to serve as a testbed for future CubeSat hardware. To achieve this, our payload mirrors the development of the ASU Sun Devil Satellite Laboratory's SquidSat system, separating each primary payload function into a separate PCB with a standardized interconnection system. For ASCEND's version, these boards implement Payload Data Recorder, Power and Control, and a Radio system developed by the SquidSat team.

Stahoviak, Phillip (Junior, Mechatronics and Robotics, Northern Arizona University). Mentor: Subhayen De, Mechanical Engineering, Northern Arizona University. [F-3]

USING MACHINE LEARNING TO DESIGN COMPOSITE MATERIALS WITH TUNABLE BANDGAPS

Composite materials are used in aerospace applications due to their high strength-to-weight ratio, and durability. Composite materials can also be designed to control how waves pass through them by adjusting their bandgap widths and locations. By understanding these properties better, we can create materials that reflect/block specific waves, like vibrations or radiation. However, choosing the right bandgap characteristics is currently difficult and not very systematic. To address this problem, a deep learning model is used to predict bandgap width and location. The dataset for this model is generated using finite element simulations, which calculate bandgap properties for different material configurations. A feedforward neural network is then trained on this dataset to learn the relationship between material parameters and bandgap behavior. After training, an optimization step is performed, using backpropagation, to identify material designs that achieve desired bandgap properties. This framework enables more efficient design of composite materials with wave-filtering capabilities.

Star, Sawyer (Senior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University. [H-3]

LORENTZ-SYMMETRY BREAKING IN QUANTUM FIELD THEORY

Scientists are still exploring the fundamental physics of our universe. The fundamental interactions in the universe are currently understood through descriptions described in the Standard Model (SM) of particle physics and General Relativity (GR). Despite their success in describing fundamental physics, they do not combine into one overarching theory, leading it to be an active area of research. One area of exploration is the possibility that fundamental principles in GR are broken at miniscule scales, such as Special Relativity's Lorentz-symmetry, due to some overarching theory. We will explore the implications of Lorentz-symmetry breaking (LSB) on a scalar field and the transition rates of particles within that field in a two-state system in the form of an Unruh-DeWitt detector.

Steiner, Kaden (Senior, Aerospace Engineering, University of Arizona). Mentor: Christoph Hader, Aerospace and Mechanical Engineering, University of Arizona. [A-1]

NUMERICAL INVESTIGATION OF WAVE PACKET SPREADING ANGLES IN HYPERSONIC BOUNDARY LAYERS

Predicting boundary-layer transition in high-speed flows is critical for vehicle design and operation. During atmospheric flight, particles impinge on the vehicle surface and generate localized wave packets that grow as they travel downstream. This spreading behavior resembles observations in low-speed flows, for which Emmons developed a spot-based transition model. A parameter in that model is the wave packet spreading angle. No systematic investigation of wave packet spreading angles exists for the hypersonic regime. In this work, flow simulations were performed for a seven-degree half-angle cone in Mach 5 and Mach 10, with wall-to-stagnation temperature ratios between 0.2 and 1.0. Using a Linear Stability Theory-based solver the N-factors and growth rates of first- and second-mode instabilities were determined. Wave packet simulations were then carried out to simulate the early stages of turbulent spot formation and propagation with the goal of analyzing linear and nonlinear spreading angles.

Tatsch, Angela (Senior, Geophysics and Planetary Geosciences, University of Arizona). Mentor: Jessica Barnes, Lunar and Planetary Laboratory, University of Arizona. [G-2]

INVESTIGATING THE TRANSPORT OF VOLATILE-BEARING VAPORS IN THE CRUST OF THE MOON

Understanding how volcanic and impact processes transport and modify volatiles (including H, S, Cu, Zn, Cl) on the lunar surface is a key science driver for future exploration. With upcoming Artemis missions to return new lunar surface samples, identifying and constraining these processes is essential. We investigate the mineralogy and petrology of a suite of Apollo samples using coordinated microanalysis (SEM, FIB, TEM). So far, we identified bright, feather-like phases, often near vesicles and phosphates in a volcanic sample. Preliminary analyses identified the phase as digenite (Cu9S5), a rare copper sulfide mineral, with Cu-S signatures extending through a vein into the section, indicating a lunar origin. These observations support prior work and indicate that the condensation of vapors during volcanic eruptions is important for sequestering volatiles on the lunar surface. We are currently investigating how impacts may remobilize surface volatiles.

Taylor, Jacob (Senior, Computer Science and Environmental and Water Resource Economics, University of Arizona). Mentor: Stefano Nerozzi, Lunar and Planetary Laboratory, University of Arizona. [D-7]

SIMULATIONS AND INVERSIONS FOR DRONE-BASED TIME-DOMAIN ELECTROMAGNETIC SURVEYING FOR GROUNDWATER DETECTION FOR ARIZONA AND MARS WATER EXPLORATION

Groundwater detection in water-scarce arid environments and extraterrestrial settings presents significant challenges for traditional geophysical methods. Ground-based Time-Domain Electromagnetic (TDEM) surveying is effective, but cost-prohibitive, labor-intensive, and logistically constrained in complex terrain. The HoverTEM project addresses these limitations by developing a compact, drone-based TDEM system for efficient, high-resolution groundwater detection in environmentally sensitive or logistically restricted areas. We optimized forward modeling simulations based on the open-source SimPEG software to inform instrument design and survey optimization for planned flight deployments. We conducted TDEM surveys across aquifer systems in Southern Arizona to establish baseline hydrogeologic conditions. We developed data processing pipelines based on Python and electromagnetic inversion methods to enable systematic analysis of electromagnetic decay signatures and characterize aquifer geometry. These interdisciplinary efforts in arid, Mars-analog environments, advance the technical readiness of autonomous airborne geophysical platforms for both Earth-based water resource management and future planetary science applications.

Thomas, Justin (Sophomore, AI and Machine Learning, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [B-3, ASCEND-Poster Session]

GCC ASCEND TEAM 2: SPACEJUNKIES I2C MODULES, BLUETOOTH DATA LINK, AND NEW SENSORS!

During the Fall 2025 semester, GCC ASCEND built two payloads that both flew to 100,000 feet and returned with temperature, pressure, and acceleration data. This Spring 2026 semester, we will expand on that success by integrating I2C components into our board, including a radio receiver and a temperature and humidity sensor. The I2C radio receiver will help map how signal strength between the payload and nearby radio stations changes. The I2C temperature and humidity sensor will allow comparison with readings from our analog temperature sensors. We are also adding an Iridium modem and an I2C Bluetooth module. To meet Arizona Near Space Research weight constraints, we will have our two payloads communicate via Bluetooth using GNSS and Iridium modem data. This approach helps manage mass while enabling a data link that can transmit GNSS coordinates via satellite, allowing us to track our payload independently and improve reliability during flight operations.

Thorley, Elizabeth (Senior, Mathematics, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-6, ASCEND-Poster Session]

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Trujillo, Dominic (Senior, Aerospace Engineering - Aeronautics, Arizona State University). Mentor: Jennifer Wong, Engineering Academic and Student Affairs, Arizona State University. [E-2]

STEM KIT DESIGN FOR EARLY AEROSPACE EDUCATION

This project is primarily concerned with the design, development, and implementation of innovative engineering kit boxes for middle school aged children. The goal of this project is to help develop an interest in the aerospace field within young, aspiring engineers. Currently, several mini-projects have been designed, and some have been built and tested, indicating an evolution from conceptual design to application. However, in the future, this project will transcend beyond the NASA Space Grant Internship and will be concerned with further improving existing designs, expanding project scope, and designing more mini-projects. The overall aim of this project is to provide an opportunity for young, bright-minded students to get experience with the ideas, concepts, and tools behind real-world engineering.

Tsosie, Brad (Junior, Biology, Northern Arizona University). Mentor: Haley Sapers, Astronomy and Planetary Sciences, Northern Arizona University. [G-12]

THE GEOCHEMICAL BUFFET: EVALUATING THE INFLUENCE OF IMPACT-INDUCED MIXING IN EJECTA ON LITHOTROPHIC MICROBIAL DIVERSITY AT BARRINGER CRATER, ARIZONA

Lithotrophs, or "rock-eaters," are foundational to transforming uninhabited mineral landscapes into a living ecosystem, offering insight into the habitability of planetary surfaces. This study investigates whether the impact-induced mixing of geologically distinct units, forming polymict breccias, enhances lithotrophic microbial colonization by creating a "geochemical buffet" of nutrients. Using high-resolution 16S rRNA gene sequencing, X-ray Diffraction (XRD), and Fourier Transform Infrared (FTIR) spectroscopy, I will compare microbial diversity and mineralogy between stratographically isolated pre-impact strata in the crater wall and mixed polymict breccia ejecta facies. I hypothesize that the convergence of stratigraphically separated minerals in impact breccias fosters specialized lithotrophic guilds, significantly increasing alpha diversity. This research establishes a framework for identifying potential biosignatures within shocked lithologies on other planetary surfaces.

Valentine, Cheyenne (Junior, Aerospace Engineering - Astronautics, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Electrical, Computer and Software Engineering, Embry-Riddle Aeronautical University. [B-5]

EAGLESAT

The EagleSat program provides undergraduate students with hands-on experience in various areas of spacecraft development through the design, building, and testing of CubeSats. These CubeSats are tailored to meet the requirements of the NASA CubeSat Launch Initiative, and align with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. In December 2025, EagleSat 2 was deployed from the International Space Station. EagleSat 2's mission is to study the effects of solar radiation on various types of Random Access Memory (RAM). Now, EagleSat is working to develop 4 new experiments to test the degradation of solar panels, analog to digital converters, lenses for laser interferometers, and solid-state drives.

Van Story, Aso (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank and Rick Sparber, Engineering, Glendale Community College. [ASCEND-Poster Session]

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During the Fall 2025 semester, Glendale Community College teams 1 and 2 were instructed in developing a payload that could withstand a flight of over 100,000 ft into the atmosphere, while equipping the payload with an accelerometer, barometer, GNSS, and camera for data acquisition, analysis, and evaluation. This Spring 2026 semester payload builds off of that foundation by expanding the data collection capabilities of the Flight Data Recorder through new sensors integrated into the board via hardware and software, and that can transmit data in real-time via Bluetooth, all without compromising data collection. Additions to the board included a Bluetooth, modem, I2C temperature and humidity sensors, and analog UV sensors. In turn, this has had the effect of fostering real-world applicable skills, such as internal department cooperation, communication, and problem solving towards a common goal.

Vanica, Edward (Junior, Aerospace and Mechanical Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

UNIVERSITY OF ARIZONA ASCEND!: PROFILING HIGH-ALTITUDE ELECTROMAGNETIC RADIATION WITH A GENERAL DATA LOGGER

CubeSats have been a rapidly growing technology over the last decade due to their diminutive total mass to orbit while maintaining spacecraft performance. Materials and plastics are susceptible to the high-energy radiation present in orbit, so it is important to understand radiation intensities at different altitudes. This project is a proof-of-concept to study the electromagnetic spectrum of the Earth's atmosphere, particularly exploring the spectrum of light as a function of altitude. Within the bounds of a standard 2U CubeSat, the U of A ASCEND! payload housed an IR, visible light, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL. Included in this project is a 3-dimensional gyroscopic video logger and Kevlar suspension system for minimal structure damage. With the inclusion of the 3-dimensional video logger, the visual conditions can be compared to the atmospheric conditions with altitude.

Vick, Kacy (First-Year, Administration of Justice, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

CENTRAL ARIZONA COLLEGE: SPRING 2026 HIGH ALTITUDE PAYLOADS

Central Arizona College created two high-altitude balloon payloads in Spring 2026 that aim to continue a 5-year long data collection process. The first payload is the main payload that will be collecting temperature, humidity, and altitude. This payload is an improved mechanical design that will protect all electrical components from external harm. The second payload aims to collect acceleration through three different axes to test the capabilities of its respective mechanical design. The mechanical design has been improved to give a more solid structure while still having flexibility in the critical joints that hold together the payload by use of TPU 95A HF filament. A Long-Range radio has also been included in the second payload to receive data from the payload as it collects data so long as the payload is within range of the base location.

Walter-Cardona, Dario (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Quentin Bailey, Physics and Astronomy, Arizona State University. [H-4]

SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS IN BUMBLEBEE GRAVITY

In this work, we study a vector model of spontaneous spacetime-symmetry breaking coupled to gravity: The bumblebee model. The primary focus is on static spherically symmetric solutions. Complementing previous work on black hole solutions, we study the effects on the solutions when the vector field does not lie at the minimum of its potential. We first investigate the flat spacetime limit, which can be viewed as a modified electrostatics model with a nonlinear interaction term. We study the stability of classical solutions generally and in the spherically-symmetric case. We also find that certain potentials, based on hypergeometric functions, yield a Hamiltonian bounded from below.

Wee, Isabel (Senior, Industrial Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-Poster Session]

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Weissbluth, Eyan (Senior, Astrophysics, Arizona State University). Mentor: Tuna Yildirim, Physics, Arizona State University. [E-3]

EVALUATING STEM RESEARCHES KNOWLEDGE OF PHILOSOPHY OF SCIENCE

This study investigates the extent to which scientists and researchers are familiar with key ideas in the philosophy of science (PoS), and whether limited exposure to PoS may affect scientific practice. Using a self-assessment survey, participants rate their familiarity with major thinkers, from Bacon to Lakatos, and associated concepts across multiple levels of conceptual depth. The survey incorporates a layered design to compare general self-perceived knowledge with familiarity across foundational, intermediate, and advanced philosophical ideas. Open ended responses further explore how researchers perceive philosophical issues within their own fields and whether these issues impact their work. By analyzing discrepancies between perceived and demonstrated familiarity, this study aims to assess whether gaps in PoS education persist within STEM communities and to evaluate their potential implications for scientific reasoning, methodology, and theory development.

Williams, Ryan (Sophomore, Engineering, Central Arizona College). Mentor: Kimberly Baldwin, Science and Engineering, Central Arizona College. [ASCEND-Poster Session]

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Williams, Adler (Junior, Astronomy, Embry-Riddle Aeronautical University). Mentor: Noel Richardson, Physics and Astronomy, Embry-Riddle Aeronautical University. [C-15]

MEASURING MASSES AND KINEMATICS FOR TWO HIGHLY ECCENTRIC MASSIVE BINARIES

Massive stars provide much of the energy in their host galaxies in the form of feedback to the interstellar medium. Most massive stars are found in multiple systems, allowing us to measure how the stars interact and obtain direct measurements of their masses. This project aims to measure spectroscopic data for two massive binaries in long orbits (periods of years) but highly eccentric. Our project aims to better understand these highly eccentric orbits by using spectroscopic data collected during the star’s closest approach. The first system being analyzed is WR 140, which went through its closest approach two years ago. Adler Williams will be analyzing the collected spectrum of WR 140. The expected outcome of this study is to better understand how these high mass stars interact with each other and by proxy understand how the system’s dust creation interacts with the interstellar medium.

2025-2026 Arizona NASA Space Grant Program Mentors

Organized by mentor's last name.

Adler, Jacob (School of Earth and Space Exploration, Arizona State University) See: Bolanos Pina, Alison [C-1].

Anbar, Ariel (School of Molecular Sciences, Arizona State University) See: Rajopadhye, Aseem [D-1].

Bailey, Quentin (Physics and Astronomy, Embry-Riddle Aeronautical University) See:
Star, Sawyer [H-3]
Walter-Cardona, Dario [H-4]

Baldwin, Kimberly (Science and Engineering, Central Arizona College) See:
Canales, Emmanuel [ASCEND-Poster Session]
Coca, Phoenix [ASCEND-Poster Session]
Contreras, Javier [ASCEND-Poster Session]
Ellis, Edgar [ASCEND-Poster Session]
Herrera Ortiz, Fernando [ASCEND-Poster Session]
Perez, Dillon [ASCEND-Poster Session]
Vick, Kacy [ASCEND-Poster Session]
Williams, Ryan [ASCEND-Poster Session]

Barnes, Jessica (Lunar and Planetary Laboratory, University of Arizona) See: Tatsch, Angela [G-2].

Bose, Maitrayee (School of Earth and Space Exploration, Arizona State University) See: Shepard, Els [C-5].

Bossert, Katrina (School of Earth and Space Exploration, Arizona State University) See:
Hollowell, Brittany [C-3]
Prasad, Harshita [C-7]

Budinoff, Hannah (Systems and Industrial Engineering, University of Arizona) See: Barber, Tegan [F-2].

Caballero, Lorena (Biological Sciences, Northern Arizona University) See: Alger, Taylor [D-2].

Coe, Michelle (Lunar and Planetary Laboratory, University of Arizona) See:
Adamu, Razak [ASCEND-Poster Session]
Brown, Colin [ASCEND-Poster Session]
Holtz, Robert [ASCEND-Poster Session]
Mattison, Kane [ASCEND-Poster Session]
Miller, Ella [ASCEND-Poster Session]

Vanica, Edward [ASCEND-Poster Session]
Wee, Isabel [ASCEND-Poster Session]

Condes, AnnMarie (Chemistry, Pima Community College) See:
Aguiar Carrillo, Omar [ASCEND-Poster Session]
Bustamante, Ana [ASCEND-Poster Session]
Carrillo, Edith [ASCEND-Poster Session]

De, Subhayen (Mechanical Engineering, Northern Arizona University) See: Stahoviak, Phillip [F-3].

Desch, Steven (School of Earth and Space Exploration, Arizona State University) See: Sorensen, Anneli [D-4].

Doughty, Christopher (School of Informatics, Computing, and Cyber Systems, Northern Arizona University) See:
Kennan, Zephyr [C-4]
Biemond, Maezy [G-1]

Dubois, Joe (Interplanetary Lab, Arizona State University) See: Nielsen, Tyler [B-1].

Eifler, Tim (Steward Observatory, University of Arizona) See: Brown, Tyler [H-5].

Fan, Siwei (Aerospace Engineering, Embry-Riddle Aeronautical University) See:
LeClair, Christopher [B-2]
Noble, Bruce [B-2]
Shackelford, Connor [B-2]

Fields, Carl (Steward Observatory, University of Arizona) See: Cioffi, Camille [C-6].

Smekens, Jean-Francois (Astronomy and Planetary Science, Northern Arizona University) See: Herrington, Ethan [D-5].

Frank, Tim (Engineering, Glendale Community College) See:
Estrada Fernandez, Irwin [B-3, ASCEND-Poster Session]
Hess, Caden [B-3, ASCEND-Poster Session]
Jimenez, Adrian [B-3, ASCEND-Poster Session]
Martinez Hernandez, Jesse [ASCEND-Poster Session]
Petersen, James [B-3, ASCEND-Poster Session]
Seitter, Ethan [ASCEND-Poster Session]
Thomas, Justin [B-3, ASCEND-Poster Session]
Van Story, Aso [ASCEND-Poster Session]
Coulthard, David [ASCEND-Poster Session]

Garelick Bell, Ross (The Aerospace States Association, Arizona State University) See: Monreal, Sierra [E-1].

Goryll, Michael (School of Electrical, Computer and Energy Engineering, Arizona State University) See: Brooks, Marcelo [B-6].

Gowanlock, Michael (School of Informatics, Computing, and Cyber Systems, Northern Arizona University) See:
Biemond, Maezy [B-1]
Kennan, Zephyr [C-4]

Green, Richard (Astronomy, University of Arizona) See: Abdessalam, Nayera [C-8].

Gretarsson, Elizabeth (Physics and Astronomy Department, Embry-Riddle Aeronautical University) See:
Chai, Ari [C-9]
Juston, Ambroise [C-10]

Grundy, Will (Astronomy and Planetary Science, Northern Arizona University) See:
Lucas, Trisha [G-3]
Smith, Audrey [G-4]

Hader, Christoph (Aerospace and Mechanical Engineering, University of Arizona) See:
Steiner, Kaden [A-1].

Hood, Lon (Lunar and Planetary Laboratory, University of Arizona) See: Fischer, Cody [G-5].

Isbell, Jacob (Steward Observatory, University of Arizona) See: Sant, Rohin [C-11].

Jacobs, Daniel (School of Earth and Space Exploration, Arizona State University) See: O'Brien, William [C-12].

Juarez, Josue (Engineering, Arizona Western College) See:
Bibriesca, Victor [ASCEND-Poster Session]
Gonzalez, Cristian [ASCEND-Poster Session]
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Lanning, David (Aerospace Engineering, Embry-Riddle Aeronautical University) See:
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Lapides, Dana (USDA ARS, Southwest Watershed Research Center, Other Institution) See: Le, Tiffany [D-13].

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Lin, Jerry (Fulton School of Energy, Matter and Transport, Arizona State University) See: Eidenbenz, Yaris [F-5].

Mauskopf, Philip (School of Earth and Space Exploration, Arizona State University) See: O'Brien, Isabella [F-1].

Margolis, David (Orthopedic Surgery, University of Arizona) See: Hall, Rose [F-6].

Masel, Joanna (Ecology and Evolutionary Biology, University of Arizona) See: Goodman, Peter [H-2].

Mathis, Cole (School of Complex Adaptive Systems, Arizona State University) See: Bisson, Charly [G-6].

Mauskopf, Philip (Department of Physics, Arizona State University) See: Rix, Madison [F-7].

Miles, Brittany (Astronomy and Steward Observatory, University of Arizona) See: Boisvert, Rebekah [C-13].

Morris, John (CTE Engineering, Casa Grande Union High School) See:
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Patience, Jennifer (School of Earth and Space Exploration, Arizona State University) See: Headon, Jackson [C-14].

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