Arizona NASA Space Grant Consortium

Thirty-Fourth Annual Statewide Student Research Symposium

Presentations by Space Grant Students from:

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

April 19th, 2025
Scottsdale, AZ

Arizona NASA Space Grant Consortium
Thirty-Fourth Annual Statewide Student Research Symposium

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2024-2025 Arizona NASA Space Grant Consortium
Statewide Student Research Symposium
April 19, 2025

Welcome to the 34th 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 180 students, with 3 students represented "In Title Only". 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, University of Arizona – Yuma, 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

Michelle Coe, Program Manager
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

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

Paloma Rose Davidson, Assistant Program Manager
NAU NASA Space Grant

Saturday, April 19, 2025

8:30-8:45 a.m. WELCOME & INTRODUCTIONS

SKYSONG BUILDING 3, SYNERGY, LEVEL 1
Dr. Thomas Sharp, Director of Arizona State University NASA Space Grant

Room	Global Room SkySong Bldg 1, Level 2	Discovery Room SkySong Bldg 1, Level 3	Ingenuity Room SkySong Bldg 1, Level 3	Exploration Room SkySong Bldg 1, Level 3
TIME **(MST)**	**Moderators:** Timothy Swindle, UA Michele Zanolin, ERAU **Session A** **ASTRONOMY & SPACE PHYSICS** (9:00 AM – 3:00 PM)	**Moderators:** Anne Boettcher, ERAU Michelle Coe, UA **Session B** **PLANETARY SCIENCE** (9:00 AM – 2:30 PM) --- **Session C** **EDUCATION & PUBLIC OUTREACH** **Moderators:** Anne Boettcher, ERAU Michelle Coe, UA (2:30 PM – 3:10 PM)	**Moderators:** Elliott Bryner, ERAU Jeremy Forsythe, NAU Thomas Sharp, ASU **Session D** **EARTH & ENVIRONMENTAL SCIENCE/ENGINEERING** (9:00 AM - 2:00 PM) --- **Session E** **AERONAUTICS** **Moderators:** Elliott Bryner, ERAU Thomas Sharp, ASU (2:00 PM-2:40 PM)	**Moderators:** Hadi Ali, ERAU Catalina Aranzazu Suescun, ERAU Rosa Szurgot, ERAU Ahmed Sulyman, ERAU **Session F** **AEROSPACE TECHNOLOGY** (9:00 AM-1:30 PM) --- **Session G** **EXPLORATION SYSTEMS ENGINEERING** **Moderators:** Rosa Szurgot, ERAU Ahmed Sulyman, ERAU (1:30 PM-2:40 PM) --- **Session H** **TOPICS IN MATH, PHYSICS, AND CHEMISTRY** **Moderators:** Rosa Szurgot, ERAU Ahmed Sulyman, ERAU (2:40 PM-3:10 PM)

9:00-9:10	[A-1] *Lucas Murphy, Blake Schuetz* Energy Distribution of Cosmic Rays in ERAU Prescott	[B-1] *Emma Guinan* A Panspermia Origin for Venus Cloud Life	[D-1-2] *Taylor Alger, Skylar Catania* Cultivation on Mars: Improving Soil Fertility of MGS-1 using Green Compost Amendment	[F-1-2] *Kian Blackey, Aidan Maney, Claire Picht, Andrew Reynolds* Exploration of Model-Based Systems Engineering Methodologies for Modeling Pre-Existing Systems
9:10-9:20	[A-2] *Aleah Short* Using PDR Modeling Tools to Simulate Spectroscopic Observations from GUSTO	[B-2] *Lucienne Morton* Post-Asteroid-Impact Downstream Flooding Hazards		
9:20-9:30	[A-3] *Els Shepard* Comparison of Three-Dimensional Supernova Models and Stardust Compositions	[B-3] *Cade Smith* Comparative Mineralogy and Chemistry of Bennu and Oued Chebeika 002	[D-3] *Sicily Vicera* Climatological Analysis of Tempe Town Lake	[F-3] *Jasmine Garnett* Enhancing Mars Helicopter Performance with Tethered Flight and Active Flow Controls
9:30-9:40	[A-4] *Tyler Hinrichs* Analyzing Globular Cluster Systems in PLCK G165.7+67.0	[B-4] *Ava Campbell* Hydrogen Formation and Storage in Earth Mantle Minerals	[D-4] *Embrey Saville* Biological Soil Crust as a Nature-Based Solution for Radionuclide Immobilization and Reclamation of Abandoned Uranium Mines on the Navajo Nation	[F-4] *Regen Michon* Artificial Intelligence and Machine Learning for Space Structures
9:40-9:50	[A-5] *Jaxson Mitchell, Lara Ortelli* Harnessing the Φn Transform for Early Warning of Neutron Star-Black Hole Binary Events	[B-5] *Sam Phippen* Constructing a Comprehensive Database of Planetary Maps	[D-5] *Nandini Manepalli* Metal Usage in Ancient Protein Domains	[F-5-6] *Bruce Noble, Ela Ozatay, Joseph Ribaudo, Frederick Wadnola III* EagleSat 2
9:50-10:00	[A-6] *Hunter Brooks* Storming the CASTL: A MCMC Tool for Spectral Parameter Fitting	[B-6] *Nidhi Nirwan* Petrography of New Basaltic Shergottite Northwest Africa 17234	[D-6] *Alexis Bass* Evaluating Sustainable Agriculture in Extraterrestrial Regolith: The Role of AM fungi and Fertilizers	
10:00-10:20	Midmorning Break & Refreshments SkySong Building 1, Level 3			
10:20-10:30	[A-7] *Dario Walter-Cardona* Nonlinear Differential Equations from a Vector Model of Lorentz Symmetry Breaking	[B-7] *Tatiana Asadourian* Changes in pH During Glycine Entrainment in Halite Crystals: A Ceres Analogue	[D-7] *Jasmine Engel* Evaluating Revegetation Techniques for Enhanced Disposal Cell Covers	[F-7] *Brendan Perry* Electrodeless Local Force Generator Using Magnetohydrodynamics for Aerocapture
10:30-10:40	[A-8] *Naomi Carl* A Stellar Renaissance: Exploring the Star Formation of a Spiral Galaxy	[B-8] *Savannah Smith* An Analysis of the Particle Size Frequency Distribution of an Aggregate Bennu Sample	[D-8] *Tayler John* Mapping Lead Exposure Risk: A Spatial Analysis of Vulnerable Communities	[F-8] *Athul Kodancha* ADCS Testbed

10:40-10:50	[A-9] *Ari Chai, Ambroise Juston* Birefringence Testing of AlGaAs Mirrors	[B-9] *Jacob Shoulders* Synthetic Approaches to Creating Hole Transport Materials	[D-9] *Kadin Pulliam* Exploring the Dynamics of Cell Morphology and Organic Carbon Concentration	[F-9] *Nathaniel van der Leeuw* Overcoming Impact: Deformable Drones for Dynamic Operations
10:50-11:00	[A-10] *Rachel Honor* SKYSURFIR: Catching Light Waves	[B-10] *Karla Paredes Aguilar* Terrestrial Alkaline Lakes as Analogs for Extraterrestrial Aqueous Environments	[D-10] *Mateo De La Torre* Using Spherical Slepian Functions to Estimate Regional Ice Loss from Glaciers	[F-10-11] *Benjamin Higgins, Philipp Shchetinin, Aaron Tulino* Radio Frequency Identification Security for IoT Airport Infrastructure
11:00-11:10	[A-11] *Naomi Borg* GeNS Mechanical Loss Measurement	[B-11] *Zoe Durica* Age of Metamorphism Documented by Monazite in the Orocopia Schist at Cemetery Ridge, AZ	[D-11] *Simon Fronmueller* Impact of Trace Metal Abundances on Microbial Community Composition and Diversity	
11:10-11:20	[A-12] *Jakob Perivolotis* Detecting Overlooked High Redshift Caustic Transients in MACS J0416.1-2403	[B-12] *Veronica Klawender* Viability of Methanogens in the Ice Shell of Europa	[D-12] *Johnelle Gonzales* Determining the Best-fit Function for Modeling the Aeolian Sediment Vertical Mass Distribution and Transport for an Active Dune Field with both Felsic Sand and Basaltic Cinders	[F-12] *Makena Wheeler* Cryogenic Cooling of a 3D Printed Cone Model for Hypersonic Wind Tunnel Experimentation
11:20-11:30	[A-13] *Isabella Olin* Galaxy Evolution: Investigating Paths of Reddening Through Machine Learning Models	[B-13] *Andrea Blake* Science Communication	[D-13] *Aseem Rajopadhye* Barberton Greenstone Shale XRD Analysis	[F-13] *Dom Belasquez* Development of an Assistive Exoskeleton for a Space Suit
11:30-11:40	[A-14] *Jackson Headon* Analyzing the Near-Infrared Spectra of M and L-Dwarfs	[B-14] *Aaron McCray* Improving Lunar Crustal Magnetic Field Maps in the South Polar Region	[D-14] *CGUHS ASCEND* Development and Deployment of High-Altitude Balloon Payloads for Atmospheric Characterization and Mesh Network Prototyping	[F-14] *Gabriella Mayrend* Models, Testing and Public Affairs: The Case for Crash Test Dummies
11:40-11:50	[A-15] *Anthony Fabrega* Photometric Monte Carlo Simulation of Wolf-Rayet Wind-Eclipsing Binaries	[B-15] *Kirsten Bauck* Mapping Carbon from Space: Comparing Satellite Biomass Models in NASA's Arctic Boreal Vulnerability Experiment (ABoVE)	[D-15] *ASU ASCEND* ASU StratoDevils: Advancing Real-Time Data Processing in High-Altitude Balloon Systems	[F-15] *Hal Ingram* Single-Filter Measurement Results
11:50-12:00	Return to SkySong Building 3, Synergy, Level 1			
12:00-12:50	**Lunch, SkySong Building 3, Synergy, Level 1**			

12:50-1:00	Return to SkySong Building 1, Breakout Rooms				
1:00-1:10	[A-16] Megan Miller Predicting the Zodi: Hubble Space Telescope Images Need Better Zodiacal Light Models!	[B-16] *Linae Larson* Impact-induced Spallation on Icy Moons and its Potential Effects on Habitability	[D-16] *Madelaine Stockman* Saguaro and Nurse Rocks: What are the Underlying Variables	[F-16-17] *Heerok Das, Hayden Marchinek, Jasmine Martinez Castillo* Spatial Heterodyne Interferometric Molecular Cloud Observer (SHIMCO), a Suborbital Sounding Rocket Mission	
1:10-1:20	[A-17] *Francesco Busini, Diego Spross* High Mass X-Ray Binaries: Stars that Sculpt the Universe	[B-17] *Charly Bisson* Observing the Effects of Allometric Scaling Laws in the Organization of Microbial Ecosystems	[D-17] *Colin Boecker-Grieme* Computationally Modelling the Phospholipid Membrane		
1:20-1:30	[A-18] *Keenan Fiedler* Creating a Galaxy Cluster Simulation to Constrain Cosmology	[B-18] *Dora Elalaoui-Pinedo* Investigating Enigmatic Pits in the North Polar Layered Deposits of Mars	[D-18] *Anneli Sorensen* Optimizing Arctic Ice Preservation	[F-18] *Logan Conrad* SKYSURF-IR: Assessing JADES Completeness	
1:30-1:40	[A-19] *Jake Markovsky* Modeling of Light Curves from Core Collapse Supernovae	[B-19] *Connor Derusseau* Low Distortion Map Projections for Mars	[D-19] *Tye Ropati* Fan and Fill in the Safford Basin	[G-1] *Supriya Roy* Discovering Optical Imaging Biomarkers for Early Detection of Gastrointestinal Cancers	
1:40-1:50	[A-20] *Sara Jones* Meteor Crater LWA Station	[B-20] *Emily Clark* Space Weathering of Carbonaceous Asteroids	[D-20] *Aiden Harper* Harvesting Horizons: Predictive Modeling for Crop Loss and their Telecoupled Supply Chain Impacts	[G-2] *Rayna Hylden* Perovskite Performance on Glass and Metal Alloy Substrates	
1:50-2:00	[A-21] *Breelyn Cocke* An Archetype of a Stripped Wolf-Rayet Binary	[B-21] *Eleanor Cornish* Inferring the Presence of Oceans on Earth-like Exoplanets	[D-21] *Emily Speckman* Flood Patterns in East Coast Catchments: How have they changed?	[G-3] *Molly Auer* Examining Effects of Post-Processing Operations on Laser Powder Bed Fusion 3D Printed Parts	
2:00-2:10	[A-22] *Megan Harrison* Mapping HCN Gas within the L1495 Filament of the Taurus Molecular Cloud to Probe for Large-Scale Flow	[B-22] *Ryan Wochner* Measuring Optical Constants for Semi-Heavy and Heavy Water	[E-1] *Anna Gold* Effect of Upstream Screens on Flow Unsteadiness in a Supersonic Wind Tunnel	[G-4] *Chloe Gustafson* Using Heat Stress to Mitigate Physiological Decline During Long-term Spaceflight	
2:10-2:20	[A-23] *Miriam Biehle* Improving the Detection and Characterization of Standing Accretion Shock Instability Using Gravitational Waves	[B-23] *Audrey Smith* Investigation of the Role of Vapor Pressure Differences Between H_2O and D_2O	[E-2] *Lina Youssfi* Boundary Layer Separation over Porous Media	[G-5] *Dillan Synan* Selective Laser Etching of Slumped Mirrors for X-Ray Astronomy	
2:20-2:30	[A-24] *Jack Kohm* A Differentiable Action-Space Framework for Stellar Stream	[B-24] *Kiera Charley* A Direct Imaging Search for Substellar Companions around B &	[E-3] *Sean Young* Development of a Low-Cost High Altitude Manned Balloon Capsule	[G-6] *Cristo Lopez Rosas* Acoustic Levitation Bioassembly of 3D Tissue Constructs for Radiation	

	Clustering and Milky Way Potential Constraints	A Stars		Research
2:30-2:40	[A-25] *Julio Corona* Characterizing the Cosmological Dependence of the Lognormal Model	[C-1] *Abigail Clerget, Taylor Hobbs* Facilitating Women's Success in Software Engineering through the Exploration of Non-traditional Educational Environments	[E-4] *Emanuele Bossi, Francesco Busini* Human-AI Symbiosis	[G-7] *Sierra Monreal* Investigation of Flexible Perovskite Solar Cells for Space Applications
2:40-2:50	[A-26] *Hailey Nelson* Exploring the Foundation of Life in the Universe with Ultrafast Dynamics	[C-2] *James Moore* The Development Process of Educational Space Focused Entertainment		[H-1] *Thomas Herrmann* The Ionic Liquid CAGE Promotes and Stabilizes the Formation of Secondary Structures in Viral Capsid Proteins
2:50-3:00	[A-27] *Ashton Cardona* Spectral Emisson Distributions of Galaxy Pair VV191	[C-3] *Penny Duran* Science Writing with University Communications		[H-2] *Andrew Ortega* Building Computational Models to Understand the Interplay Between Climatic Factors, Mobility, and Vector-borne Disease Dynamics
3:00-3:10		[C-4] *Eyan Weissbluth* The Role of Philosophy of Science in Science Education		[H-3] *Eric Vaughn* Spectroscopic Insights into CO and CO_2 Mixtures: Implications for Planetary Environment Analysis
3:10-3:20	Return to SkySong Building 1, Synergy, Level 1			
3:20-4:30	**ASCEND Poster Session** **SkySong Building 1, Synergy, Level 1** Closing Session			

Program Schedule by Session

Session A: Astronomy & Space Physics

Moderators:

Tim Swindle, University of Arizona

Michele Zanolin, Embry-Riddle Aeronautical University

[A-1] **Energy Distribution of Cosmic Rays in ERAU Prescott**. Students: Lucas Murphy, Junior, Space Physics, Embry-Riddle Aeronautical University. Blake Schuetz, Junior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Darrel Smith, Physics and Astronomy, Embry-Riddle Aeronautical University.

[A-2] **Using PDR Modeling Tools to Simulate Spectroscopic Observations from GUSTO**. Student: Aleah Short, Junior, Physics, Astronomy, University of Arizona. Mentor: Christopher Walker, Astronomy, University of Arizona.

[A-3] **Comparison of Three-Dimensional Supernova Models and Stardust Compositions**. Student: Els Shepard, Sophomore, Aerospace Engineering, Arizona State University. Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University.

[A-4] **Analyzing Globular Cluster Systems in PLCK G165.7+67.0**. Student: Tyler Hinrichs, Senior, Astrophysics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[A-5] **Harnessing the Φn Transform for Early Warning of Neutron Star-Black Hole Binary Events**. Students: Jaxson Mitchell, Senior, Space Physics, Embry-Riddle Aeronautical University. Lara Ortelli, Junior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Cameron Williams, Mathematics, Embry-Riddle Aeronautical University.

[A-6] **Storming the CASTL: A MCMC Tool for Spectral Parameter Fitting**. Student: Hunter Brooks, Senior, Physics, Astrophysics, Northern Arizona University. Mentor: Jasmine Garani, Astronomy and Planetary Science, Northern Arizona University.

[A-7] **Nonlinear Differential Equations from a Vector Model of Lorentz Symmetry Breaking**. Student: Dario Walter-Cardona, Sophomore, Space Physics, Embry-Riddle Aeronautical University. Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University.

[A-8] **A Stellar Renaissance: Exploring the Star Formation of a Spiral Galaxy**. Student: Naomi Carl, Senior, Astrophysics, Physics, Arizona State University. Mentor: Sanchayeeta Borthakur, School of Earth and Space Exploration, Arizona State University.

[A-9] **Birefringence Testing of AlGaAs Mirrors**. Students: Ari Chai, Sophomore, Space Physics, Embry-Riddle Aeronautical University. Ambroise Juston, Junior, Aerospace Engineer, Embry-Riddle Aeronautical University. Mentor: Ellizabeth Gretarsson, Physics and Astronomy, Embry-Riddle Aeronautical University.

[A-10] **SKYSURFIR: Catching Light Waves**. Student: Rachel Honor, Sophomore, Astrophysics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[A-11] **GeNS Mechanical Loss Measurement**. Student: Naomi Borg, Junior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University. Mentor: Andri Gretarsson, Physics and Astronomy, Embry-Riddle Aeronautical University.

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[A-13] **Galaxy Evolution: Investigating Paths of Reddening Through Machine Learning Models**. Student: Isabella Olin, Senior, Astronomy, University of Arizona. Mentor: Stephanie Juneau, NOIRLab.

[A-14] **Analyzing the Near-Infrared Spectra of M and L-Dwarfs**. Student: Jackson Headon, Junior, Astrophysics, Physics, Arizona State University. Mentor: Jennifer Patience, School of Earth and Space Exploration, Arizona State University.

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[A-16] **Predicting the Zodi: Hubble Space Telescope Images Need Better Zodiacal Light Models!**. Student: Megan Miller, Junior, Astrophysics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[A-17] **High Mass X-Ray Binaries: Stars that Sculpt the Universe**. Students: Francesco Busini, Sophomore, Mechanical Engineering, Embry-Riddle Aeronautical University. Diego Spross, Sophomore, Aerospace Engineering, Aeronautics, Embry-Riddle Aeronautical University. Mentor: Pragati Pradhan, Physics Department, Embry-Riddle Aeronautical University.

[A-18] **Creating a Galaxy Cluster Simulation to Constrain Cosmology**. Student: Keenan Fiedler, Junior, Physics, Astronomy, University of Arizona. Mentor: Eduardo Rozo, Physics, University of Arizona.

[A-19] **Modeling of Light Curves from Core Collapse Supernovae**. Student: Jake Markovsky, Sophomore, Space Physics, Embry-Riddle Aeronautical University. Mentor: Michele Zanolin, Physics, Embry-Riddle Aeronautical University.

[A-20] **Meteor Crater LWA Station**. Student: Sara Jones, Sophomore, Astrophysics, Physics, Arizona State University. Mentor: Daniel Jacobs, School of Earth and Space Exploration, Arizona State University.

[A-21] **An Archetype of a Stripped Wolf-Rayet Binary**. Student: Breelyn Cocke, Senior, Physics, Astrophysics, Mathematics, Northern Arizona University. Mentor: Philip Massey, Lowell Observatory.

[A-22] **Mapping HCN Gas within the L1495 Filament of the Taurus Molecular Cloud to Probe for Large-Scale Flow**. Student: Megan Harrison, Senior, Physics, University of Arizona. Mentor: Yancy Shirley, Astronomy, University of Arizona.

[A-23] **Improving the Detection and Characterization of Standing Accretion Shock Instability Using Gravitational Waves**. Student: Miriam Biehle, Sophomore, Space Physics, Embry-Riddle Aeronautical University. Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University.

[A-24] **A Differentiable Action-Space Framework for Stellar Stream Clustering and Milky Way Potential Constraints**. Student: Jack Kohm, Senior, Physics, Astrophysics, Northern Arizona University. Mentor: Lisa Chien, Lowell Observatory, Northern Arizona University.

[A-25] **Characterizing the Cosmological Dependence of the Lognormal Model**. Student: Julio Corona, Junior, Physics, Astronomy, University of Arizona. Mentor: Eduardo Rozo, Physics, University of Arizona.

[A-26] **Exploring the Foundation of Life in the Universe with Ultrafast Dynamics**. Student: Hailey Nelson, Senior, Astrophysics, Chemistry, French, Arizona State University. Mentor: Scott Sayres, School of Molecular Sciences, Arizona State University.

[A-27] **Spectral Emisson Distributions of Galaxy Pair VV191**. Student: Ashton Cardona, Junior, Astrophysics, Physics, Arizona State University. Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University.

[A-In Title Only] **Black Hole Solutions with Spacetime-Symmerty Breaking**. Student: Hailey Murray, Senior, Space Physics, Embry-Riddle Aeronautical University. Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University.

Session B: Planetary Science
Moderators:
Anne Boettcher, Embry-Riddle Aeronautical University
Michelle Coe, University of Arizona

[B-1] **A Panspermia Origin for Venus Cloud Life**. Student: Emma Guinan, Sophomore, Astrophysics, Arizona State University. Mentor: Joseph O'Rourke, School of Earth and Space Exploration, Arizona State University.

[B-2] **Post-Asteroid-Impact Downstream Flooding Hazards**. Student: Lucienne Morton, Junior, Geology, Northern Arizona University. Mentor: Timothy Titus, USGS Astrogeology Center, United States Geological Survey.

[B-3] **Comparative Mineralogy and Chemistry of Bennu and Oued Chebeika 002**. Student: Cade Smith, Junior, Computer Science, University of Arizona. Mentor: Pierre Haenecour, Lunar and Planetary Laboratory, University of Arizona.

[B-4] **Hydrogen Formation and Storage in Earth Mantle Minerals**. Student: Ava Campbell, Junior, Chemistry, Arizona State University. Mentor: Dan Shim, School of Earth and Space Exploration, Arizona State University.

[B-5] **Constructing a Comprehensive Database of Planetary Maps**. Student: Sam Phippen, Junior, Geology, Northern Arizona University. Mentor: Sarah Black, USGS Astrogeology Center, United States Geological Survey.

[B-6] **Petrography of New Basaltic Shergottite Northwest Africa 17234**. Student: Nidhi Nirwan, Junior, Biomedicine, Arizona State University. Mentor: Meenakshi Wadhwa, School of Earth and Space Exploration, Arizona State University.

[B-7] **Changes in pH During Glycine Entrainment in Halite Crystals: A Ceres Analogue**. Student: Tatiana Asadourian, Junior, Astrophysics, Arizona State University. Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University.

[B-8] **An Analysis of the Particle Size Frequency Distribution of an Aggregate Bennu Sample**. Student: Savannah Smith, Senior, Astronomy, University of Arizona. Mentor: Andrew Ryan, Lunar and Planetary Laboratory, University of Arizona.

[B-9] **Synthetic Approaches to Creating Hole Transport Materials**. Student: Jacob Shoulders, Sophomore, Biomedical Science, Northern Arizona University. Mentor: Stephanie Hurst, Chemistry and Biochemistry, Northern Arizona University.

[B-10] **Terrestrial Alkaline Lakes as Analogs for Extraterrestrial Aqueous Environments**. Student: Karla Paredes Aguilar, Senior, Planetary Geoscience, University of Arizona. Mentor: Dante Lauretta, Planetary Sciences, University of Arizona.

[B-11] **Age of Metamorphism Documented by Monazite in the Orocopia Schist at Cemetery Ridge, AZ**. Student: Zoe Durica, Junior, Geology, Northern Arizona University. Mentor: Suzanne Affinati, Geosciences, Northern Arizona University.

[B-12] **Viability of Methanogens in the Ice Shell of Europa**. Student: Veronica Klawender, Junior, Ecology and Evolutionary Biology, University of Arizona. Mentor: Daniel Apai, Steward Observatory, University of Arizona.

[B-13] **Science Communication**. Student: Andrea Blake, Junior, Astronomy, Northern Arizona University. Mentor: Chris Etling, Editor, Arizona Daily Sun - Flagstaff.

[B-14] **Improving Lunar Crustal Magnetic Field Maps in the South Polar Region**. Student: Aaron McCray, Junior, Astronomy, Physics, University of Arizona. Mentor: Lon Hood, Lunar and Planetary Laboratory, University of Arizona.

[B-15] **Mapping Carbon from Space: Comparing Satellite Biomass Models in NASA's Arctic Boreal Vulnerability Experiment (ABoVE)**. Student: Kirsten Bauck, Senior, Data Science, Northern Arizona University. Mentor: Jeremy Forsythe, The Center for Ecosystem Science and Society (ECOSS) - Walker Lab, Northern Arizona University.

[B-16] **Impact-induced Spallation on Icy Moons and its Potential Effects on Habitability**. Student: Linae Larson, Junior, Astronomy, University of Arizona. Mentor: Christopher W. Hamilton, Lunar and Planetary Laboratory, University of Arizona.

[B-17] **Observing the Effects of Allometric Scaling Laws in the Organization of Microbial Ecosystems**. Student: Charly Bisson, Sophomore, Astrobiology, Arizona State University. Mentor: Cole Mathis, School of Complex Adaptive Systems, Arizona State University.

[B-18] **Investigating Enigmatic Pits in the North Polar Layered Deposits of Mars**. Student: Dora Elalaoui-Pinedo, Junior, Planetary Geosciences, University of Arizona. Mentor: Sarah Sutton, Lunar and Planetary Laboratory, University of Arizona.

[B-19] **Low Distortion Map Projections for Mars**. Student: Connor Derusseau, Sophomore, Civil Engineering, Northern Arizona University. Mentor: Mark McClernan, USGS Astrogeology Center, United States Geological Survey.

[B-20] **Space Weathering of Carbonaceous Asteroids**. Student: Emily Clark, Senior, Physics, Astrophysics, Northern Arizona University. Mentor: Mark Loeffler, Astronomy and Planetary Science, Northern Arizona University.

[B-21] **Inferring the Presence of Oceans on Earth-like Exoplanets**. Student: Eleanor Cornish, Sophomore, Astronomy, Physics, University of Arizona. Mentor: Tyler Robinson, Lunar and Planetary Labratory, University of Arizona.

[B-22] **Measuring Optical Constants for Semi-Heavy and Heavy Water**. Student: Ryan Wochner, Senior, Physics & Astrophysics, Northern Arizona University. Mentor: Stephen Tegler, Astronomy and Planetary Science, Northern Arizona University.

[B-23] **Investigation of the Role of Vapor Pressure Differences Between H_2O and D_2O**. Student: Audrey Smith, Sophomore, Astronomy, Northern Arizona University. Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University.

[B-24] **A Direct Imaging Search for Substellar Companions around B & A Stars**. Student: Kiera Charley, Senior, Astrobiology, Arizona State University. Mentor: Jennifer Patience, School of Earth and Space Exploration, Arizona State University.

Session C: Education & Public Outreach

Moderators:

Anne Boettcher, Embry-Riddle Aeronautical University
Michelle Coe, University of Arizona

[C-1] **Facilitating Women's Success in Software Engineering through the Exploration of Non-traditional Educational Environments**. Students: Abigail Clerget, Junior, Computer Engineering, Embry-Riddle Aeronautical University. Taylor Hobbs, Junior, Software Engineering, Embry-Riddle Aeronautical University. Mentor: Ashley Rea, Humanities and Communications, Embry-Riddle Aeronautical University.

[C-2] **The Development Process of Educational Space Focused Entertainment**. Student: James Moore, Sophomore, Civil Engineering, Sustainability, Arizona State University. Mentor: Eric Stribling, ASU Interplanetary Initiative, Arizona State University.

[C-3] **Science Writing with University Communications**. Student: Penny Duran, Junior, Physics, University of Arizona. Mentor: Daniel Stolte, University Communications, University of Arizona.

[C-4] **The Role of Philosophy of Science in Science Education**. Student: Eyan Weissbluth, Junior, Astrophysics, Arizona State University. Mentor: Tuna Yildirim, Physics, Arizona State University.

Session D: Earth & Environmental Science & Engineering
Moderators:
Elliott Bryner, Embry-Riddle Aeronautical University
Jeremy Forsythe, Northern Arizona University
Thomas Sharp, Arizona State University

[D-1-2] **Cultivation on Mars: Improving Soil Fertility of MGS-1 using Green Compost Amendment**. Students: Taylor Alger, Sophomore, Microbiology, Northern Arizona University. Skylar Catania, Senior, Microbiology, Northern Arizona University. Mentor: Lorena Caballero, Biological Sciences, Northern Arizona University.

[D-3] **Climatological Analysis of Tempe Town Lake**. Student: Sicily Vicera, Junior, Chemistry, Arizona State University. Mentor: Sean Bryan, School of Space and Earth Exploration, Arizona State University.

[D-4] **Biological Soil Crust as a Nature-Based Solution for Radionuclide Immobilization and Reclamation of Abandoned Uranium Mines on the Navajo Nation**. Student: Embrey Saville, Senior, Chemistry, Northern Arizona University. Mentor: Anita Antoninka, School of Forestry, Northern Arizona University.

[D-5] **Metal Usage in Ancient Protein Domains**. Student: Nandini Manepalli, Sophomore, Molecular and Cellular Biology, University of Arizona. Mentor: Sawsan Wehbi, Genetics Graduate Interdisciplinary Program, University of Arizona.

[D-6] **Evaluating Sustainable Agriculture in Extraterrestrial Regolith: The Role of AM fungi and Fertilizers**. Student: Alexis Bass, Senior, Environmental and Sustainability, Northern Arizona University. Mentor: Nancy Johnson, School of Earth and Sustainability, Northern Arizona University.

[D-7] **Evaluating Revegetation Techniques for Enhanced Disposal Cell Covers**. Student: Jasmine Engel, Sophomore, Environmental Science, Florida A&M University. Mentor: David Holbrook, Department of Energy, Legacy Management.

[D-8] **Mapping Lead Exposure Risk: A Spatial Analysis of Vulnerable Communities**. Student: Tayler John, Senior, Computer Science, University of Arizona. Mentor: Mónica Ramírez-Andreotta, Environmental Science, University of Arizona.

[D-9] **Exploring the Dynamics of Cell Morphology and Organic Carbon Concentration**. Student: Kadin Pulliam, Senior, Astrobiology, Biogeoscience, Arizona State University. Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University.

[D-10] **Using Spherical Slepian Functions to Estimate Regional Ice Loss from Glaciers**. Student: Mateo De La Torre, Sophomore, Aerospace Engineering, Planetary Geoscience, University of Arizona. Mentor: Christopher Harig, Geosciences, University of Arizona.

[D-11] **Impact of Trace Metal Abundances on Microbial Community Composition and Diversity**. Student: Simon Fronmueller, Senior, Astrobiology, Biogeosciences, Arizona State University. Mentor: Everett Shock, School of Earth and Space Exploration, Arizona State University.

[D-12] **Determining the Best-fit Function for Modeling the Aeolian Sediment Vertical Mass Distribution and Transport for an Active Dune Field with both Felsic Sand and Basaltic Cinders**.

Student: Johnelle Gonzales, Post-Baccalaureate, Geology, Northern Arizona University. Mentor: Amber Gullikson, USGS Astrogeology Center.

[D-13] **Barberton Greenstone Shale XRD Analysis**. Student: Aseem Rajopadhye, Junior, Astrobiology, Biogeosciences, Arizona State University. Mentor: Ariel Anbar, School of Earth and Space Exploration, Arizona State University.

[D-14] **Development and Deployment of High-Altitude Balloon Payloads for Atmospheric Characterization and Mesh Network Prototyping.** Team Presentation: CGUHS ASCEND, Casa Grande Union High School. Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[D-15] **ASU StratoDevils: Advancing Real-Time Data Processing in High-Altitude Balloon Systems**. Team Presentation: ASU ASCEND, Arizona State University. Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[D-16] **Saguaro and Nurse Rocks: What are the Underlying Variables**. Student: Madelaine Stockman, Senior, Environmental Science, Northern Arizona University. Mentor: Helen Rowe, School of Earth and Sustainability, Northern Arizona University.

[D-17] **Computationally Modelling the Phospholipid Membrane**. Student: Colin Boecker-Grieme, Sophomore, Astrobiology and Biogeosciences, Arizona State University. Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University.

[D-18] **Optimizing Arctic Ice Preservation**. Student: Anneli Sorensen, Sophomore, Aerospace Astronautical Engineering, Arizona State University. Mentor: Steve Desch, School of Earth and Space Exploration, Arizona State University.

[D-19] **Fan and Fill in the Safford Basin**. Student: Tye Ropati, Junior, Geological Sciences, Arizona State University. Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University.

[D-20] **Harvesting Horizons: Predictive Modeling for Crop Loss and their Telecoupled Supply Chain Impacts**. Student: Aiden Harper, Senior, Computer Engineering, Northern Arizona University. Mentor: Richard Rushforth, School of Informatics, Computing, and Cyber Systems, Northern Arizona University.

[D-21] **Flood Patterns in East Coast Catchments: How have they changed?**. Student: Emily Speckman, Senior, Earth and Environmental Sciences, Arizona State University. Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University.

[D-In Title Only] **Assessing Vegetation Composition and Biocontrol Strategies for Sustainable Land Management at DOE Legacy Sites**. Student: Mikayla Bia, Sophomore, Civil Engineering, Diné College. Mentor: Angelita Denny, Department of Energy, Legacy Management.

[D-In Title Only] **Cyanobacteria and Exopolysaccharide Growth on Martian Biocrusts**. Student: Margaret Mayhook, Junior, Biology, Northern Arizona University. Mentor: Alicia Rutledge, Astronomy and Planetary Science, Northern Arizona University.

Session E: Aeronautics
Moderators:
Elliott Bryner, Embry-Riddle Aeronautical University
Thomas Sharp, Arizona State University

[E-1] **Effect of Upstream Screens on Flow Unsteadiness in a Supersonic Wind Tunnel**. Student: Anna Gold, Senior, Aerospace Engineering, University of Arizona. Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona.

[E-2] **Boundary Layer Separation over Porous Media**. Student: Lina Youssfi, Junior, Aerospace Engineering, Aeronautics, Arizona State University. Mentor: Gokul Pathikonda, School of Engineering, Matter, Transport and Energy, Arizona State University.

[E-3] **Development of a Low-Cost High Altitude Manned Balloon Capsule**. Student: Sean Young, Senior, Aerospace Engineering, University of Arizona. Mentor: Trent Tresch, Center for Human Space Exploration, University of Arizona.

[E-4] **Human-AI Symbiosis**. Students: Emanuele Bossi, Senior, Software Engineering, Data Science, Embry-Riddle Aeronautical University. Francesco Busini, Sophomore, Mechanical Engineering, Embry-Riddle Aeronautical University. Mentor: Hadi Ali, Aerospace Engineering, Embry-Riddle Aeronautical University.

Session F: Aerospace Technology: Spaceflight & Engineering Programs
Moderators:
Hadi Ali, Embry-Riddle Aeronautical University
Catalina Aranzazu Suescun, Embry-Riddle Aeronautical University
Ahmed Sulyman, Embry-Riddle Aeronautical University
Rosa Szurgot, Embry-Riddle Aeronautical University

[F-1-2] **Exploration of Model-Based Systems Engineering Methodologies for Modeling Pre-Existing Systems**. Students: Kian Blackey, Senior, Aerospace Engineering Astronautics, Embry-Riddle Aeronautical University. Aidan Maney, Senior, Aerospace Engineering, Embry-Riddle Aeronautical University. Claire Picht, Senior, Mechanical Engineering, Embry-Riddle Aeronautical University. Andrew Reynolds, Senior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University. Mentor: Kathryn Wesson, College of Engineering, Embry-Riddle Aeronautical University.

[F-3] **Enhancing Mars Helicopter Performance with Tethered Flight and Active Flow Controls**. Student: Jasmine Garnett, Junior, Aerospace Engineering, University of Arizona. Mentor: Sergey Shkarayev, Aerospace and Mechanical Engineering, University of Arizona.

[F-4] **Artificial Intelligence and Machine Learning for Space Structures**. Student: Regen Michon, Senior, Electrical Engineering, Northern Arizona University. Mentor: Subhayan De, Mechanical Engineering, Northern Arizona University.

[F-5-6] **EagleSat 2**. Students: Bruce Noble, Senior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University. Ela Ozatay, Junior, Aerospace Engineering, Embry-Riddle Aeronautical University. Joseph Ribaudo, Junior, Space Physics, Embry-Riddle Aeronautical University. Frederick Wadnola III, Senior, Mechanical Engineering, Embry-Riddle Aeronautical University. Mentor: Ahmed Sulyman, Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University.

[F-7] **Electrodeless Local Force Generator Using Magnetohydrodynamics for Aerocapture**. Student: Brendan Perry, Senior, Mechanical Engineering, University of Arizona. Mentor: Bernard Parent, Aerospace and Mechanical Engineering, University of Arizona.

[F-8] **ADCS Testbed**. Student: Athul Kodancha, Senior, Aerospace Engineering, Arizona State University. Mentor: Joe Dubois, Interplanetary Initiative, Arizona State University.

[F-9] **Overcoming Impact: Deformable Drones for Dynamic Operations**. Student: Nathaniel van der Leeuw, Sophomore, Mechanical Engineering, University of Arizona. Mentor: Jekan Thangavelautham, Aerospace and Mechanical Engineering, University of Arizona.

[F-10-11] **Radio Frequency Identification Security for IoT Airport Infrastructure**. Students: Benjamin Higgins, First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. Philipp Shchetinin, First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. Aaron Tulino, First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. Mentor: Catalina Aranzazu-Suescun, Cyber Intelligence and Security, Embry-Riddle Aeronautical University.

[F-12] **Cryogenic Cooling of a 3D Printed Cone Model for Hypersonic Wind Tunnel Experimentation**. Student: Makena Wheeler, Sophomore, Aerospace Engineering, University of Arizona. Mentor: Alex Craig, Aerospace and Mechanical Engineering, University of Arizona.

[F-13] **Development of an Assistive Exoskeleton for a Space Suit**. Student: Dom Belasquez, Junior, Mechanical Engineering, Northern Arizona University. Mentor: Reza Razavian, Mechanical Engineering, Northern Arizona University.

[F-14] **Models, Testing and Public Affairs: The Case for Crash Test Dummies**. Student: Gabriella Mayrend, First-Year, Mechanical Engineering Propulsion, Embry-Riddle Aeronautical University. Mentor: Hadi Ali, Aerospace Engineering, Embry-Riddle Aeronautical University.

[F-15] **Single-Filter Measurement Results**. Student: Hal Ingram, Sophomore, Astrophysics, Arizona State University. Mentor: Rogier Windhorst, Physics, Arizona State University.

[F-16-17] **Spatial Heterodyne Interferometric Molecular Cloud Observer (SHIMCO), a Suborbital Sounding Rocket Mission**. Students: Heerok Das, Sophomore, Astronomy, Physics, University of Arizona. Hayden Marchinek, Junior, Physics, Astronomy, University of Arizona. Jasmine Martinez Castillo, Junior, Biosystems Engineering, University of Arizona. Mentor: Jason Corliss, Lunar and Planetary Laboratory, University of Arizona.

[F-18] **SKYSURF-IR: Assessing JADES Completeness**. Student: Logan Conrad, Junior, Astronomical and Planetary Sciences, Arizona State University. Mentor: Rogier Windhorst, Physics, Arizona State University.

Session G: Exploration Systems Engineering: Biological, Materials, Optical, and Electrical
Moderators:
Ahmed Sulyman, Embry-Riddle Aeronautical University
Rosa Szurgot, Embry-Riddle Aeronautical University

[G-1] **Discovering Optical Imaging Biomarkers for Early Detection of Gastrointestinal Cancers**. Student: Supriya Roy, Sophomore, Optical Sciences and Engineering, University of Arizona. Mentor: Travis Sawyer, Wyant College of Optical Sciences, University of Arizona.

[G-2] **Perovskite Performance on Glass and Metal Alloy Substrates**. Student: Rayna Hylden, Sophomore, Materials Science and Engineering, Arizona State University. Mentor: Nicholas Rolston, School of Electrical, Computer, and Energy Engineering, Arizona State University.

[G-3] **Examining Effects of Post-Processing Operations on Laser Powder Bed Fusion 3D Printed Parts**. Student: Molly Auer, Junior, Mechanical Engineering, University of Arizona. Mentor: Hannah Budinoff, Systems and Industrial Engineering, University of Arizona.

[G-4] **Using Heat Stress to Mitigate Physiological Decline During Long-term Spaceflight**. Student: Chloe Gustafson, Senior, Biomedical Sciences, Northern Arizona University. Mentor: Travis Gibbons, Biological Sciences, Northern Arizona University.

[G-5] **Selective Laser Etching of Slumped Mirrors for X-Ray Astronomy**. Student: Dillan Synan, Sophomore, Optical Sciences and Engineering, University of Arizona. Mentor: Brandon Chalifoux, Wyant College of Optical Sciences, University of Arizona.

[G-6] **Acoustic Levitation Bioassembly of 3D Tissue Constructs for Radiation Research**. Student: Cristo Lopez Rosas, Senior, Mechanical Engineering, Arizona State University. Mentor: Xiangjia Li, School for Engineering of Matter, Transport and Energy, Arizona State University.

[G-7] **Investigation of Flexible Perovskite Solar Cells for Space Applications**. Student: Sierra Monreal, Sophomore, Aerospace Engineering, Astronautics, Arizona State University. Mentor: Nicholas Rolston, School of Electrical, Computer, and Energy Engineering, Arizona State University.

Session H: Topics in Math, Physics, and Chemistry
Moderators:
Ahmed Sulyman, Embry-Riddle Aeronautical University
Rosa Szurgot, Embry-Riddle Aeronautical University

[H-1] **The Ionic Liquid CAGE Promotes and Stabilizes the Formation of Secondary Structures in Viral Capsid Proteins**. Student: Thomas Herrmann, Senior, Biochemistry, Northern Arizona University. Mentor: Gerrick Lindberg, Chemistry and Biochemistry, Northern Arizona University.

[H-2] **Building Computational Models to Understand the Interplay Between Climatic Factors, Mobility, and Vector-borne Disease Dynamics**. Student: Andrew Ortega, Senior, Mathematics/Computer Science, Northern Arizona University. Mentor: Kayode Oshinubi, School of Informatics, Computing & Cyber Systems, Northern Arizona University.

[H-3] **Spectroscopic Insights into CO and CO_2 Mixtures: Implications for Planetary Environment Analysis**. Student: Eric Vaughn, Senior, Chemistry, Biology, Northern Arizona University. Mentor: Gerrick Lindberg, Chemistry and Biochemistry, Northern Arizona University.

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

[ASCEND-1] **ASU StratoDevils: Advancing Real-Time Data Processing in High-Altitude Balloon Systems**.
Students: Alec Arcara, Junior, Electrical Engineering, Arizona State University.
Divyam Bhasker, Junior, Astrophysics, Arizona State University.
Marcelo Brooks, Junior, Computer Systems Engineering, Arizona State University.
Eliaz Garcia, Sophomore, Earth and Space Exploration, Arizona State University.
Amanda Gibbons, Senior, Geography, Arizona State University.
Amal Krishna, Junior, Computer Science, Arizona State University.
Tyler Nielsen, Junior, Computer Systems Engineering, Arizona State University.
Ricardo Ontiveros, Senior, Electrical Engineering, Arizona State University.
Alejandro Reyes Villa, Junior, Aerospace Engineering, Arizona State University.
Josh Sink, Junior, Aerospace Engineering, Arizona State University.
Alexandra Soto-Lopez, Junior, Electrical Engineering, Arizona State University.
Bryce Verberne, Senior, Computer Science, Arizona State University.
Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University.

[ASCEND-2] **Optimizing High-Altitude Payload Housing for Future Scientific Missions**.
Students: Connor Fletcher, Sophomore, General Studies, Arizona Western College.
Jose Martinez, Junior, Mechanical Engineering, Arizona Western College.
Ashby Resendiz, Senior, Engineering, Arizona Western College. Mentor:
Leonardo Rojas, Junior, Mechanical Engineering, Northern Arizona University.
Lizbeth Sarabia, Sophomore, Civil Engineering, Arizona Western College.
Anil Yamaner, Senior, Industrial Engineering, University of Arizona Yuma.
Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona.

[ASCEND-3] **Development and Deployment of High-Altitude Balloon Payloads for Atmospheric Characterization and Mesh Network Prototyping**.
Students: Zacheriah Buchanan, High School Student, Aerospace Engineering, Casa Grande Union High School.
Axel Carrera, High School Student, Engineering Technology, Casa Grande Union High School.
Emily Geen, High School Student, Electrical Engineering, Casa Grande Union High School.
Landri Howard, High School Student, Software Engineering, Casa Grande Union High School.
Peyton Posey, High School Student, Computer Engineering, Casa Grande Union High School.
Hailianna Rodgers, High School Student, Computer Engineering, Casa Grande Union High School.
Rayne Tarmann, High School Student, Computer Engineering, Casa Grande Union High School.
Aliceanna Villanueva, High School Student, Architecture, Casa Grande Union High School.
Mentor: John Morris, CTE Engineering, Casa Grande Union High School.

[ASCEND-4] **On the Design of Central Arizona College's High-Altitude Balloon Payloads**.
Students: Emmanuel Canales, Sophomore, Electrical Engineering, Central Arizona College.
Cortney Fisher, Sophomore, Electrical Engineering, Central Arizona College.
Itxclari Garcia, First-Year, Chemical Engineering, Central Arizona College.
James LaFaut, Sophomore, Automated Industrial Technology, Central Arizona College.
Elizabeth Maziarka, Sophomore, Engineering, Central Arizona College.
Elijah Mountz, High School Student, Software Development, Central Arizona College.
Ervin Thomas, Sophomore, Civil Engineering, Central Arizona College.
Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College.

[ASCEND-5] **ERAU ASCEND! Collection and Transmission of Upper Atmospheric Data**.
Students: Evan Hiland, Junior, Aerospace Engineering, Embry-Riddle Aeronautical University.
Kyle LaClair, Senior, Aerospace Engineering, Embry-Riddle Aeronautical University.
Santiago Nuno, Sophomore, Aerospace Engineering, Embry-Riddle Aeronautical University.
Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University.

[ASCEND-6] **Collecting Data Using a Particle I2C Sensor to Test for Residual Particles in the Arizona Atmosphere from the California Wildfires.**
Students: Mia Faust, Sophomore, Mechanical Engineering, Glendale Community College.
Martinez, Sophomore, Electrical Engineering, Glendale Community College.
Mia Pagliuca, Junior, Mechanical Engineering, Glendale Community College.
Kaye Adrianne Yu, Sophomore, Electrical Engineering, Glendale Community College.
Emmanuel Zelaya-Armenta, Sophomore, Computer Science, Glendale Community College.
Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences; Glendale Community College

[ASCEND-7] **Glendale Community College, Team Interdependent Researchers in Space (IRS)**.
Students: Jared Ayala, Sophomore, Astronautical Engineering, Glendale Community College.
Daniel Badiu, Sophomore, Electrical Engineering, Glendale Community College.
Zachary Massey, Junior, Astronautical Engineering, Glendale Community College.
Philippou, Sophomore, Electrical Engineering, Glendale Community College.
Jayden Truong, Junior, Mechanical Engineering, Glendale Community College.
Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences; Glendale Community College

[ASCEND-8] **Studying Radiation in Upper Atmosphere**.
Students: Adam Fuge, Junior, Electrical Engineering, Phoenix College.
Elvis Fernando Garcia Segundo, Sophomore, Aerospace Engineering, Phoenix College.
Marquis Muza, Sophomore, Web Development, Phoenix College.
Nathaniel Okafor, Sophomore, Network and System Administration, Phoenix College.
Ethan Pierson, Sophomore, Mathematics, Phoenix College.
Rafael Sanchez, Sophomore, Mechanical Engineering, Phoenix College.
Mentor: Eddie Ong, Physical Sciences, Phoenix College.

[ASCEND-9] **Reliable and Sustainable Observations in Atmospheric Research**.
Students: Jordan Boe, Junior, Mechanical Engineering, Pima Community College.
Hayden Dohaniuk, Sophomore, Engineering and Technology, Pima Community College.
Roberto Navarro, Sophomore, Mechanical Engineering, Pima Community College.
Mentors: Annmarie Condes, Science and Engineering; Ross Waldrip, Science, Pima Community College.

[ASCEND-10] **University of Arizona ASCEND!: Profiling High-Altitude Electromagnetic Radiation with a General Data Logger**.
Students: Razak Adamu, Junior, Aerospace Engineering, University of Arizona.
Sarina Blanchard, Senior, Mechanical Engineering, University of Arizona.
Colin Brown, Junior, Optical Sciences, Engineering, University of Arizona.
Andrew Kwolek, Senior, Systems Engineering, University of Arizona.
Kane Mattison, Sophomore, Aerospace Engineering, University of Arizona.
Ella Miller, First-Year, Physics, Astronomy, University of Arizona.
Natasha Oler, Senior, Aerospace Engineering, University of Arizona.
Isabel Wee, Junior, Industrial Engineering, University of Arizona.

Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona.

2024-2025 Arizona NASA Space Grant Student Abstracts

Organized by presenter's last name.

Adamu, Razak (Junior, Aerospace Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Alger, Taylor (Sophomore, Microbiology, Northern Arizona University). Mentor: Lorena Caballero, Biological Sciences, Northern Arizona University. [D-1-2]

CULTIVATION ON MARS: IMPROVING SOIL FERTILITY OF MGS-1 USING GREEN COMPOST AMENDMENT

In situ resource utilization (ISRU) offers a promising solution to sustainable food production on Mars by utilizing local Martian resources, particularly the native regolith. However, the lack of organic matter and the alkaline pH of Martian regolith analyzed thus far present significant obstacles to plant growth. This study explores the use of a green compost amendment to enhance the pH, improve drainage, and increase nutrient availability of Martian regolith simulant (MGS-1), promoting plant cultivation. Using a controlled environment with LED lighting and a controlled watering schedule, the three selected crops were planted in w:w regolith-compost mixtures (100:0, 80:20, 60:40, 40:60, and 20:80). Preliminary results indicate that green compost amendments, particularly at a regolith-compost ratio of 40:60, improve the growth of the crops. These findings highlight the potential of ISRU techniques, particularly regolith-amended soils. Further research is needed to determine if compost addition is the most effective, cost-efficient, and space-efficient amendment.

Arcara, Alec (Junior, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility, setting a new standard for student-built aerospace payloads.

Asadourian, Tatiana (Junior, Astrophysics, Arizona State University). Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University. [B-7]

CHANGES IN PH DURING GLYCINE ENTRAINMENT IN HALITE CRYSTALS: A CERES ANALOGUE

Organic material detected in the bright deposits of the asteroid Ceres' salt brines indicate the potential for icy/ocean bodies like Ceres to be suitable for prebiotic chemistry and preservation of organic materials. To study the process of organics entrapment in salt crystals and better understand factors affecting entrainment such as pH, three solutions of supersaturated sodium chloride were created with three varying concentrations of glycine, a simple amino acid. Over the course of two months, pH and temperature of the solutions were collected by a pH meter and probe biweekly, and crystals were collected from each solution at the same pace after a week of growth. The pH measurements indicated a slight increase in pH in the solution over time, becoming less acidic as glycine is entrapped in the salt crystals. Further research with a variety of organics and substrates can help interpret the effect of changes in pH.

ASU ASCEND Team Presentation (Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [D-15]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Auer, Molly (Junior, Mechanical Engineering, University of Arizona). Mentor: Hannah Budinoff, Systems and Industrial Engineering, University of Arizona. [G-3]

EXAMINING EFFECTS OF POST-PROCESSING OPERATIONS ON LASER POWDER BED FUSION 3D PRINTED PARTS

Laser Powder Bed Fusion (LPBF) is a powerful metal additive manufacturing technique with promising implications for aerospace engineering due to its ability to efficiently fabricate complex geometries and precisely distribute material. However, LPBF often introduces residual stresses, significant porosity, and high surface roughness, leading to warping, cracking, and reduced mechanical performance. Post-processing operations, such as heat treatment, mitigate these issues by reducing deformation and relieving residual stresses, therefore enhancing structural integrity. The present study seeks to examine the effects of post-processing operations, including base unbolting, base removal, support removal, and heat treatment, on LPBF parts and explore how to optimize the order of operations and processing parameters to minimize distortion and residual stresses. This presentation will quantitatively compare predicted stress and distortion for each post-processing combination simulated through the LPBF printing process using Ansys Mechanical, offering guidance about how post-processing decisions can increase the manufacturability of the LPBF process.

Ayala, Jared (Sophomore, Astronautical Engineering, Glendale Community College). Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences, Glendale Community College. [ASCEND-7]

GLENDALE COMMUNITY COLLEGE TEAM "IRS"

Team "Interdependent Researchers of Space (IRS)" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from light-weight foam-board, contained analog sensors to measure the interior and external temperatures, pressure, acceleration, and ultraviolet light, along with a GPS receiver to determine its position throughout the flight. There were also two I2C temperature sensors, whose readings were compared with those from the analog sensors. During the flight, a Runcam 2 camera recorded video. The payload also contained an Iridium Satellite modem that was programmed to transmit sensor data and GPS location every 5 minutes, with the transmissions sent to the team members emails in real-time.

Badiu, Daniel (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences, Glendale Community College. [ASCEND-7]

GCC TEAM 2: INTERDEPENDENT RESEARCHERS IN SPACE (IRS)

Team "Interdependent Researchers of Space (IRS)" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from light-weight foam-board, contained analog sensors to measure the interior and external temperatures, pressure, acceleration, and ultraviolet light, along with a GPS receiver to determine its position throughout the flight. There were also two I2C temperature sensors, whose readings were compared with those from the analog sensors. During the flight, a Runcam 2 camera recorded video. The payload also contained an Iridium Satellite modem that was programmed to transmit sensor data and GPS location every 5 minutes, with the transmissions sent to the team members emails in real-time.

Bass, Alexis (Senior, Environmental and Sustainability, Northern Arizona University). Mentor: Nancy Johnson, School of Earth and Sustainability, Northern Arizona University. [D-6]

EVALUATING SUSTAINABLE AGRICULTURE IN EXTRATERRESTRIAL REGOLITH: THE ROLE OF AM FUNGI AND FERTILIZERS

Focusing on expanding sustainable agriculture in extraterrestrial areas, as mass media sources draw attention to extraterrestrial colonization, neglecting aspects of life including food, water, and waste resources. This paper aims to answer whether waste materials are effective fertilizers (Milorganite), and if arbuscular mycorrhizal (AM) fungi reduce plant stress. Utilizing Martian and Lunar simulated regolith researchers planted 44 corn pots, applying four experimental groups consisting of live AM fungi, sterile AM fungi, Milorganite, and BlueChip fertilizers. Preliminary results indicate higher survival rates and lower stress in Lunar pots. Lunar pots appeared healthier, taller, and produced higher fruit yields. Specifically, pots with AMF and Milorganite recorded the tallest heights, correlating a positive response to AMF and Milorganite. Researchers plan to gather statistical data from root DNA, and colonization. Preliminary results indicate future experiments should be completed in a sterile environment mimicking Martian and Lunar atmospheres to produce viable agriculture in extraterrestrial areas.

Bauck, Kirsten (Senior, Data Science, Northern Arizona University). Mentor: Jeremy Forsythe, The Center for Ecosystem Science and Society (ECOSS) - Walker Lab, Northern Arizona University. [B-15]

MAPPING CARBON FROM SPACE: COMPARING SATELLITE BIOMASS MODELS IN NASA'S ARCTIC BOREAL VULNERABILITY EXPERIMENT (ABOVE)

As NASA's Arctic Boreal Vulnerability Experiment (ABoVE) nears the end of its 10-year research program, understanding biomass estimation variability between datasets is critical for assessing carbon dynamics in high-latitude ecosystems, which store a significant portion of global carbon. We conducted a meta-analysis of eight biomass estimation datasets to evaluate their variability across the North American Arctic and Boreal Region (ABR). Biomass estimates were validated against ground plot data, compared at province and ecoregion levels, and assessed under different disturbance conditions including wildfire and timber harvest. Significant differences in dataset coverage, resolution, and methodologies led to variability in biomass estimates and therefore potential applications. This work provides key insights into biomass modeling approaches and datasets within the ABR, a region experiencing rapid climate change and shifts from carbon sinks to carbon sources. It supports NASA's mission to understand the vulnerability and resilience of these at-risk ecosystems and their impact on societies.

Belasquez, Dom (Junior, Mechanical Engineering, Northern Arizona University). Mentor: Reza Razavian, Mechanical Engineering, Northern Arizona University. [F-13]

DEVELOPMENT OF AN ASSISTIVE EXOSKELETON FOR A SPACE SUIT

A major problem with extravehicular activity space missions is the prolonged hours an astronaut must wear a spacesuit that heavily restricts arm movement. This results in excessive energy expenditure and heavy sweating. With no way for the sweat to effectively evaporate, this can lead to infections and injury. To mitigate this issue and reduce astronauts' energy expenditure, we developed a lightweight, low volume, cable driven power exoskeleton for assisted movements. Following experimentation, the exoskeleton could lift a handheld mass of around 1 kg with little effort by the wearer. As a result, it is possible for a lightweight, low volume exoskeleton to assist the wearer in physical tasks. There were limiting factors to this design such as the low strength of the polylactic acid (PLA) plastic, so we did not push the exoskeleton to the limits. Further revisions and tests are still required for optimal power delivery.

Bhasker, Divyam (Junior, Astrophysics, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Bia, Mikayla (Sophomore, Civil Engineering, Diné College). Mentor: Angelita Denny, Department of Energy, Legacy Management. [D-In Title Only]

ASSESSING VEGETATION COMPOSITION AND BIOCONTROL STRATEGIES FOR SUSTAINABLE LAND MANAGEMENT AT DOE LEGACY SITES

During my 10-week DOE federal internship, I collaborated with senior ecologists to assess vegetation composition and implement biocontrol strategies at Legacy Management (LM) sites. My research focused on evaluating plant community dynamics to support ecosystem stability and long-term site sustainability. I documented vegetation trends and identified key species for botanical implementation using field surveys, GIS mapping, and botanical data analysis. By analyzing plant interactions, I contributed to strategies for managing invasive species and promoting native plant resilience. Additionally, I updated herbarium records to enhance historical data accuracy and inform future ecological assessments. My findings emphasized the role of vegetation assessments in maintaining habitat health and guiding land management decisions. This experience strengthened my understanding of environmental monitoring while highlighting the importance of integrating scientific research with conservation practices to ensure the sustainability of LM sites for future generations.

Biehle, Miriam (Sophomore, Space Physics, Embry-Riddle Aeronautical University). Mentor: Michele Zanolin, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-23]

IMPROVING THE DETECTION AND CHARACTERIZATION OF STANDING ACCRETION SHOCK INSTABILITY USING GRAVITATIONAL WAVES

Core collapse supernovae (CCSNe) occur when the iron core of a supermassive star reaches the Chandrasekar limit and collapses on itself. The explosion sometimes contains a feature named standing accretion shock instability (SASI). Using laser interferometry, we can detect gravitational waves (GW) that result from CCSNe. The GW signals from CCSNe are rare and the SASI cannot be detected at all amplitudes and locations within our galaxy. This project's goal is to improve the distance of GW detectability of the SASI component in CCSNe by using the new version of coherent Wave Burst and introducing MuLaSEcC. This will result in better data that can be run through a green version of SASI-meter, a program designed to analyze and characterize the SASI component of CCSNe. This improvement can be applied to real interferometric data with the potential to discover the first GW of CCSNe and SASI components within our galaxy.

Bisson, Charly (Sophomore, Astrobiology, Arizona State University). Mentor: Cole Mathis, School of Complex Adaptive Systems, Arizona State University. [B-17]

OBSERVING THE EFFECTS OF ALLOMETRIC SCALING LAWS IN THE ORGANIZATION OF MICROBIAL ECOSYSTEMS

This project aims to model simple microbial ecosystems while accounting for the influence of allometric scaling laws, searching for conditions that allow for coexistence between multiple microbial species, and in an astrobiological context, exploring the possibility of the resulting elemental ratios as an agnostic biosignature. The Kempes General Chemostat Model is being employed to simulate an environment containing two limiting resource and three species, each of a different cell size. Allometric scaling laws concern traits of cells that change with size, influencing the resulting environment. Through this model, we are conducting an exploration of parameter changes with the intention of facilitating coexistence, focusing particularly on cell mortality rate. Understanding conditions that support ecosystem survival will advance astrobiological interests, for both the early Earth and beyond Earth.

Blackey, Kian (Senior, Aerospace Engineering Astronautics, Embry-Riddle Aeronautical University). Mentor: Kathryn Wesson, College of Engineering, Embry-Riddle Aeronautical University. [F-1-2]

EXPLORATION OF MODEL-BASED SYSTEMS ENGINEERING METHODOLOGIES FOR MODELING PRE-EXISTING SYSTEMS

As system complexity increases, intricate and interdisciplinary problems emerge. The document-based approach to systems engineering has regressed from an organized regulatory process to an incoherent labyrinth of document. Currently, Model-Based Systems Engineering (MBSE) is uniquely implemented to generate systems top-down; contrarily, experts in industry typically have a functional system which needs to be upgraded or altered. The purpose of this research project is to establish a method that can be used to adapt the MagicGrid framework for use in modeling preexisting systems. Our research resulted in the Modified Meet-in-the-Middle Methodology, M5. The process facilitates the transition from an as-is product to a to-be evolution by creating a semi-formal, descriptive, verification model. By tailoring the MagicGrid framework into a Meet-in-the-Middle concept, teams can begin to tackle modeling complex as-is systems and driving new design through MBSE and gain efficiency when executing the system lifecycle.

Blake, Andrea (Junior, Astronomy, Northern Arizona University). Mentor: Chris Etling, Editor, Arizona Daily Sun - Flagstaff. [B-13]

SCIENCE COMMUNICATION

I wrote science articles for the Daily Sun. My favorite article being the opening for the Marley Foundation at Lowell Observatory in Flagstaff Arizona. It was a wonderful and unique event for science. The new building is truly magnificent and eye opening for science and astronomy lovers, including young children who dream of the wonders of the universe. My second favorite article was The Night of Discovery event from the I Heart Pluto event in Flagstaff Arizona. There I met and interviewed speakers David Levy (amateur astronomer and comet hunter), Adam Nimoy (author of Almost Human, and son of Leonard Nimoy), and Alan Stern (planetary scientist and astronaut). The event held a discussion between the speakers surrounding the topic of Star Trek.

Blanchard, Sarina (Senior, Mechanical Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Boe, Jordan (Junior, Mechanical Engineering, Pima Community College). Mentors: AnnMarie Condes, Science and Engineering; Ross Waldrip, Science, Pima Community College. [ASCEND-9]

RELIABLE AND SUSTAINABLE OBSERVATIONS IN ATMOSPHERIC RESEARCH

Atmospheric research is a key component in understanding our global environment. Understanding how we can collect data to further understand our environment is essential. Sustainability includes reusing hardware to have equivalent outcomes. A goal of this project is to collect atmospheric data with multiple launches to support the accuracy of data and components that have been exposed to outer atmosphere conditions. Currently, the investigation is 4 flights which include: the main body and the electronics, sensors, and experimental data. The CubeSat design was selected for its ease of design and PLA used for the CubeSat which is an area of investigation based on PLA is considered an inferior material in which we are testing. We have found that PLA is satisfactory based on our testing and design. This research will aid both in tracking atmospheric trends and in long-term recycling and sustained use of components in high-altitude experimentations.

Boecker-Grieme, Colin (Sophomore, Astrobiology and Biogeosciences, Arizona State University). Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University. [D-17]

COMPUTATIONALLY MODELLING THE PHOSPHOLIPID MEMBRANE

Fatty acid saturation in lipid bilayer membranes plays an important role in homeostasis by influencing membrane fluidity. Due to the time consuming nature of laboratory investigations across all potential conditions a microorganism might experience, computational simulations are a useful tool to explore bacterial membrane dynamics to better understand these adaptations. This project utilizes gromacs-md for molecular dynamics simulation charmm-gui as the input file generator, and the ASU Sol Supercomputer. Khakbaz and Klauda (2018) utilized molecular dynamic simulations to investigate phase transitions of saturated phosphocholine lipid bilayers with the CHARMM36 force field finding that many of their computational experiments found results close to experimental results. As an initial test C-14 and C-18 saturated phosphatidylethanolamine lipids in a membrane bilayer at 10 °C and 30 °C were simulated. Once these simulations were complete, the results were compared laboratory investigations of bacterial lipid membranes under different temperature conditions.

Borg, Naomi (Junior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University). Mentor: Andri Gretarsson, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-11]

GENS MECHANICAL LOSS MEASUREMENT

The sources from which the Laser Interferometer Gravitational-Wave Observatory (LIGO) detects gravitational waves are all fairly nearby because instrument noise masks the faint signals from sources further away. Some instrument noise is because the interferometer mirrors vibrate randomly (Brownian motion). What is most important in the evaluation of Brownian noise from mirrors is internal friction or mechanical loss. By measuring the rate at which mirrors "ring-down" we can estimate this mechanical loss. The apparatus required for such measurements is known as a Gentle Nodal Suspension (GeNS) apparatus. So, how does the mechanical loss in the samples depend on the placement of the samples on their support? We are setting up a system for measurement of the GeNS balance point location to do a study of mechanical loss based on balance point location. This will help improve the understanding of the GeNS system and potentially improve methods of Brownian Noise reduction.

Bossi, Emanuele (Senior, Software Engineering, Data Science, Embry-Riddle Aeronautical University). Mentor: Hadi Ali, Aerospace Engineering, Embry-Riddle Aeronautical University. [E-4]

HUMAN-AI SYMBIOSIS

As Artificial Intelligence (AI) increasingly supports critical decision-making in different real-world contexts, understanding trust between humans and AI becomes crucial. The goal of this study is to explore how various levels of AI transparency, control, and error influence human trust in AI-based decision support in safety-critical systems. By evaluating participant responses to AI recommendations across different operational modes, this research aims to identify optimal conditions that foster trust and enhance collaboration between humans and AI in high-risk environments. The findings will inform the development of more effective and reliable AI systems.

Brooks, Hunter (Senior, Physics, Astrophysics, Northern Arizona University). Mentor: Jasmine Garani, Astronomy and Planetary Science, Northern Arizona University. [A-6]

STORMING THE CASTL: A MCMC TOOL FOR SPECTRAL PARAMETER FITTING

We present the Computional Anaylsis of Spectral TempLates (castl) tool, a python pip package designed to efficiently run Markov-Chain Monte-Carlo (MCMC) simulations on interpolated spectral grids using Radial Basis Function (RBF) Interpolation and Linear N-Dimensional Interpolation for fast and computationally efficient interpolation. It provides a flexible tool for fitting spectral data across a wide range of astronomical objects, from supernovae to brown dwarfs. Only requiring a model spectral grid and observed spectrum to run. The algorithm is streamlined for ease of use, requiring only four input variables while additional input variables are available for more customization. This software supports both regular and irregular grids, making it versatile for various modeling scenarios. To aid the user, an example Jupyter Notebook for using castl is provided.

Brooks, Marcelo (Junior, Computer Systems Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility, setting a new standard for student-built aerospace payloads

Brown, Colin (Junior, Optical Sciences, Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Buchanan, Zacheriah (High School Student, Aerospace Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Busini, Francesco (Sophomore, Mechanical Engineering, Embry-Riddle Aeronautical University). Mentor: Pragati Pradhan, Physics Department, Embry-Riddle Aeronautical University. [A-17]

HIGH MASS X-RAY BINARIES: STARS THAT SCULPT THE UNIVERSE

High-mass X-ray binaries (HMXBs), consisting of a massive star and a compact object like a neutron star, are key to studying stellar wind dynamics. In these systems, the star's clumpy wind interacts with the compact object, producing variable X-ray emissions. This study investigates the HMXB 4U 1700-371 using NuSTAR data to analyze X-ray variability and characterize wind clumps. By measuring soft X-ray absorption, examining the hardness ratio, and studying iron line emissions, researchers estimate clump size, density, and ionization state. Results reveal significant absorption patterns, offering insights into the wind's inhomogeneity. These findings enhance models of stellar wind behavior, contributing to a better understanding of stellar evolution and high-energy astrophysical processes.

Busini, Francesco (Sophomore, Mechanical Engineering, Embry-Riddle Aeronautical University). Mentor: Pragati Pradhan, Physics Department, Embry-Riddle Aeronautical University. [E-4]

HUMAN-AI SYMBIOSIS

As Artificial Intelligence (AI) increasingly supports critical decision-making in different real-world contexts, understanding trust between humans and AI becomes crucial. The goal of this study is to explore how various levels of AI transparency, control, and error influence human trust in AI-based decision support in safety-critical systems. By evaluating participant responses to AI recommendations across different operational modes, this research aims to identify optimal conditions that foster trust and enhance collaboration between humans and AI in high-risk environments. The findings will inform the development of more effective and reliable AI systems.

Campbell, Ava (Junior, Chemistry, Arizona State University). Mentor: Dan Shim, School of Earth and Space Exploration, Arizona State University. [B-4]

HYDROGEN FORMATION AND STORAGE IN EARTH MANTLE MINERALS

$CaTiO_3$ is known to split water at 1 bar using UV light as a catalyst. Preliminary experiments indicate that heat can replace UV light at high pressures. Titanium's capability to change oxidation states is a major component in water splitting, but its low mantle abundance makes iron a possible replacement due to similar oxidation properties and higher abundance. Major mantle phases $CaSiO_3$ and $MgSiO_3$ form a perovskite structure at high pressures, therefore it is possible to determine the mantle conditions under which iron bearing $CaSiO_3$ and $MgSiO_3$ can split water. In this study, the temperature, time, and pressure conditions for $CaTiO_3$ water splitting are varied and the hydrogen content is analyzed using Raman spectroscopy. Understanding the processes for hydrogen formation and storage in Earth mantle minerals provides important information about deep interiors' contribution to the formation and evolution of rocky planet atmospheres.

Canales, Emmanuel (Sophomore, Electrical Engineering, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

ON THE DESIGN OF CENTRAL ARIZONA COLLEGE'S HIGH-ALTITUDE BALLOON PAYLOADS

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

Cardona, Ashton (Junior, Astrophysics, Physics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [A-27]

SPECTRAL EMISSON DISTRIBUTIONS OF GALAXY PAIR VV191

Globular clusters inside of galaxies are often utilized like fossil records of how the galaxy evolved over time. This remains the case for the Galaxy pair VV191, a foreground spiral galaxy with a background elliptical. Within the elliptical are many globular clusters that it's believed can detail how conditions in that galaxy changed over time. Utilizing the Bagpipes Python package, we intend to obtain the photometric flux of the various point sources (globular clusters) for VV191 and create Spectral Emission Distribution (SED) diagrams of the found fluxes. This includes filtering out an excess of flux from any point sources not associated with the elliptical galaxy. From there, after the interpretation of some preliminary fits, we have already begun to notice a range of star formation histories, where the results will help us interpret how these clusters formed and evolved over time.

Carl, Naomi (Senior, Astrophysics, Physics, Arizona State University). Mentor: Sanchayeeta Borthakur, School of Earth and Space Exploration, Arizona State University. [A-8]

A STELLAR RENAISSANCE: EXPLORING THE STAR FORMATION OF A SPIRAL GALAXY

In this work, we analyze the nearby, spiral galaxy, NGC 3344. This particular galaxy is interesting due to the discovery of its extended ultraviolet (XUV) disk. We find a higher ratio of younger stars to older stars in the outer disk, which indicates that NGC 3344 grows from the inside-out. After testing over 1,469,664 combinations of models, we conclude that NGC 3344 matches the pattern of a delayed star forming galaxy with a constant burst episode. Based on the modeled star formation rate, NGC 3344 experienced a 5% increase in star formation100 million years ago. This finding corroborates the presence of an XUV disk in the galaxy, which could be tied to an accretion event of a spiral density wave. These results are very exciting, and will be explored further in Padave et al. 2025 (in prep).

Carrera, Axel (High School Student, Engineering Technology, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Catania, Skylar (Senior, Microbiology, Northern Arizona University). Mentor: Lorena Caballero, Biological Sciences, Northern Arizona University. [D-1-2]

Cultivation on Mars: Improving Soil Fertility of MGS-1 using Green Compost Amendment

In situ resource utilization (ISRU) offers a promising solution to sustainable food production on Mars by utilizing local Martian resources, particularly the native regolith. However, the lack of organic matter and the alkaline pH of Martian regolith analyzed thus far present significant obstacles to plant growth. This study explores the use of a green compost amendment to enhance the pH, improve drainage, and increase nutrient availability of Martian regolith simulant (MGS-1), promoting plant cultivation. Using a controlled environment with LED lighting and a controlled watering schedule, the three selected crops were planted in w:w regolith-compost mixtures (100:0, 80:20, 60:40, 40:60, and 20:80). Preliminary results indicate that green compost amendments, particularly at a regolith-compost ratio of 40:60, improve the growth of the crops. These findings highlight the potential of ISRU techniques, particularly regolith-amended soils. Further research is needed to determine if compost addition is the most effective, cost-efficient, and space-efficient amendment.

CGUHS ASCEND Team Presentation (Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [D-14]

Development and Deployment of High-Altitude Balloon Payloads for Atmospheric Characterization and Mesh Network Prototyping

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

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

Birefringence Testing of AlGaAs Mirrors

We propose a combined approach to test birefringence in Aluminum Gallium Arsenide (AlGaAs) mirrors with a 1064 nm laser. This project reconstructs an optical chain to analyze the birefringent behavior of the mirror material under infrared lasers. Furthermore, we introduce a separate optical setup that includes a laser cavity featuring a vibrating mirror to examine the resonance peaks of the laser light within the cavity, offering two high-definition experimental platforms to measure birefringence. This investigation will deepen understanding of AlGaAs's optical properties and enhance the design of mirrors for laser systems, critical in Laser interferometer gravitational observatories.

Charley, Kiera (Senior, Astrobiology, Arizona State University). Mentor: Jennifer Patience, School of Earth and Space Exploration, Arizona State University. [B-24]

A Direct Imaging Search for Substellar Companions around B & A Stars

Using data in the Keck Observatory Archives of B & A stars from the Hipparcos Catalogue, direct images taken in the K-band were observed for potential companion candidates. Images of interest were corrected by subtracting their darks and dividing them by flats to verify companion existence further. Separation distances from their host star were also calculated to determine whether these objects were known. Using the SIMBAD database in conjunction with the distances, host stars were noted as possessing daughter objects verified through our imaging search or as unknown. Future works involve observations of our revised target list at the Keck Observatory or other facilities to verify our results and provide second epochs that are instrumental in distinguishing these candidates as co-moving companions or background objects. Further work would also be performed to distinguish between planetary bodies or intermediate masses like brown stars, with the aid of direct imaging and spectroscopy.

Clark, Emily (Senior, Physics, Astrophysics, Northern Arizona University). Mentor: Mark Loeffler, Astronomy and Planetary Science, Northern Arizona University. [B-20]

SPACE WEATHERING OF CARBONACEOUS ASTEROIDS

Space weathering, the alteration of surfaces caused by exposure to the harsh conditions of space, is important in understanding the evolution of airless bodies throughout time. Last year, we performed a series of experiments exploring the effect of space weathering on CI simulant samples. We observed interesting outcomes and wanted to verify the replicability of these results. A sample of CI simulant was prepared and we characterized the initial reflectance of the sample. In our ultra-high vacuum system, we used a laser to ablate iron metal onto the surface to mimic redeposition after micrometeorite bombardment. In this talk, I will compare our results to ones from last year and discuss the implications of the similarities and differences that we observe. I will also discuss the extensive troubleshooting process that occurred over the course of this project.

Clerget, Abigail (Junior, Computer Engineering, Embry-Riddle Aeronautical University). Mentor: Ashley Rea, Humanities and Communications, Embry-Riddle Aeronautical University. [C-1]

FACILITATING WOMEN'S SUCCESS IN SOFTWARE ENGINEERING THROUGH THE EXPLORATION OF NON-TRADITIONAL EDUCATIONAL ENVIRONMENTS

Participation of women in the field of software engineering is a longstanding concern (Society of Women Engineers, 2024b). In response, the industry of equity-focused coding education had been growing, leading to the rise of bootcamps, workshops, and community-based coding education designed to increase the participation of women in tech (Rea, 2022; Jabbari, 2023). While the impacts of these sites of coding education are many and varied, they have much to offer researchers exploring strategies for inclusive pedagogy (Byrd, 2020; Damian et al., 2024; Vakil, 2018). The need for such work is made even more pressing in the current legislative landscape. This presentation offers pedagogical insights derived from an IRB-approved, multi-year qualitative study created to increase representation, access, and equity in the tech industry.

Cocke, Breelyn (Senior, Physics, Astrophysics, Mathematics, Northern Arizona University). Mentor: Philip Massey, Lowell Observatory. [A-21]

AN ARCHETYPE OF A STRIPPED WOLF-RAYET BINARY

Massive stars are often described as the "cosmic engines" of the Universe, as they are the major contributor of ionizing photons, mechanical energy, and chemical enrichments for galaxies. However, there are many outstanding questions about their evolution, specifically the role of binarity in the formation of Wolf-Rayet (WR) stars. Although only 30-40% of WRs are currently binary, many more may have evolved through binary stripping, with their companions now merged. Identifying specific examples, however, has remained elusive. We are studying a WR binary, LMC173-1, which consists of a WN3+O7.5V pair. A dozen radial velocity measurements over the past decade demonstrate that the WR star has lost at least 65% of its initial mass, which could not have happened by stellar winds alone. We aim to determine periods and orbital parameters for what we expect to be the archetype of a WR star stripped by binary evolution.

Conrad, Logan (Junior, Astronomical and Planetary Sciences, Arizona State University). Mentor: Rogier Windhorst, Physics, Arizona State University. [F-18]

SKYSURF-IR: ASSESSING JADES COMPLETENESS

Project SKYSURF-IR is an archival project that aims to detail diffuse light measurements using the James Webb Space Telescope (JWST), as a follow-up to the Hubble Space Telescope's project SKYSURF. Project SKYSURF {O'Brien et. al 2023} concluded an under-prediction of sky-SB measurements. A plausible cause could be the missing of faint high redshift galaxies. Using a JWST image simulator MIRAGE, we evaluate the density of deep sky galaxies using the JADES time domain field (TDF). In addition to JADES, we simulate galaxy catalogs to influx the density of galaxies in the JADES field. We aim to understand the overlap of galaxies in a field and the confusion limit as galaxy count increases, to conclude if we over or under estimate galaxy counts.

Cornish, Eleanor (Sophomore, Astronomy, Physics, University of Arizona). Mentor: Tyler Robinson, Lunar and Planetary Labratory, University of Arizona. [B-21]

INFERRING THE PRESENCE OF OCEANS ON EARTH-LIKE EXOPLANETS

The Habitable Worlds Observatory (HWO) is an under-development NASA mission to observe exoplanets (planets around other stars). To determine the potential for life on these planets, researchers need methods to assess their habitability, such as the detection of ocean glint. Life as we know it requires water, so detecting oceans and water on distant planets might mean life could exist there. The project consisted of translating a specular reflection model from Fortran to python and integrating it into an existing reflected-light atmospheric/surface inference tool. We then validated the predictive tool against high-fidelity models for Earth and observed the effects of variables such as wind, cloud, and phase angle. Now, with a working glint retrieval tool, the next steps will be completing retrievals on simulated HWO observations of Earth-like exoplanets to determine the feasibility of glint detection and the potential for false positives.

Corona, Julio (Junior, Physics, Astronomy, University of Arizona). Mentor: Eduardo Rozo, Physics, University of Arizona. [A-25]

CHARACTERIZING THE COSMOLOGICAL DEPENDENCE OF THE LOGNORMAL MODEL

Understanding large-scale structures is crucial to cosmology, providing insights into structure formation and the universe's history. Weak lensing, a phenomenon where gravity bends light around an object, causes the projected matter density of the Universe, denoted as κ, to function as a lens that distorts the images of background galaxies (Bartelmann & Maturi, 2016). Denser regions produce greater distortions, overall making mapping of matter possible. These maps reveal details of large-scale structure, such as its general shape and distribution. Astronomers can further analyze these maps by graphing the density observed versus frequency of observation in a histogram. In this work, I characterize the cosmological dependence of the shift parameter in a statistical description called the log-normal approximation, using numerical simulations. After measuring and minimizing errors, I aim to build an emulator that will predict the shift parameter as a function of cosmology to improve future weak lensing studies.

Das, Heerok (Sophomore, Astronomy, Physics, University of Arizona). Mentor: Jason Corliss, Lunar and Planetary Laboratory, University of Arizona. [F-16-17]

SCIENCE TARGET SELECTION FOR THE SPATIAL HETERODYNE INTERFEROMETRIC MOLECULAR CLOUD OBSERVER (SHIMCO), A SUBORBITAL SOUNDING ROCKET MISSION

The science goal of the SHIMCO mission is to obtain high-resolution far-ultraviolet (FUV) spectra of molecular hydrogen (H2) fluorescence emission within molecular clouds, to probe the conditions of these complex star-formation regions. However, such regions often contain high levels of dust, leading to significant extinction at these wavelengths. To guide SHIMCO's target selection, we used data from the FIMS-SPEAR mission, which created a low-resolution all-sky (76% coverage) FUV map, to assess the intensity and breadth of H2 emission in potential target regions. We also created differential and cumulative dust extinction plots to better separate the intrinsic brightness and effects of scattering. The leading target candidates are within the ρ Ophiuchi Cloud Complex, which contains 3 distinct ~10 deg2 subregions with high-intensity emission over our bandpass (1605-1615 Å). Next steps include identifying specific targets within the complex and using theoretical models to estimate line intensity in fluorescence spectra.

De La Torre, Mateo (Sophomore, Aerospace Engineering, Planetary Geoscience, University of Arizona). Mentor: Christopher Harig, Geosciences, University of Arizona. [D-10]

USING SPHERICAL SLEPIAN FUNCTIONS TO ESTIMATE REGIONAL ICE LOSS FROM GLACIERS

Every year, glaciers around the globe lose a very substantial amount of ice mass, introducing increased threats ranging from sea level rise to less secure water reserves for many populations. Measuring this loss can be very challenging and there are varying ways to quantify such change. In this study, we use gravimetry data collected by the GRACE/-FO missions to estimate the mass change in glacier regions defined by the Randolph Glacier Inventory. We use spherical Slepian functions to localize the global data provided by GRACE to a given region and estimate monthly mass changes. These results can be used to monitor the health of these glaciers and of the immediate ecosystem and water reserves, which many people depend on. International research teams such as GlaMBIE may also use the results produced here in larger intercomparison studies to compile global estimates across disciplines.

Derusseau, Connor (Sophomore, Civil Engineering, Northern Arizona University). Mentor: Mark McClernan, USGS Astrogeology Center, United States Geological Survey. [B-19]

LOW DISTORTION MAP PROJECTIONS FOR MARS

Map projections are integral to the future exploration of Mars. The existing Mars map projection system, the Mars Transverse Mercator (MTM), utilizes wide zones that lead to excess distortion. The State Plane Coordinate System (SPCS) is a map projection system where smaller zones are created by using more specific parameters that are unique to those zones, thus decreasing distortion. Map projections were tested on the Jezero Crater zone by using a python script that determined the optimal values for parameters such as origin Longitude, Latitude, and Scale Factor. The values were evaluated by degree to which they decreased the range in distortion. Our findings indicate that using a Transverse Mercator Projection with an origin longitude of 7.24 degrees, the distortion range for the Jezero Crater plot can be decreased by 7.8 cm per km. This data is important as it showcases the opportunity for improved map projections focused on engineering.

Dohaniuk, Hayden (Sophomore, Engineering and Technology, Pima Community College). Mentors: AnnMarie Condes, Science and Engineering; Ross Waldrip, Science, Pima Community College. [ASCEND-9]

RELIABLE AND SUSTAINABLE OBSERVATIONS IN ATMOSPHERIC RESEARCH

Atmospheric research is a key component in understanding our global environment. Understanding how we can collect data to further understand our environment is essential. Sustainability includes reusing hardware to have equivalent outcomes. A goal of this project is to collect atmospheric data with multiple launches to support the accuracy of data and components that have been exposed to outer atmosphere conditions. Currently the investigation is 4 flights which include: the main body and the electronics, sensors, and experimental data. The CubeSat design was selected for its ease of design and PLA used for the CubeSat which is an area of investigation based on PLA is considered an inferior material in which we are testing. We have found that PLA is satisfactory based on our testing and design. This research will aid both in tracking atmospheric trends and in long-term recycling and sustained use of components in high-altitude experimentations.

Duran, Penny (Junior, Physics, University of Arizona). Mentor: Daniel Stolte, University Communications, University of Arizona. [C-3]

SCIENCE WRITING WITH UNIVERSITY COMMUNICATIONS

Scientific papers have experts as their target audience, making cutting edge research challenging for general audiences to understand. University Communications crafts press releases about research conducted at the University of Arizona to translate complex scientific information into a format that is digestible for non-experts. Science writers work together closely with scientists through interviews and a collaborative drafting process to break down science without sacrificing accuracy. Press releases establish research as newsworthy and the science stories can get picked up by news outlets outside of the University of Arizona, allowing the research to achieve broad reach. Notable story examples that I have written include the dating of ancient solar storms, the longevity of planet-forming disks and detailed images of young planets. News outlets like Earth.com, Universe Today and Phys.org have picked up these press releases and stand as a testament to the publicity that science communication can bring to research.

Durica, Zoe (Junior, Geology, Northern Arizona University). Mentor: Suzanne Affinati, Geosciences, Northern Arizona University. [B-11]

AGE OF METAMORPHISM DOCUMENTED BY MONAZITE IN THE OROCOPIA SCHIST AT CEMETERY RIDGE, AZ

Cemetery Ridge, in SW Arizona, is an exposure of lower continental crust from the Laramide low-angle subduction zone that was active 85-40 Ma ago. This region includes the underplated metamorphosed Orocopia Schist, which is surrounded by intrusive igneous rock with recorded U-Pb ages at 22 Ma. This project analyzed 17 monazite grains from 4 samples in the Orocopia Schist using a laser ablation split-stream system to collect trace elements and isotopic ages simultaneously. The data recorded monazite ages around 22-26 Ma and rare earth element (REE) patterns were consistent in the samples, enriched in light REE, depleted in heavy REE, with a negative Eu anomaly. The monazite in the Orocopia Schist likely crystallized because of heating and/or fluid movement as the surrounding igneous body intruded the crust. The monazite documents a Miocene metamorphic event that can be attributed increased volcanism as the Laramie slab detached from the upper plate.

Elalaoui-Pinedo, Dora (Junior, Planetary Geosciences, University of Arizona). Mentor: Sarah Sutton, Lunar and Planetary Laboratory, University of Arizona. [B-18]

INVESTIGATING ENIGMATIC PITS IN THE NORTH POLAR LAYERED DEPOSITS OF MARS

The North Polar Layered Deposits (NPLD) are layers of dust and water ice within Planum Boreum, Mars's north polar ice cap. The NPLD consists of profound spiral troughs, whose walls carve into the deposits and expose the layers. Intriguing features within the NPLD are polar pits of unknown origin, which typically appear circular, meter-sized, along troughs, and deeply shadowed. Using images from the High Resolution Imaging Science Experiment (HiRISE) and elevation data from the Mars Orbiter Laser Altimeter (MOLA), we can make Digital Terrain Models (DTMs) of different areas with pits to observe possible changes. A change detection study aids in understanding the formation mechanisms of pits, active surface processes, and ice sublimation or deposition. Ultimately, studying the pits is unexplored research that may further explain the structure of the NPLD and advance our knowledge of Mars's climate history.

Engel, Jasmine (Sophomore, Environmental Science, Florida A&M University). Mentor: David Holbrook, Department of Energy, Legacy Management. [D-7]

EVALUATING REVEGETATION TECHNIQUES FOR ENHANCED DISPOSAL CELL COVERS

The Department of Energy (DOE) Legacy Management (LM) oversees uranium disposal sites to protect human health and the environment. Disposal cells use engineered covers to prevent the migration of contaminants. The Enhanced Cover Application Project (ECAP) examines how revegetation and evapotranspiration (ET) minimize infiltration. Cover enhancement tests implemented at the Grand Junction, CO Disposal Site (GJDS) include adaptive vegetation management, hydroseeding, species selection, broadcast seeding, transplanting, and monitoring. Selecting effective strategies requires site-specific considerations like engineering design, regulations, soil properties, and climate. ET-type cover enhancements offer a sustainable approach to managing porewater levels at the Rifle, Colorado Disposal Site. Using GJDS as a model, this study identifies effective methods for controlling water accumulation at Rifle, reducing reliance on costly extraction systems. The findings support long-term, passive solutions that improve hydrological performance and disposal cell sustainability.

Fabrega, Anthony (Junior, Astronomy, Embry-Riddle Aeronautical University). Mentor: Noel Richardson, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-15]

PHOTOMETRIC MONTE CARLO SIMULATION OF WOLF-RAYET WIND-ECLIPSING BINARIES

Wolf-Rayet (WR) stars are evolved, massive stars that have lost their hydrogen envelopes and now burn helium in their cores. They are compact and drive fast, dense stellar winds. Often found in binaries with massive O stars, these systems can help us determine some physical quantities. In short-period systems, when a WR star transits its companion, its hot, ionized wind scatters light from the O star. This scattering, influenced by inclination, free electron density, and stellar separation, allows modeling to yield independent measurements of both inclination and mass-loss rate. I am advancing a Markov Chain Monte Carlo fitting technique using Python's emcee algorithm to analyze light curves from binaries. Under my mentor, Dr. Richardson's, guidance last summer, I obtained results consistent with ground-based light curves. With further enhancements, the routine will model high-precision data from TESS, providing a robust method for determining WR stars' inclinations and mass-loss rates.

Faust, Mia (Sophomore, Mechanical Engineering, Glendale Community College). Mentor: Tim Frank, Engineering, Glendale Community College. [ASCEND-6]

COLLECTING DATA USING A PARTICLE I2C SENSOR TO TEST FOR RESIDUAL PARTICLES IN THE ARIZONA ATMOSPHERE FROM THE CALIFORNIA WILDFIRES

Team "Flight Club" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from foam-board, contained analog sensors to measure temperature, pressure, and acceleration, an I2C particle sensor, and a GPS receiver. The data collected from the particle sensor is used to test whether the pollutants released from the recent wildfires in southern California have migrated into the upper atmosphere above central Arizona. Besides these sensors, the payload also includes an Insta360 X2 camera, which provided a 360-degree view from the payload, and an Iridium Satellite modem to transmit data and the GPS location during the flight.

Fiedler, Keenan (Junior, Physics, Astronomy, University of Arizona). Mentor: Eduardo Rozo, Physics, University of Arizona. [A-18]

CREATING A GALAXY CLUSTER SIMULATION TO CONSTRAIN COSMOLOGY

Current measurements of cosmology from the early and late universe are in significant (~5σ) tension with each other. In the late universe, galaxy clustering is a key probe of cosmology, and new techniques meant to address errors in the analysis of galaxy survey data require simulations that can be generated quickly and with high accuracy. To test current analyses methods, I am developing a new simulation pipeline that generates synthetic survey data that can be analyzed using the same tools applied to real data. Using an existing simulation of dark matter halos, I populate with the correct number of galaxies based on the mass of the halos, and assign galaxy colors based on a model of the red-sequence of galaxies. My simulations are fast, with accuracy to Dark Energy Survey measurements currently being assessed.

Fisher, Cortney (Sophomore, Electrical Engineering, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

ON THE DESIGN OF CENTRAL ARIZONA COLLEGE'S HIGH-ALTITUDE BALLOON PAYLOADS

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

Fletcher, Connor (Sophomore, General Studies, Arizona Western College). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

OPTIMIZING HIGH-ALTITUDE PAYLOAD HOUSING FOR FUTURE SCIENTIFIC MISSIONS

Our project focuses on improving the structural integrity and functionality of a high-altitude payload designed for flights reaching 100,000 feet. This iteration prioritizes a lightweight, yet durable 3D-printed structure, ensuring airtight and water-resistant protection for internal components. While maintaining the same sensors as previous designs, enhancements include improved wiring reliability to sustain proper operation throughout the mission and the integration of a 360-degree camera for comprehensive environmental data collection. These upgrades establish a modular and robust payload housing, serving as a foundation for future scientific experiments and engineering advancements. The optimized design will be tested in extreme conditions to validate its performance and resilience in near-space environments.

Fronmueller, Simon (Senior, Astrobiology, Biogeosciences, Arizona State University). Mentor: Everett Shock, School of Earth and Space Exploration, Arizona State University. [D-11]

IMPACT OF TRACE METAL ABUNDANCES ON MICROBIAL COMMUNITY COMPOSITION AND DIVERSITY

Many trace metals have been studied in their effects on individual microbial species and their role in microbial metabolisms. However, many microbes participate in obligate symbiosis with members of other species. Despite this, little is known about how the small-scale effects of trace metals on one species are reflected in the larger-scale dynamics across their microbial communities. To contribute to closing this gap, 16S rRNA gene sequencing data and geochemical measurements were collected in tandem from 60 Yellowstone National Park (YNP) hot springs. The data was analyzed and interpreted through the use of geochemical modeling software, and several bioinformatics packages in RStudio. In order to make justifiable interpretations, the impacts of other geochemical variables had to be accounted for and or ruled out as an explanation for any potential trends. Consideration of these variables explains some but not all of the observed trends in microbial community composition and diversity.

Fuge, Adam (Junior, Electrical Engineering, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

STUDYING RADIATION IN UPPER ATMOSPHERE

The Phoenix College NASA ASCEND team has long been involved in launch activities, with a large focus on improving the fabrication techniques and design quality of our carbon fiber based vehicle. To that end, for our current payload we have designed a new chassis that shaves weight by ~40% compared to our previous chassis. Incorporated into our payload are two Geiger counters: one for recording beta and gamma radiation across different altitudes and the other for neutron detection in order to ascertain the Pfotzer-Regener maximum. We have also incorporated four UV sensors to accurately record UV radiation at different altitudes. Additionally, we've utilized a thermistor based heating circuit on our payload in order to keep our camera and other specific components at an optimal temperature during flight, ensuring said components function properly in spite of low temperatures in the upper atmosphere.

Garcia, Itxclari (First-Year, Chemical Engineering, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

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Garcia, Eliaz (Sophomore, Earth and Space Exploration, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Garcia Segundo, Elvis Fernando (Sophomore, Aerospace Engineering, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

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Garnett, Jasmine (Junior, Aerospace Engineering, University of Arizona). Mentor: Sergey Shkarayev, Aerospace and Mechanical Engineering, University of Arizona. [F-3]

ENHANCING MARS HELICOPTER PERFORMANCE WITH TETHERED FLIGHT AND ACTIVE FLOW CONTROLS

Exploration of Mars cannot be accomplished without understanding its atmosphere and surface. One of the tools used to further our knowledge of the red planet is the Ingenuity Mars Helicopter (IMH). This research focuses on improving upon the performance of the wings of the IMH for future Martian explorations. A simplified rotor and two-wing model was used to simulate how the IMH flew. In an effort to improve upon NASA's original design, the wings were changed to determine the effect of air blown through them. It was discovered that by having a 10-degree angle position for both wings as well as having a stream of air blowing through them, it allows less forces to be felt which is essential for the IMH to withstand rough atmospheric conditions. More research, such as using variable speed wind tunnels, is necessary to understand how the wings would operate under severe conditions on Mars.

Geen, Emily (High School Student, Electrical Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Gibbons, Amanda (Senior, Geography, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Gold, Anna (Senior, Aerospace Engineering, University of Arizona). Mentor: James Threadgill, Aerospace and Mechanical Engineering, University of Arizona. [E-1]

EFFECT OF UPSTREAM SCREENS ON FLOW UNSTEADINESS IN A SUPERSONIC WIND TUNNEL

Wind tunnels are used to study aerodynamic behavior by generating controlled airflow around objects. Maintaining a steady and uniform flow is important for accurate testing, as disturbances can affect experimental results. If untested, assumptions about flow disturbances in wind tunnels may lead to sources of error. This study investigates the effect of upstream screens on flow unsteadiness in a supersonic wind tunnel operating at Mach 2.3, 4.0, and 5.0. Coarse and fine steel mesh screens are being tested to evaluate how different levels of resistance influence flow unsteadiness. These screens break down larger turbulent structures into smaller eddies, reducing turbulence intensity through pressure drop. Honeycomb screens, consisting of a network of small cells, are used to straighten and stabilize airflow by minimizing lateral and rotational velocity components. If these screens significantly improve flow quality, future work could focus on optimizing screen configurations for various testing conditions.

Gonzales, Johnelle (Post-Baccalaureate, Geology, Northern Arizona University). Mentor: Amber Gullikson, USGS Astrogeology Center. [D-12]

DETERMINING THE BEST-FIT FUNCTION FOR MODELING THE AEOLIAN SEDIMENT VERTICAL MASS DISTRIBUTION AND TRANSPORT FOR AN ACTIVE DUNE FIELD WITH BOTH FELSIC SAND AND BASALTIC CINDERS

The Grand Falls Dune Field (GFDF) is a young dune field (<100 years old) located NE of Flagstaff and has a bi-modal composition of coarse-grained basaltic sand and fine-grained felsic sand. The fast growth of GFDF makes it an ideal site to study how dune field formation is affected by environmental conditions and acts as an excellent analog site for active dunes on Mars. We aim to quantify sediment distribution with varying wind velocities and characterize the sediment through ratios of basaltic versus felsic sand at different heights. Sediment from GFDF collected using Big Spring Number Eight (BSNE) sediment traps positioned at varying heights and sieved into various grain sizes mixed with wind velocity data allows us to quantify this distribution. Modeling sediment distribution with changing environmental conditions may improve our understanding of dune growth and the dune formation on planetary bodies such as Mars.

Guinan, Emma (Sophomore, Astrophysics, Arizona State University). Mentor: Joseph O'Rourke, School of Earth and Space Exploration, Arizona State University. [B-1]

A PANSPERMIA ORIGIN FOR VENUS CLOUD LIFE

Various observations hint at life in Venus's clouds. Perhaps the Venusian surface was clement in the past, but as the climate changed, life migrated to altitudes above ~50 km with Earth-like temperatures and pressures. We consider if life was instead delivered to Venus's clouds from Earth or, perhaps, Mars ("panspermia"). A microbe-containing bolide could enter the atmosphere without experiencing complete sterilization from ablation. Aerodynamic drag would fragment the bolide and spread it horizontally, increasing the effective cross-section and causing rapid deceleration. An airburst occurs as the bolide rapidly sheds its kinetic energy. The fragments small enough to dwell in the clouds can then be dispersed at high altitudes. Observations of terrestrial meteorites provide scaling laws for the distribution of post-airburst fragment sizes. We present a framework for calculating the rate at which panspermia delivers microbes to the clouds of Venus, estimating an average of ~10 viable microbes per Earth-year.

Gustafson, Chloe (Senior, Biomedical Sciences, Northern Arizona University). Mentor: Travis Gibbons, Biological Sciences, Northern Arizona University. [G-4]

USING HEAT STRESS TO MITIGATE PHYSIOLOGICAL DECLINE DURING LONG-TERM SPACEFLIGHT

Astronauts live free from the environmental and physical stress experienced on Earth. Physical stress, such as exercise, promotes adaptations for maintaining basic physiological functions necessary for life on Earth. Without this 'eu'-stress in space, multiple biological systems deteriorate rapidly. Astronauts are required to exercise each day to minimize physical and biological deconditioning, yet long-term space missions still negatively impact astronaut health. Six months of spaceflight accelerates arterial stiffening by approximately 30 years, and most astronauts return to Earth with signs of prediabetes. An additional complication upon return to Earth is a lack of blood, which challenges blood pressure control and leads to light-headedness in the upright position. Heat has short-term benefits for vascular function, glucose control, and blood volume expansion. We propose that introducing heat stress during spaceflight may minimize these negative health outcomes in astronauts. Given NASA's pending Mars mission, ensuring astronaut health is crucial for 2+ year spaceflight.

Harper, Aiden (Senior, Computer Engineering, Northern Arizona University). Mentor: Richard Rushforth, School of Informatics, Computing, and Cyber Systems, Northern Arizona University. [D-20]

HARVESTING HORIZONS: PREDICTIVE MODELING FOR CROP LOSS AND THEIR TELECOUPLED SUPPLY CHAIN IMPACTS

Crop loss, whether due to natural disasters, disease, or other factors, substantially impacts suppliers, consumers, and numerous government programs. Early prediction of crop loss can enable timely preparation and mitigation strategies. This study investigated whether remote sensing data – such as vegetation indices, temperature, precipitation, and vapor pressure - can effectively predict crop loss. This study developed a CatBoost machine learning model to predict corn acreage loss in Iowa from 2003-2023 using United States Departure of Agriculture (USDA) bulletin reports. Though tested and validated on historical data, the CatBoost model is capable of predicting crop loss for years without reported USDA data. Next, using U.S. commodity flow data, we identified domestic regions that were the most impacted by corn production loss in Iowa. The predictive capability of this model, paired with the insights of trade-based telecoupling, has the potential to inform governmental planning programs and supply chain management.

Harrison, Megan (Senior, Physics, University of Arizona). Mentor: Yancy Shirley, Astronomy, University of Arizona. [A-22]

MAPPING HCN GAS WITHIN THE L1495 FILAMENT OF THE TAURUS MOLECULAR CLOUD TO PROBE FOR LARGE-SCALE FLOW

Molecular clouds are regions of cold gases where star formation occurs. We can trace the motion of these gases by line asymmetries within the integrated intensity of optically thick spectral lines. The integrated intensity and line asymmetries of the HCN hyperfine transitions were found across the L1495 filament of the Taurus Molecular Cloud using ammonia as a tracer of the average maximum likelihood velocity along each line-of-sight. The data was reduced in CLASS, and the total integrated intensities and infall intensity asymmetries were calculated using custom Python scripts. I calculate the statistical excess of blue asymmetric vs. red asymmetric line profiles and interpret the results in terms of implications for large scale flows within the cloud.

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

ANALYZING THE NEAR-INFRARED SPECTRA OF M AND L-DWARFS

M-class stars have some of the more prominent absorption line features due to their cooler temperatures and composition. L-dwarfs share similar qualities, however, emit larger amounts of infrared light, making their absorption spectra more difficult to detect. To combat this, we analyze the absorption features of both M and L-dwarfs and compare how L-dwarf absorption features differ from M-dwarfs within the H, J, and K band ranges. By using data from the NASA InfraRed Telescope Facility (IRTF), we plot the near-infrared spectra of M-class stars ranging from M0-M8 and observe how their absorption lines vary as a function of temperature. With this, we will then be able to compare their spectra with L-dwarf data from the Gemini North Telescope, and utilize this process to not only analyze how their spectra change through different stellar boundaries, but show how their characteristics provide insight into companion formation.

Herrmann, Thomas (Senior, Biochemistry, Northern Arizona University). Mentor: Gerrick Lindberg, Chemistry and Biochemistry, Northern Arizona University. [H-1]

THE IONIC LIQUID CAGE PROMOTES AND STABILIZES THE FORMATION OF SECONDARY STRUCTURES IN VIRAL CAPSID PROTEINS

Ionic liquids are a unique class of organic salts characterized by their low melting points and high customizability. Choline geranate (CAGE) is a solvent that has been previously identified to possess antimicrobial effects. To help explain this observation, molecular dynamics (MD) simulations were used to analyze the effect of CAGE on microbial structures. Specifically, its interaction with the Karolinska Instituet polyomavirus (KIPyV) major capsid protein viral protein 1 (VP1) reveals a consistent promotion of α-helix secondary structure within surface loop regions. On average, simulations of the VP1 monomer show an increase in the proportion of α-helical structures of 2.24% or 5 - 6 amino acid residues. These regions are crucial to host-cell infiltration and replication, functions that are highly dependent on protein structure. Significant changes to these regions contribute to the idea that CAGE may be used as a nontoxic disinfectant that appears safe for human life and the environment.

Higgins, Benjamin (First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University). Mentor: Catalina Aranzazu-Suescun, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. [F-10-11]

RADIO FREQUENCY IDENTIFICATION SECURITY FOR IOT AIRPORT INFRASTRUCTURE

Radio Frequency Identification (RFID) technology is used in airports to track passengers, employees, and luggage. For employees, it controls access to restricted areas based on their roles and permissions. For passengers, RFID tracks and authenticates them throughout airport processes. RFID also plays a key role in luggage tracking, addressing the growing issue of misplaced or lost baggage. This project focuses on developing an IoT-based RFID luggage tracking system to improve luggage management and reduce such incidents. The project aims to enhance the security of RFID IoT systems through four phases. First, an RFID IoT infrastructure testbed was created to assess functionality. Second, a vulnerability assessment identified potential weaknesses in the system. Third, simulated cyberattacks tested the system's integrity and availability under threat. Finally, based on these findings, tailored security recommendations were proposed to strengthen the system's defenses. This approach helps mitigate risks and ensures the system's resilience against cyber threats.

Hiland, Evan (Junior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-5]

ERAU ASCEND! COLLECTION AND TRANSMISSION OF UPPER ATMOSPHERIC DATA

For decades, weather balloons have provided means for collecting data at every level of the atmosphere. Because they can not be tethered, high-altitude balloons must float freely and risk total data loss if they are not recovered. This project aims to increase the reliability of data collection by transmitting telemetry and sensor data to a ground station with a tracking, high gain antenna. A GPS unit was placed on the payload and transmits coordinates and altitude over the 915 MHz LoRa band, utilizing omnidirectional dipole antennas for transmission and reception. The ground station uses these coordinates and Vincenty's formulae to compute the range and azimuth along which the ground station points. Elevation is calculated using altitude and range to account for the curvature of the Earth. The results will demonstrate that data transmission is possible, while the atmospheric data collected can be compared to existing data to benefit the field.

Hinrichs, Tyler (Senior, Astrophysics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [A-4]

ANALYZING GLOBULAR CLUSTER SYSTEMS IN PLCK G165.7+67.0

Although the James Webb Space Telescope has received much attention for its ability to search deeper into the cosmos than ever before, it also enhances our capability to study objects closer to us in the Universe. We apply a methodology of subtracting intracluster light to the PLCK G165.7+67.0 (G165, z=0.35) cluster, revealing a population of unresolved point-like sources including globular clusters. By applying a fitting algorithm in color space to only select the sources in the galaxy cluster, we uncover 452 globular cluster candidates within a projected radius of 1200 kpc. We use the brightness distribution of these candidates to construct a luminosity function with a predicted peak of M ~ -9.4 mag. Finally, we find the globular cluster candidates to be highly correlated spatially with the intracluster light and lensing mass of the cluster, allowing us to discuss the dynamical state of G165.

Hobbs, Taylor (Junior, Software Engineering, Embry-Riddle Aeronautical University). Mentor: Ashley Rea, Humanities and Communications, Embry-Riddle Aeronautical University. [C-1]

FACILITATING WOMEN'S SUCCESS IN SOFTWARE ENGINEERING THROUGH THE EXPLORATION OF NON-TRADITIONAL EDUCATIONAL ENVIRONMENTS

Participation of women in the field of software engineering is a longstanding concern (Society of Women Engineers, 2024b). In response, the industry of equity-focused coding education had been growing, leading to the rise of bootcamps, workshops, and community-based coding education designed to increase the participation of women in tech (Rea, 2022; Jabbari, 2023). While the impacts of these sites of coding education are many and varied, they have much to offer researchers exploring strategies for inclusive pedagogy (Byrd, 2020; Damian et al., 2024; Vakil, 2018). The need for such work is made even more pressing in the current legislative landscape. This presentation offers pedagogical insights derived from an IRB-approved, multi-year qualitative study created to increase representation, access, and equity in the tech industry.

Honor, Rachel (Sophomore, Astrophysics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [A-10]

SKYSURFIR: CATCHING LIGHT WAVES

Project SKYSURFIR aims to measure the sky surface brightness across about 60,000 individual exposures observed with JWST. It is a follow-up to project SKYSURF, which did the same thing using HST images. We have found through these two projects that there is a discrepancy between the measured total extragalactic background light (EBL), which is the light from all galaxies across cosmic time, and the amount of light predicted by our models. It is likely that our model for the Zodiacal light component, which is all the light coming from within the inner solar system, is incomplete. In order to constrain the EBL, we will refine our Zodiacal light models at near-IR wavelengths. This optimal background modeling will help us learn more about the background light captured by space telescopes such as JWST and HST, which in turn will help us optimize the use of these telescopes and their instruments.

Howard, Landri (High School Student, Software Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Hylden, Rayna (Sophomore, Materials Science and Engineering, Arizona State University). Mentor: Nicholas Rolston, School of Electrical, Computer, and Energy Engineering, Arizona State University. [G-2]

PEROVSKITE PERFORMANCE ON GLASS AND METAL ALLOY SUBSTRATES

Perovskite solar cells (PSCs) are a promising source of renewable energy that function based on forming crystal structures. This project uses Cs0.2FA0.8PbI3 ink enhanced with gellan gum to create PSCs that favor thermal stability and long-term use. This ink was blade coated on both glass and flexible metal substrates, each of which hold promising applications for the clean energy industry and space travel. Perovskites were fabricated on each substrate type using the same process parameters and then characterized using profilometry, hyperspectral photoluminescence analysis, and scanning electron microscopy. By understanding the performances of PSCs on each substrate type, the best route for the fabrication and application of each can be understood.

Ingram, Hal (Sophomore, Astrophysics, Arizona State University). Mentor: Rogier Windhorst, Physics, Arizona State University. [F-15]

SINGLE-FILTER MEASUREMENT RESULTS

In this presentation, we go over our Cosmic Ray Flux measurements for the entire archive of a single individual filter, F606W. F606W is commonly used in modern HST (Hubble Space Telescope) measurements taken with ACS (Advanced Camera for Surveys) and WFC3 (Wide-Field Camera 3 (replaced WFPC2)) in the broadband filter, covering a range of Visible Light between 480 nm to 720 nm. Given this, we expect to see a significant amount of read noise from WFPC2 (Wide-Field Planetary Camera 2) in this filter compared to other filters, given that this Filter operates at the cameras peak measurement capabilities for this band. Furthermore, WFPC2 suffers from Dark Glow - radiation from the CCD (Charge-Coupled Device), which this work aims to measure and provide supplemental measurements to the SKYSURF Archival project.

John, Tayler (Senior, Computer Science, University of Arizona). Mentor: Mónica Ramírez-Andreotta, Environmental Science, University of Arizona. [D-8]

MAPPING LEAD EXPOSURE RISK: A SPATIAL ANALYSIS OF VULNERABLE COMMUNITIES

Lead exposure remains a significant environmental health concern, particularly in communities with aging housing infrastructure and socioeconomic disparities. This project utilizes the most recent 5-Year American Community Survey (ACS) data to map lead exposure risks across Cuyahoga County (OH), Gila County (AZ), and Pinal County (AZ). A Lead Exposure Risk Index (LERI) was developed using three key indicators of vulnerability: (1) the proportion of homes built before 1980, (2) the percentage of children under age 5, and (3) the percentage of the population below the poverty line. These indicators were standardized using percentile normalization to allow for comparative spatial analysis. Preliminary results identify high-risk areas with concentrated socioeconomic vulnerabilities. These findings can inform targeted public health interventions and policy decisions to mitigate lead exposure risks in affected communities.

Jones, Sara (Sophomore, Astrophysics, Physics, Arizona State University). Mentor: Daniel Jacobs, School of Earth and Space Exploration, Arizona State University. [A-20]

METEOR CRATER LWA STATION

The Meteor Crater LWA (Long Wavelength Array) Station is a radio telescope to be constructed near the Meteor Crater National Landmark in Winslow, Arizona. Comprising of 64 antennas and 256 dipoles, the station will operate as part of the LWA Swarm—a dispersed, interferometric array of low-frequency radio observatories. Key science goals of the Meteor Crater station include investigations of ionospheric wave dynamics and turbulence, pulsar scattering phenomena, active galactic nuclei (AGN), the Cosmic Dawn, and Dark Ages instrumentation. Additional efforts examine transient propagation effects such as tropospheric ducting. Arizona State University has developed a custom digital rack enclosure for the station to enhance processing efficiency and support increased bandwidth. The project is currently in site preparation, with final design reviews underway and procurement of materials in progress. Construction is scheduled to begin no earlier than May 2025.

Juston, Ambroise (Junior, Aerospace Engineer, Embry-Riddle Aeronautical University). Mentor: Ellizabeth Gretarsson, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-9]

BIREFRINGENCE TESTING OF ALGAAS MIRRORS

We propose a combined approach to test birefringence in Aluminum Gallium Arsenide (AlGaAs) mirrors with a 1064 nm laser. This project reconstructs an optical chain to analyze the birefringent behavior of the mirror material under infrared lasers. Furthermore, we introduce a separate optical setup that includes a laser cavity featuring a vibrating mirror to examine the resonance peaks of the laser light within the cavity, offering two high-definition experimental platforms to measure birefringence. This investigation will deepen understanding of AlGaAs's optical properties and enhance the design of mirrors for laser systems, critical in Laser interferometer gravitational observatories.

Klawender, Veronica (Junior, Ecology and Evolutionary Biology, University of Arizona). Mentor: Daniel Apai, Steward Observatory, University of Arizona. [B-12]

VIABILITY OF METHANOGENS IN THE ICE SHELL OF EUROPA

One major obstacle in astrobiology is the definition of habitability, given that certain metabolisms are more viable in some environments than others. This can be overcome by assessing the intersection between metabolic requirements and environmental conditions. Using the Quantitative Habitability Framework, it is possible to compare known tolerable conditions for life on Earth with expected conditions on extraterrestrial bodies (Apai et al. in prep). Due to the recent launch of the Europa Clipper and the accessibility of chaos terrains on Europa's surface, it is important to constrain the viability of extremophiles such as methanogens in liquid water pockets underlying these chaos regions. Using first order environmental parameters, results indicate that low temperatures and rapid salinity increases over time strongly affect the viability of methanogen species in these environments. These factors exert strong evolutionary pressures that are still tolerable by terrestrial methanogens, demonstrating Europa can potentially harbor life.

Kodancha, Athul (Senior, Aerospace Engineering, Arizona State University). Mentor: Joe Dubois, Interplanetary Initiative, Arizona State University. [F-8]

ADCS TESTBED

The Attitude Determination and Control System (ADCS) Testbed is a hardware-in-the-loop (HIL) platform designed to validate control algorithms for CubeSat missions. This project focuses on simulating low Earth orbit (LEO) magnetic field conditions using a 3-axis Helmholtz cage, allowing for precise testing of CubeSat attitude control systems. The system integrates PID control simulations to ensure uniform field generation, while a 3-DOF gimbal test stand enables real-time validation of CubeSat attitude dynamics. Through iterative testing and data analysis, the testbed supports the refinement of magnetorquer control strategies, improving mission reliability. Additionally, this project contributes to STEM outreach, engaging students in hands-on aerospace education. By advancing ADCS validation capabilities, this testbed plays a crucial role in reducing mission risks for future CubeSat deployments.

Kohm, Jack (Senior, Physics, Astrophysics, Northern Arizona University). Mentor: Lisa Chien, Lowell Observatory, Northern Arizona University. [A-24]

A DIFFERENTIABLE ACTION-SPACE FRAMEWORK FOR STELLAR STREAM CLUSTERING AND MILKY WAY POTENTIAL CONSTRAINTS

Recent astrometric surveys now provide 6D phase-space data on stellar streams, offering new opportunities to constrain the Milky Way's gravitational potential. I present a Bayesian action-space clustering method for multiple tidal streams that uses differentiable Stäckel actions and Kullback–Leibler divergence–based likelihoods to identify potential parameters. In the correct potential, each stream remains tightly clustered in integral of motion space. Our JAX-based pipeline enables advanced sampling, including Hamiltonian Monte Carlo. Preliminary fits to well-known halo streams show that combining them reduces degeneracies and yields robust constraints on halo shape and mass. Partial disk–halo decomposition is feasible with sufficient stream coverage. We have tested on mock and real Gaia-based data and plan to incorporate chemical or radial velocity measurements to refine membership and break remaining degeneracies. This extensible method can also incorporate future accelerometric tracers and account for external perturbations, ultimately providing a more complete view of the Milky Way's gravitational field.

Krishna, Amal (Junior, Computer Science, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Kwolek, Andrew (Senior, Systems Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

LaClair, Kyle (Senior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-5]

ERAU ASCEND! COLLECTION AND TRANSMISSION OF UPPER ATMOSPHERIC DATA

For decades, weather balloons have provided means for collecting data at every level of the atmosphere. Because they can not be tethered, high-altitude balloons must float freely and risk total data loss if they are not recovered. This project aims to increase the reliability of data collection by transmitting telemetry and sensor data to a ground station with a tracking, high gain antenna. A GPS unit was placed on the payload and transmits coordinates and altitude over the 915 MHz LoRa band, utilizing omnidirectional dipole antennas for transmission and reception. The ground station uses these coordinates and Vincenty's formulae to compute the range and azimuth along which the ground station points. Elevation is calculated using altitude and range to account for the curvature of the Earth. The results will demonstrate that data transmission is possible, while the atmospheric data collected can be compared to existing data to benefit the field.

LaFaut, James (Sophomore, Automated Industrial Technology, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

ON THE DESIGN OF CENTRAL ARIZONA COLLEGE'S HIGH-ALTITUDE BALLOON PAYLOADS

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

Larson, Linae (Junior, Astronomy, University of Arizona). Mentor: Christopher W. Hamilton, Lunar and Planetary Laboratory, University of Arizona. [B-16]

IMPACT-INDUCED SPALLATION ON ICY MOONS AND ITS POTENTIAL EFFECTS ON HABITABILITY

Asteroid impacts on Solar System moons and terrestrial planets are known to eject fragments of surface material at several kilometers per second, in a process called spallation. The icy moons of Jupiter and Saturn are theorized to have ice shells and a global ocean underneath, tens to hundreds of kilometers deep. These moons with ice shells and subsurface oceans may experience spallation, despite the impacting object never penetrating the ice shell. This project investigates whether impact-induced spallation on these icy moons can also occur on the underside of these icy shells, ejecting fragments and adding energy to the subsurface ocean. A geophysics model in Python was created to calculate the energy input into the ocean. Impact-induced spallation may provide a new mechanism for ocean mixing and formation of cryomagmas, which may contribute to the habitability of these ocean worlds.

Lopez Rosas, Cristo (Senior, Mechanical Engineering, Arizona State University). Mentor: Xiangjia Li, School for Engineering of Matter, Transport and Energy, Arizona State University. [G-6]

ACOUSTIC LEVITATION BIOASSEMBLY OF 3D TISSUE CONSTRUCTS FOR RADIATION RESEARCH

This research explores the use of acoustic levitation to develop a system for assembling 3D tissues and studying the long-term effects of radiation exposure in medical and space environments. Acoustic levitation uses sound waves to suspend and manipulate cells, providing a contact-free method for precise tissue construction. The current focus is on designing and building the levitation system, ensuring stability and control for future bioassembly applications. Once developed, this system will enable the preparation and assembly of biomaterials into 3D tissue constructs, which will later be analyzed and exposed to controlled radiation doses to simulate real-world conditions. By examining how tissues respond to different radiation types and intensities, this research aims to enhance our understanding of radiation-induced damage and contribute to developing protective strategies for astronauts, medical patients, and others exposed to radiation.

Manepalli, Nandini (Sophomore, Molecular and Cellular Biology, University of Arizona). Mentor: Sawsan Wehbi, Genetics Graduate Interdisciplinary Program, University of Arizona. [D-5]

METAL USAGE IN ANCIENT PROTEIN DOMAINS

Almost half of all proteins are metal binders, known as metalloproteins. Many metalloproteins are ancient, dating back to the last universal common ancestor (LUCA) and pre-LUCA communities. We previously dated protein domains (basic units of proteins that evolve and fold independently) based on their presence in LUCA, pre-LUCA, post-LUCA and modern supergroups. By analyzing the metal usage of protein domains, we aim to compare the metal preferences of ancient protein domains to those that emerged more recently. We use the BioLiP Database to identify metal-binding domains in each age group. Preliminary findings suggest ancient domains bind metals more often than younger domains. Ancient domains also bind manganese more often than younger domains. Ongoing work includes inferring the ancestral state of domains that bind multiple metals using comparative phylogenetic methods. This research provides insight into the environmental conditions conducive to the origins of life on Earth and elsewhere in the universe.

Maney, Aidan (Senior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Kathryn Wesson, College of Engineering, Embry-Riddle Aeronautical University. [F-1-2]

EXPLORATION OF MODEL-BASED SYSTEMS ENGINEERING METHODOLOGIES FOR MODELING PRE-EXISTING SYSTEMS

As system complexity increases, intricate and interdisciplinary problems emerge. The document-based approach to systems engineering has regressed from an organized regulatory process to an incoherent labyrinth of document. Currently, Model-Based Systems Engineering (MBSE) is uniquely implemented to generate systems top-down; contrarily, experts in industry typically have a functional system which needs to be upgraded or altered. The purpose of this research project is to establish a method that can be used to adapt the MagicGrid framework for use in modeling preexisting systems. Our research resulted in the Modified Meet-in-the-Middle Methodology, M5. The process facilitates the transition from an as-is product to a to-be evolution by creating a semi-formal, descriptive, verification model. By tailoring the MagicGrid framework into a Meet-in-the-Middle concept, teams can begin to tackle modeling complex as-is systems and driving new design through MBSE and gain efficiency when executing the system lifecycle.

Marchinek, Hayden (Junior, Physics, Astronomy, University of Arizona). Mentor: Jason Corliss, Lunar and Planetary Laboratory, University of Arizona. [F-16-17]

NOVEL DETECTOR DATA INTEGRATION TECHNIQUES FOR THE SPATIAL HETERODYNE INTERFEROMETRIC MOLECULAR CLOUD OBSERVER (SHIMCO)

Sounding rockets provide an important foundation for observational astronomy and instrumentation development for spaceflight qualifications. At high altitude we avoid atmospheric attenuation in the far ultraviolet, allowing for observations of emissions not attainable from the ground. SHIMCO is a NASA sub-orbital sounding rocket mission to observe H2 fluorescence in molecular cloud star forming environments. Integral to SHIMCO, a custom photon-counting EMCCD detector is being developed at JPL to be used to record our desired astronomic data. To integrate this into our data pipeline, we developed a software interface to emulate the EMCCD functionality in a laboratory setting. This software provides a GUI for interactive image capture through multiple capture modes, with dynamic parameter adjustment and real time image visualization. This tool will undergo comprehensive testing before launch and will be adapted and implemented in the SHIMCO spaceflight.

Markovsky, Jake (Sophomore, Space Physics, Embry-Riddle Aeronautical University). Mentor: Michele Zanolin, Physics, Embry-Riddle Aeronautical University. [A-19]

MODELING OF LIGHT CURVES FROM CORE COLLAPSE SUPERNOVAE

Supernovae have been known to astronomers for more than a thousand years. Our research is about improving the existing search for Gravitational waves from Core collapse supernovae with laser interferometers. At the initial explosion of a core collapse supernova, the iron core collapses with the emission of neutrinos and gravitational waves. A shockwave then propagates throughout the stellar material. The point at which this shockwave breaks out of the stellar material is called the shockwave breakout (SBO). That is when the EM radiation from the explosion is released, happening a few hours to a few days after the GW emission. In this project we used polynomial interpolation and physics-based interpolations of incomplete Supernovae light curves to estimate the time and its uncertainty of GW emission. This will require both an estimate of the time of the SBO and the delay between the collapse and the SBO.

Martinez, Jose (Junior, Mechanical Engineering, Arizona Western College). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

OPTIMIZING HIGH-ALTITUDE PAYLOAD HOUSING FOR FUTURE SCIENTIFIC MISSIONS

Our project focuses on improving the structural integrity and functionality of a high-altitude payload designed for flights reaching 100,000 feet. This iteration prioritizes a lightweight, yet durable 3D-printed structure, ensuring airtight and water-resistant protection for internal components. While maintaining the same sensors as previous designs, enhancements include improved wiring reliability to sustain proper operation throughout the mission and the integration of a 360-degree camera for comprehensive environmental data collection. These upgrades establish a modular and robust payload housing, serving as a foundation for future scientific experiments and engineering advancements. The optimized design will be tested in extreme conditions to validate its performance and resilience in near-space environments.

Martinez, Jesus (Sophomore, Electrical Engineering, Glendale Community College). Mentor: Tim Frank, Engineering, Glendale Community College. [ASCEND-6]

COLLECTING DATA USING A PARTICLE I2C SENSOR TO TEST FOR RESIDUAL PARTICLES IN THE ARIZONA ATMOSPHERE FROM THE CALIFORNIA WILDFIRES

Team "Flight Club" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from foam-board, contained analog sensors to measure temperature, pressure, and acceleration, an I2C particle sensor, and a GPS receiver. The data collected from the particle sensor is used to test whether the pollutants released from the recent wildfires in southern California have migrated into the upper atmosphere above central Arizona. Besides these sensors, the payload also includes an Insta360 X2 camera, which provided a 360-degree view from the payload, and an Iridium Satellite modem to transmit data and the GPS location during the flight.

Martinez Castillo, Jasmine (Junior, Biosystems Engineering, University of Arizona). Mentor: Jason Corliss, Lunar and Planetary Laboratory, University of Arizona. [F-16-17]

SHIMCO SOUNDING ROCKET CONCEPT OF OPERATION AND ELECTRONICS DESIGN

The Spatial Heterodyne Interferometric Molecular Cloud Observer (SHIMCO) sounding rocket will analyze molecular hydrogen(H2) fluorescence near young OB stars in the Ophiuchi molecular cloud complex at ultra-high spectral resolution ($R>150,000$). The image data will measure temperature and other physical properties of these dense star formation regions. The mission will launch aboard a Black Brant XI sounding rocket, exceeding an altitude of 350 km during flight. This presentation will focus on the flight events and Concept of Operations (ConOps), including the use of an artificial intelligence (AI) prototype system that provides real-time analysis and suggestions in science target discrimination and acquisition/exposure time. Payload operation will be controlled via uplink commands through telemetry with a dedicated satellite link for data transmission. SHIMCO's unique electronic systems aim to improve real-time science target acquisition and the execution of flight events, to pave the way for future sounding rocket missions.

Massey, Zachary (Junior, Astronautical Engineering, Glendale Community College). Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences, Glendale Community College. [ASCEND-7]

ASCEND SPRING 2025

Team "Interdependent Researchers of Space (IRS)" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from light-weight foam-board, contained analog sensors to measure the interior and external temperatures, pressure, acceleration, and ultraviolet light, along with a GPS receiver to determine its position throughout the flight. There were also two I2C temperature sensors, whose readings were compared with those from the analog sensors. During the flight, a Runcam 2 camera recorded video. The payload also contained an Iridium Satellite modem that was programmed to transmit sensor data and GPS location every 5 minutes, with the transmissions sent to the team members emails in real-time.

Mattison, Kane (Sophomore, Aerospace Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Mayhook, Margaret (Junior, Biology, Northern Arizona University). Mentor: Alicia Rutledge, Astronomy and Planetary Science, Northern Arizona University. [D-In Title Only]

Cyanobacteria and Exopolysaccharide Growth on Martian Biocrusts

Cyanobacteria are believed to be the first prokaryotes on Earth, and are still alive today due to their simple living conditions and ability to help feed microbiomes and supply oxygen. It is suspected that life was once present on Mars, but there are no papers regarding if cyanobacteria can grow on Martian soils. In this study, we tested the ability of Cyanobacteria to grow on Mars Regolith in comparison to Earth soils, while looking at the amount of exopolysaccharides (EPS) they produce. EPS is a sticky substance, made by cyanobacteria, that helps soils stick together. We hypothesized that the amount of EPS in the soils will be larger than the amount of cyanobacteria on Martian soils. In our findings, sand textures have a better environment for EPS and cyanobacteria to grow in comparison to clay or martian regolith. Even so, the martian regolith did still have cyanobacteria and EPS growing.

Mayrend, Gabriella (First-Year, Mechanical Engineering Propulsion, Embry-Riddle Aeronautical University). Mentor: Hadi Ali, Aerospace Engineering, Embry-Riddle Aeronautical University. [F-14]

Models, Testing and Public Affairs: The Case for Crash Test Dummies

As the evolving qualities of the STEM workforce continues, it becomes important to illustrate the impact of workforce readiness on public affairs. The research question around this work is: how do models and engineering, influence public affairs in the context of safety in the aerospace industry? Safety for years has been known to rely on dummy models created in the 1950s that are modeled after the average male. Our research focuses on the development and implementation of a female crash test dummy, which has the dimensions of 4'11" and weighs 108lbs, the average American female is 5'4" and 120lbs. This project explores the role of modeling in crash testing to improve safety outcomes for occupants. We show our analysis on common injuries and the vehicle response to female anatomy in comparison to a male, which will allow us to pinpoint changes required to better make crash testing more accurate.

Maziarka, Elizabeth (Sophomore, Engineering, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

On the Design of Central Arizona College's High-Altitude Balloon Payloads

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

McCray, Aaron (Junior, Astronomy, Physics, University of Arizona). Mentor: Lon Hood, Lunar and Planetary Laboratory, University of Arizona. [B-14]

Improving Lunar Crustal Magnetic Field Maps in the South Polar Region

Precise mapping of the lunar crustal magnetic field is important for improving our understanding of its relationship with solar wind ion sputtering. These maps can help identify regions where crustal magnetic fields may reduce ion sputtering in permanently shadowed regions (PSRs), a potentially important factor for preserving water-ice in those regions. Using magnetometer data collected by the Lunar Prospector and Kaguya orbiters, this research endeavored to create reliable maps of the crustal magnetic field. The raw magnetometer data was adjusted using least-squares detrending, designed to exclude long-wavelength trends. The detrending program was edited to account for higher order polynomials, reducing lineation and RMS values. The maps were also adjusted through the addition and removal of data with the goal of reducing external field contamination, resulting in mixed effects on RMS values. Ongoing research will include additional adjustments to remove trends, updated data selection, and experimental research into ion sputtering.

Michon, Regen (Senior, Electrical Engineering, Northern Arizona University). Mentor: Subhayan De, Mechanical Engineering, Northern Arizona University. [F-4]

Artificial Intelligence and Machine Learning for Space Structures

Space structures, such as the International Space Station, consist of numerous advanced components. The behavior of these components is complex, and the properties of the materials they are composed of are often uncertain. Machine learning (ML)-based methods can be effectively used to approximate these complex space structures, enabling computationally efficient analysis and simulation. To train these ML-based models, the outermost solar panels and P3/4 truss assembly were analyzed for a potential asteroid impact across 100 realizations of the uncertain material properties using transient structural analysis. The resulting dataset was then used to train a neural network capable of approximating the deformation while accounting for uncertainty, significantly reducing the required simulation time for further realizations of the uncertain material properties with high accuracy.

Miller, Megan (Junior, Astrophysics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [A-16]

Predicting the Zodi: Hubble Space Telescope Images Need Better Zodiacal Light Models!

The Hubble Space Telescope reveals that current zodiacal light models fall short! Zodiacal light — the diffuse glow caused by sunlight scattering off interplanetary dust particles — is a major foreground component in deep-sky observations. This study uses synthetic photometry to predict zodiacal light fluxes across a range of wavelengths (0.2 to 1.6 microns) based on Hubble observations. By incorporating the ecliptic latitude of each image, this study will refine flux predictions and isolate the zodiacal component. These results can then be used to adjust the Aldering (2001) zodiacal light model, providing a more accurate representation of its structure across the sky. Ultimately, this enables a more precise estimation of the Extragalactic Background Light (EBL), once the zodiacal foreground is properly accounted for.

Miller, Ella (First-Year, Physics, Astronomy, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Mitchell, Jaxson (Senior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Cameron Williams, Mathematics, Embry-Riddle Aeronautical University. [A-5]

HARNESSING THE ΦN TRANSFORM FOR EARLY WARNING OF NEUTRON STAR-BLACK HOLE BINARY EVENTS

Gravitational waves are ripples in the fabric of spacetime produced by astrophysical events such as the merger of compact stellar objects. Ground-based detectors such as LIGO and Virgo allow us to observe these events and analyze their gravitational waves. In the era of multi-messenger astronomy, where events can be observed by gravitational and electromagnetic signals, it is vital to detect the gravitational waves well before the merger. We introduce a new method for extracting gravitational waves from neutron star–black hole (NSBH) binaries before the merger using the Φn transform and its chirp extraction techniques. We see that the analog of the power spectral density of white noise is different under the Φn transform allowing for more effective chirp extraction when properly aligned in time. Such techniques allow for the early detection of NSBH and other CBC signals. We outline how to build such an early warning detection system and triggers.

Monreal, Sierra (Sophomore, Aerospace Engineering, Astronautics, Arizona State University). Mentor: Nicholas Rolston, School of Electrical, Computer, and Energy Engineering, Arizona State University. [G-7]

INVESTIGATION OF FLEXIBLE PEROVSKITE SOLAR CELLS FOR SPACE APPLICATIONS

Perovskite solar cells (PSCs) using metal halide perovskites (MHPs) are a promising next-generation photovoltaic technology, particularly for space applications due to their radiation tolerance. To facilitate their deployment, PSCs must be lightweight, adaptable, and transportable, making flexible substrates essential. MHPs offer benefits over traditional silicon-based solar cells, including cost-effectiveness and greater robustness. Additionally, PSCs have demonstrated self-healing properties in specific space environments, increasing their viability. While most PSCs are fabricated on rigid substrates, this research focuses on developing methodologies for processing thin MHP films on flexible substrates using ink-based solution techniques. Optical microscopy ensures film uniformity, while photoluminescence spectroscopy verifies phase integrity by measuring wavelength and band gap. Future efforts will adapt these techniques for PSC fabrication and explore their stability and self-healing mechanisms under simulated space conditions, including exposure to intense radiation and temperature fluctuations, ensuring their effectiveness for extraterrestrial applications.

Moore, James (Sophomore, Civil Engineering, Sustainability, Arizona State University). Mentor: Eric Stribling, ASU Interplanetary Initiative, Arizona State University. [C-2]

THE DEVELOPMENT PROCESS OF EDUCATIONAL SPACE FOCUSED ENTERTAINMENT

With recent developments in the space sector, it becomes increasingly important to be well informed about what is going on. Easy access to this information is the key to a future filled with students and workers who are invested and ready to engage in the space sector. Programs like “Space for Humans” are bridging the gap for people who may be on the verge of starting a career in space. Informing and encouraging people to look more into what is happening in the space currently and sometimes the history of how we got there. This presentation is an overview of the development and processes involved in creating educational space content. This particular project focuses on an overview of the DARPA LunA-10 Program.

Morton, Lucienne (Junior, Geology, Northern Arizona University). Mentor: Timothy Titus, USGS Astrogeology Center, United States Geological Survey. [B-2]

POST-ASTEROID-IMPACT DOWNSTREAM FLOODING HAZARDS

Humanity’s level of asteroid impact recovery planning relies on our knowledge of how this hazard may develop over time, meaning we need to understand both the immediate and delayed effects associated with such an event. This work focuses on downstream flooding risk post-impact by adopting a timeline similar to the more common wildfire-flood sequence. We examine four impact locations derived from the 2025 Planetary Defense Conference risk corridor: South Africa, Angola, DR Congo, and Romania. This is done by using GeoClaw, a physics-based flood model, to simulate flooding in each location at a most-likely and worst-case scenario (based on historical precipitation). This modeled flood risk is compared to population to estimate hazard exposure and loss of life in the various scenarios. Emphasis is placed on how location, thermal damage size, and proximity to large population centers influence these estimates, and what that means for potential recovery paths.

Mountz, Elijah (High School Student, Software Development, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

ON THE DESIGN OF CENTRAL ARIZONA COLLEGE'S HIGH-ALTITUDE BALLOON PAYLOADS

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

Murphy, Lucas (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Darrel Smith, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-1]

ENERGY DISTRIBUTION OF COSMIC RAYS IN ERAU PRESCOTT

The Coherent CAPTAIN-Mills detector at Los Alamos National Laboratory is setting new limits to the mass of light dark matter. At the Embry-Riddle campus in Prescott, Arizona, we are assembling 4 Cosmic Watch Detectors (CWDs) to be used as a trigger for our 5-gallon scintillator detector to observe Michel electrons from stopping cosmic muons. Triggering events in a column in the middle of the detector will ensure event locations where the Michel electron light is completely captured. The kinetic energies of the Michel electrons will be plotted and compared to the theoretical distribution to determine the energy scale's upper limit. This will allow the detector to act as a model for other universities supporting the search for dark matter. Future applications of the CWDs include determining the flux and energy as a function of the zenith angle at our location in Prescott, Arizona(34.54 degrees latitude).

Murray, Hailey (Senior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-In Title Only]

BLACK HOLE SOLUTIONS WITH SPACETIME-SYMMERTY BREAKING

There is widespread interest in studying hypothetical Lorentz violation. Recent work has shown there could be interesting signals in strong gravitational fields. In this talk I discuss recent work in black holes with Lorentz violation. I examine modified Einstein Maxwell field equations with a Reissner Nordström metric and develop coupled differential equations that describe the gravitational field. I present both numerical solutions and analytic solutions for special cases as well as beginning investigation into null geodesic trajectories around the black hole.

Muza, Marquis (Sophomore, Web Development, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

STUDYING RADIATION IN UPPER ATMOSPHERE

The Phoenix College NASA ASCEND team has long been involved in launch activities, with a large focus on improving the fabrication techniques and design quality of our carbon fiber-based vehicle. To that end, for our current payload, we have designed a new chassis that shaves weight by ~40% compared to our previous chassis. Incorporated into our payload are two Geiger counters: one for recording beta and gamma radiation across different altitudes and the other for neutron detection in order to ascertain the Pfotzer-Regener maximum. We have also incorporated four UV sensors to accurately record UV radiation at different altitudes. Additionally, we've utilized a thermistor-based heating circuit on our payload in order to keep our camera and other specific components at an optimal temperature during flight, ensuring said components function properly in spite of low temperatures in the upper atmosphere.

Navarro, Roberto (Sophomore, Mechanical Engineering, Pima Community College). Mentors: AnnMarie Condes, Science and Engineering; Ross Waldrip, Science, Pima Community College. [ASCEND-9]

RELIABLE AND SUSTAINABLE OBSERVATIONS IN ATMOSPHERIC RESEARCH

Atmospheric research is a key component in understanding our global environment. Understanding how we can collect data to further understand our environment is essential. Sustainability includes reusing hardware to have equivalent outcomes. A goal of this project is to collect atmospheric data with multiple launches to support the accuracy of data and components that have been exposed to outer atmosphere conditions. Currently the investigation is 4 flights which include: the main body and the electronics, sensors, and experimental data. The CubeSat design was selected for its ease of design and PLA used for the CubeSat which is an area of investigation based on PLA is considered an inferior material in which we are testing. We have found that PLA is satisfactory based on our testing and design. This research will aid both in tracking atmospheric trends and in long-term recycling and sustained use of components in high-altitude experimentations.

Nelson, Hailey (Senior, Astrophysics, Chemistry, French, Arizona State University). Mentor: Scott Sayres, School of Molecular Sciences, Arizona State University. [A-26]

EXPLORING THE FOUNDATION OF LIFE IN THE UNIVERSE WITH ULTRAFAST DYNAMICS

Amino acids are the building blocks of all proteins in the human body. Scientists have confirmed the presence of amino acids on asteroids and hypothesize that they crash-landed on Earth and kick-started complex life. However, the transition from basic amino acids into complex life is still unknown. Neutral-form amino acids are unable to facilitate bond formation, however, in the presence of water molecules, they become charge-separated, allowing for the necessary bond formation to create complex life. This project utilizes femtosecond pump-probe spectroscopy coupled with mass spectrometry to investigate fundamental bond formation in space-like conditions. The ultrafast peptide forming dynamics with a varying number of surrounding water molecules can be individually analyzed, providing crucial information for determining the conditions for protein formation in space.

Nielsen, Tyler (Junior, Computer Systems Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility, setting a new standard for student-built aerospace payloads.

Nirwan, Nidhi (Junior, Biomedicine, Arizona State University). Mentor: Meenakshi Wadhwa, School of Earth and Space Exploration, Arizona State University. [B-6]

PETROGRAPHY OF NEW BASALTIC SHERGOTTITE NORTHWEST AFRICA 17234

Martian meteorites can tell us about the history of the planet and its different processes. There are three main groups of Martian meteorites: Shergottites, Nakhlites, and Chassignites. This project looks into the petrography of a new basaltic shergottite: Northwest Africa 17234, with an ongoing goal of constraining the petrogenesis of the meteorite.

The ASU JEOL JXA-8530F electron microprobe was used to conduct EDS and WDS analyses, along with x-ray intensity mapping. With the data gathered from these analyses, this study produced detailed petrology and geochemistry results of the meteorite, and an official classification as well. This study was also able to give a possible formation history of the meteorite, shock estimates, and pairing to other Martian meteorites that have previously been classified.

Noble, Bruce (Senior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University. [F-5-6]

EAGLESAT 2

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 Lunch Initiative, and aligin with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. EagleSat 2's mission is to study the effects of solar radiation of various types of Random Access Memory (RAM). Development of EagleSat 2 was completed in December 2024 and is currently being integrated with the NG-22 resupply mission to the International Space Station (ISS). Once deployed, communication with the satellite will be established using the EagleSat ground station and the SatNogs network.

Nuno, Santiago (Sophomore, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Yabin Liao, Aerospace Engineering, Embry-Riddle Aeronautical University. [ASCEND-5]

ERAU ASCEND! COLLECTION AND TRANSMISSION OF UPPER ATMOSPHERIC DATA

For decades, weather balloons have provided means for collecting data at every level of the atmosphere. Because they can not be tethered, high-altitude balloons must float freely and risk total data loss if they are not recovered. This project aims to increase the reliability of data collection by transmitting telemetry and sensor data to a ground station with a tracking, high gain antenna. A GPS unit was placed on the payload and transmits coordinates and altitude over the 915 MHz LoRa band, utilizing omnidirectional dipole antennas for transmission and reception. The ground station uses these coordinates and Vincenty's formulae to compute the range and azimuth along which the ground station points. Elevation is calculated using altitude and range to account for the curvature of the Earth. The results will demonstrate that data transmission is possible, while the atmospheric data collected can be compared to existing data to benefit the field.

Okafor, Nathaniel (Sophomore, Network and System Administration, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

STUDYING RADIATION IN UPPER ATMOSPHERE

The Phoenix College NASA ASCEND team has long been involved in launch activities, focusing on improving our carbon fiber-based vehicle's fabrication techniques and design quality. To that end, for our current payload, we have designed a new chassis that shaves weight by ~40% compared to our previous chassis. Incorporated into our payload are two Geiger counters: one for recording beta and gamma radiation across different altitudes and the other for neutron detection to ascertain the Pfotzer-Regener maximum. We have also incorporated four UV sensors to record UV radiation at different altitudes accurately. Additionally, we've utilized a thermistor-based heating circuit on our payload to keep our camera and other specific components at an optimal temperature during flight, ensuring said components function properly despite low temperatures in the upper atmosphere.

Oler, Natasha (Senior, Aerospace Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Olin, Isabella (Senior, Astronomy, University of Arizona). Mentor: Stephanie Juneau, NOIRLab. [A-13]

GALAXY EVOLUTION: INVESTIGATING PATHS OF REDDENING THROUGH MACHINE LEARNING MODELS

As galaxies evolve, they may redden due to decreasing star formation (becoming passive) or dust. Can we use machine learning models to categorize different paths of reddening? We apply dimensionality reduction algorithms to galaxies' spectra and ultimately reduce them to a 2D projection, allowing us to visually identify trends, such as an overall gradient from star-forming to passive galaxies. When analyzing properties (dust content, stellar mass, etc.) of galaxies along the gradient to identify evolutionary paths, we noted a subgroup of outliers within the passive region. We then investigate the subgroup through color images, and hypothesize they are a collection of mostly dusty, edge-on disks with higher active star formation than the surrounding passive galaxies. To confirm these suspicions, we combine the spectra of 1300 outlier galaxies and compare them to a stack of 2086 passive control galaxies, modeling these stacks to infer physical properties of the galaxies' stellar populations.

Ontiveros, Ricardo (Senior, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Ortega, Andrew (Senior, Mathematics/Computer Science, Northern Arizona University). Mentor: Kayode Oshinubi, School of Informatics, Computing & Cyber Systems, Northern Arizona University. [H-2]

BUILDING COMPUTATIONAL MODELS TO UNDERSTAND THE INTERPLAY BETWEEN CLIMATIC FACTORS, MOBILITY, AND VECTOR-BORNE DISEASE DYNAMICS

This project simulates how local climate factors affect mosquito populations and the spread of West Nile Virus (WNV) in Maricopa County, Arizona, with emphasis on how mosquitoes and bird populations are impacted. We focused on two spatial scales: county-wide and five subcounty locations. Using a climate-driven mathematical model with 2014 temperature and precipitation data, we analyzed how climate influences mosquito populations and WNV transmission. The simulation accounted for both mosquito and bird populations, exploring the spread of WNV with and without vector movement. The models were created with Epymorph, a new software system that integrates census data, climate data, population information, and manually adjusted parameters. Our simulation framework effectively captured mosquito population dynamics and WNV transmission patterns. This study aims to advance understanding of WNV transmission in humans within Maricopa County and provide insights into the role of climate in disease spread.

Ortelli, Lara (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Cameron Williams, Mathematics, Embry-Riddle Aeronautical University. [A-5]

HARNESSING THE Φn TRANSFORM FOR EARLY WARNING OF NEUTRON STAR-BLACK HOLE BINARY EVENTS

Gravitational waves are ripples in the fabric of spacetime produced by astrophysical events such as the merger of compact stellar objects. Ground-based detectors such as LIGO and Virgo allow us to observe these events and analyze their gravitational waves. In the era of multi-messenger astronomy, where events can be observed by gravitational and electromagnetic signals, it is vital to detect the gravitational waves well before the merger. We introduce a new method for extracting gravitational waves from neutron star–black hole (NSBH) binaries before the merger using the Φn transform and its chirp extraction techniques. We see that the analog of the power spectral density of white noise is different under the Φn transform allowing for more effective chirp extraction when properly aligned in time. Such techniques allow for the early detection of NSBH and other CBC signals. We outline how to build such an early warning detection system and triggers.

Ozatay, Ela (Junior, Aerospace Engineering, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University. [F-5-6]

EAGLESAT 2

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 Lunch Initiative, and aligin with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. EagleSat 2's mission is to study the effects of solar radiation of various types of Random Access Memory (RAM). Development of EagleSat 2 was completed in December 2024 and is currently being integrated with the NG-22 resupply mission to the International Space Station (ISS). Once deployed, communication with the satellite will be established using the EagleSat ground station and the SatNogs network.

Pagliuca, Mia (Junior, Mechanical Engineering, Glendale Community College). Mentor: Tim Frank, Engineering, Glendale Community College. [ASCEND-6]

FLIGHT CLUB'S ATMOSPHERIC MISSION

Team "Flight Club" is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from foam-board, contained analog sensors to measure temperature, pressure, and acceleration, an I2C particle sensor, and a GPS receiver. The data collected from the particle sensor is used to test whether the pollutants released from the recent wildfires in southern California have migrated into the upper atmosphere above central Arizona. Besides these sensors, the payload also includes an Insta360 X2 camera, which provided a 360-degree view from the payload, and an Iridium Satellite modem to transmit data and the GPS location during the flight.

Paredes Aguilar, Karla (Senior, Planetary Geoscience, University of Arizona). Mentor: Dante Lauretta, Planetary Sciences, University of Arizona. [B-10]

TERRESTRIAL ALKALINE LAKES AS ANALOGS FOR EXTRATERRESTRIAL AQUEOUS ENVIRONMENTS

Alkaline lakes serve as terrestrial analogs for extraterrestrial aqueous environments, offering insights into mineral formation and prebiotic chemistry relevant to astrobiology. This study investigates the geochemical and mineralogical evolution of Last Chance Lake to understand aqueous mineral formation in soda lakes and its implications for planetary bodies like Bennu. Water and evaporite samples were analyzed using XRD, ICP-MS, and spectroscopic techniques to identify mineral phases and elemental abundances. Additionally, controlled evaporation experiments simulated mineral precipitation dynamics. We identified mineral phases also found in Bennu and Ryugu samples, and our experiments confirmed phosphorus concentrations within the lake system. These findings enhance our understanding of carbonate and sulfate mineral stability, informing models of past aqueous environments on planetary bodies and their potential to preserve biosignatures.

Perivolotis, Jakob (Senior, Astrophysics, Arizona State University). Mentor: Rogier Windhorst, School of Earth and Space Exploration, Arizona State University. [A-12]

DETECTING OVERLOOKED HIGH REDSHIFT CAUSTIC TRANSIENTS IN MACS J0416.1-2403

The James Webb Space Telescope (JWST) provides unparalleled precision and detail for infrared time domain observations. Its exceptional capabilities open new avenues in high redshift transit detection, potentially revealing some of the first structures in the universe. We leverage JWST's keen eyes and the magnifying effect of massive foreground clusters to search for overlooked high redshift caustic transits in the MACS J0416.1-2403 field. After examining three previously surveyed epochs, no new caustic transients were discovered. Upper limits on the cadence of these events will be established using previously identified transients. Since no new transients were visually detected, a new effort is underway to identify unresolved caustic transients. This involves masking known transients and bright sources in stacked epochs, then integrating around critical curves to analyze flux variance compared to nearby regions. Unresolved transients may be revealed through the dispersion of pixel values.

Perry, Brendan (Senior, Mechanical Engineering, University of Arizona). Mentor: Bernard Parent, Aerospace and Mechanical Engineering, University of Arizona. [F-7]

ELECTRODELESS LOCAL FORCE GENERATOR USING MAGNETOHYDRODYNAMICS FOR AEROCAPTURE

Aerocapture is a fuel-efficient technique for spacecraft trajectory control that uses a planet’s atmosphere to decelerate and maneuver a vehicle without additional propellant. This study investigates aerocapture techniques using magnetohydrodynamic (MHD) interactions with the ionized gas surrounding a spacecraft during atmospheric entry. Specifically, an electrodeless force generator is analyzed, where the MHD interactions occur through only a magnetic field from the spacecraft. Numerical analysis is conducted using CFDWARP, an advanced Computational Fluid Dynamics (CFD) solver developed at the University of Arizona. A multi-block 3D spacecraft mesh enables full flow-field analysis, incorporating electromagnetic effects to evaluate how an electrodeless system influences the lift and drag forces acting on a re-entry vehicle returning to Earth. The findings from this study could significantly improve satellite guidance and control, cislunar missions, and missions returning from other planets by reducing fuel consumption and enhancing maneuverability.

Philippou, Karston (Sophomore, Electrical Engineering, Glendale Community College). Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences, Glendale Community College. [ASCEND-7]

INTERDEPENDENT RESEARCHERS OF SPACE PAYLOAD LAUNCH

Team “Interdependent Researchers of Space (IRS)” is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from light-weight foam-board, contained analog sensors to measure the interior and external temperatures, pressure, acceleration, and ultraviolet light, along with a GPS receiver to determine its position throughout the flight. There were also two I2C temperature sensors, whose readings were compared with those from the analog sensors. During the flight, a Runcam 2 camera recorded video. The payload also contained an Iridium Satellite modem that was programmed to transmit sensor data and GPS location every 5 minutes, with the transmissions sent to the team members emails in real-time.

Phippen, Sam (Junior, Geology, Northern Arizona University). Mentor: Sarah Black, USGS Astrogeology Center, United States Geological Survey. [B-5]

CONSTRUCTING A COMPREHENSIVE DATABASE OF PLANETARY MAPS

Geologic and geology themed maps of planetary surfaces are some of the most crucial materials in viewing and interpreting planets throughout the solar system. They allow users to view various geologic units, contacts, and topography across a given area to later use to form interpretations about the planet’s history and evolution. To date, the main avenues for accessing planetary maps are either the USGS Planetary Mapping Program website, or various scientific journals. With no single source containing all published planetary maps, there is difficulty throughout the community in finding effective ways to search for and examine such materials. To combat this problem, this project aims to create a comprehensive, searchable database of planetary maps of Mercury, Venus, the Moon, and Mars using ArcGIS Pro mapping software. After completing this work, the project will extend to the outer planets of the solar system.

Picht, Claire (Senior, Mechanical Engineering, Embry-Riddle Aeronautical University). Mentor: Kathryn Wesson, College of Engineering, Embry-Riddle Aeronautical University. [F-1-2]

EXPLORATION OF MODEL-BASED SYSTEMS ENGINEERING METHODOLOGIES FOR MODELING PRE-EXISTING SYSTEMS

As system complexity increases, intricate and interdisciplinary problems emerge. The document-based approach to systems engineering has regressed from an organized regulatory process to an incoherent labyrinth of document. Currently, Model-Based Systems Engineering (MBSE) is uniquely implemented to generate systems top-down; contrarily, experts in industry typically have a functional system which needs to be upgraded or altered. The purpose of this research project is to establish a method that can be used to adapt the MagicGrid framework for use in modeling preexisting systems. Our research resulted in the Modified Meet-in-the-Middle Methodology, M5. The process facilitates the transition from an as-is product to a to-be evolution by creating a semi-formal, descriptive, verification model. By tailoring the MagicGrid framework into a Meet-in-the-Middle concept, teams can begin to tackle modeling complex as-is systems and driving new design through MBSE and gain efficiency when executing the system lifecycle.

Pierson, Ethan (Sophomore, Mathematics, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

STUDYING RADIATION IN UPPER ATMOSPHERE

The Phoenix College NASA ASCEND team has long been involved in launch activities, with a large focus on improving the fabrication techniques and design quality of our carbon fiber based vehicle. To that end, for our current payload we have designed a new chassis that shaves weight by ~40% compared to our previous chassis. Incorporated into our payload are two Geiger counters: one for recording beta and gamma radiation across different altitudes and the other for neutron detection in order to ascertain the Pfotzer-Regener maximum. We have also incorporated four UV sensors to accurately record UV radiation at different altitudes. Additionally, we've utilized a thermistor based heating circuit on our payload in order to keep our camera and other specific components at an optimal temperature during flight, ensuring said components function properly in spite of low temperatures in the upper atmosphere.

Posey, Peyton (High School Student, Computer Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Pulliam, Kadin (Senior, Astrobiology, Biogeoscience, Arizona State University). Mentor: Elizabeth Trembath-Reichert, School of Earth and Space Exploration, Arizona State University. [D-9]

EXPLORING THE DYNAMICS OF CELL MORPHOLOGY AND ORGANIC CARBON CONCENTRATION

Microscopic life lives in dynamic environments and adapts to survive. By studying the physical adaptations microbes utilize in response to changing conditions, we better understand how life can adapt to extreme environments on other planetary bodies. Soil bacterium Pseudomonas putida was chosen for this investigation because of its capacity to regulate cell size and shape. The conditions of nutrient availability and temperature were chosen due to their impacts on habitability. To illuminate the connection between cell physicality with changing organic carbon concentration and temperature, cell cultures were grown in varied media and analyzed. The physicality of cells was quantified by staining samples for cell counts and measurements using fluorescence microscopy and DAIME, an image analysis software. Measurements found no significant differences in cell size in 30 oC carbon ideal samples, significant differences in cell size in 15 and 30 oC carbon limited samples, and in 15 oC carbon ideal conditions.

Rajopadhye, Aseem (Junior, Astrobiology, Biogeosciences, Arizona State University). Mentor: Ariel Anbar, School of Earth and Space Exploration, Arizona State University. [D-13]

BARBERTON GREENSTONE SHALE XRD ANALYSIS

The study examines the composition of minerals present within 3.2-billion-year-old shale samples from the Barberton Greenstone Belt (BARB5). The research aims to determine whether molybdenum enrichments observed at varying depths and samples in the BARB5 core can be associated with differences in mineralogical composition between samples using X-Ray Diffraction (XRD). Samples were powdered and analyzed using a PANalytical XRD machine, followed by processing using HighScore XRD Analysis Software. The findings indicate no clear correlation between major mineral components and molybdenum concentrations, though the composition of trace minerals present remains inconclusive. Future studies with improved identification of minor minerals, potentially using electron microscopy or Raman spectroscopy analysis, may provide further insights into potential trace mineralogical relationships with molybdenum enrichment.

Resendiz, Ashby (Senior, Engineering, Arizona Western College). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

OPTIMIZING HIGH-ALTITUDE PAYLOAD HOUSING FOR FUTURE SCIENTIFIC MISSIONS

Our project focuses on improving the structural integrity and functionality of a high-altitude payload designed for flights reaching 100,000 feet. This iteration prioritizes a lightweight, yet durable 3D-printed structure, ensuring airtight and water-resistant protection for internal components. While maintaining the same sensors as previous designs, enhancements include improved wiring reliability to sustain proper operation throughout the mission and the integration of a 360-degree camera for comprehensive environmental data collection. These upgrades establish a modular and robust payload housing, serving as a foundation for future scientific experiments and engineering advancements. The optimized design will be tested in extreme conditions to validate its performance and resilience in near-space environments.

Reyes Villa, Alejandro (Junior, Aerospace Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Reynolds, Andrew (Senior, Aerospace Engineering, Astronautics, Embry-Riddle Aeronautical University). Mentor: Kathryn Wesson, College of Engineering, Embry-Riddle Aeronautical University. [F-1-2]

EXPLORATION OF MODEL-BASED SYSTEMS ENGINEERING METHODOLOGIES FOR MODELING PRE-EXISTING SYSTEMS

As system complexity increases, intricate and interdisciplinary problems emerge. The document-based approach to systems engineering has regressed from an organized regulatory process to an incoherent labyrinth of document. Currently, Model-Based Systems Engineering (MBSE) is uniquely implemented to generate systems top-down; contrarily, experts in industry typically have a functional system which needs to be upgraded or altered. The purpose of this research project is to establish a method that can be used to adapt the MagicGrid framework for use in modeling preexisting systems. Our research resulted in the Modified Meet-in-the-Middle Methodology, M5. The process facilitates the transition from an as-is product to a to-be evolution by creating a semi-formal, descriptive, verification model. By tailoring the MagicGrid framework into a Meet-in-the-Middle concept, teams can begin to tackle modeling complex as-is systems and driving new design through MBSE and gain efficiency when executing the system lifecycle.

Ribaudo, Joseph (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University. [F-5-6]

EAGLESAT 2

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 Lunch Initiative, and aligin with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. EagleSat 2's mission is to study the effects of solar radiation of various types of Random Access Memory (RAM). Development of EagleSat 2 was completed in December 2024 and is currently being integrated with the NG-22 resupply mission to the International Space Station (ISS). Once deployed, communication with the satellite will be established using the EagleSat ground station and the SatNogs network.

Rodgers, Hailianna (High School Student, Computer Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

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Rojas, Leonardo (Junior, Mechanical Engineering, Northern Arizona University). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

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Ropati, Tye (Junior, Geological Sciences, Arizona State University). Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University. [D-19]

FAN AND FILL IN THE SAFFORD BASIN

The sedimentary rocks of the Safford basin record the transition from closed, internally-drained basins (created by Basin and Range extensional tectonics) to integrated river systems associated with significant incision of basin fill deposits. The basin fill is characterized by a thick sequence of fine sands, muds, and carbonates, and is capped by a thin layer of boulders/gravels. This project tests the long-standing hypothesis—that the change in facies reflects an important climate change—as well as evaluates the alternative hypothesis—that the change instead reflects a depositional response to waning basin subsidence and decreasing accommodation space. Through both GIS analysis and fieldwork, the facies transition between basin fill and alluvial fan deposits will be identified and mapped along the flank of the Pinaleno mountains. This project plays a small role in examining the paleoclimate of Arizona, which is essential to understanding landscape response to both past and present climate shifts.

Roy, Supriya (Sophomore, Optical Sciences and Engineering, University of Arizona). Mentor: Travis Sawyer, Wyant College of Optical Sciences, University of Arizona. [G-1]

DISCOVERING OPTICAL IMAGING BIOMARKERS FOR EARLY DETECTION OF GASTROINTESTINAL CANCERS

Gastrointestinal cancers affect millions of people per year worldwide. On average, fewer than 20% of patients live longer than 5 years after diagnosis, largely because current diagnostic approaches using white light and endoscopy are only effective for detecting late-stage cancer. Our work focuses on testing emerging optical techniques such as label-free imaging to provide noninvasive methods for early detection of cancer by sensing naturally occurring biomarkers that are altered at the onset of disease. Tissue optical signature characterization is accomplished by generating a dataset of tissue images using optical coherence tomography (OCT), which visualizes structural differences in tissues. Image analysis techniques are then used to determine which imaging biomarkers are most indicative of disease. We hypothesize that quantifying image texture in OCT images will provide high sensitivity to tissue changes that occur during the onset of esophageal cancer, allowing for early diagnosis and treatment with the potential to improve survival.

Sanchez, Rafael (Sophomore, Mechanical Engineering, Phoenix College). Mentor: Eddie Ong, Physical Sciences, Phoenix College. [ASCEND-8]

STUDYING RADIATION IN UPPER ATMOSPHERE

The Phoenix College NASA ASCEND team has long been involved in launch activities, with a large focus on improving the fabrication techniques and design quality of our carbon fiber based vehicle. To that end, for our current payload we have designed a new chassis that shaves weight by ~40% compared to our previous chassis. Incorporated into our payload are two Geiger counters: one for recording beta and gamma radiation across different altitudes and the other for neutron detection in order to ascertain the Pfotzer-Regener maximum. We have also incorporated four UV sensors to accurately record UV radiation at different altitudes. Additionally, we've utilized a thermistor based heating circuit on our payload in order to keep our camera and other specific components at an optimal temperature during flight, ensuring said components function properly in spite of low temperatures in the upper atmosphere.

Sarabia, Lizbeth (Sophomore, Civil Engineering, Arizona Western College). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

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Saville, Embrey (Senior, Chemistry, Northern Arizona University). Mentor: Anita Antoninka, School of Forestry, Northern Arizona University. [D-4]

Biological Soil Crust as a Nature-Based Solution for Radionuclide Immobilization and Reclamation of Abandoned Uranium Mines on the Navajo Nation

Abandoned uranium mines (AUM) on the Navajo Nation pose environmental and health risks from heavy metal contamination. Traditional cleanup methods are costly and disruptive, highlighting the need for alternatives. Biocrusts, which produce extracellular polymeric substances (EPS), may help immobilize metals through adsorption, binding, and biomineralization. This study examines biocrust potential for remediation in a controlled greenhouse setting. Soil samples with different uranium and arsenic levels were collected from an AUM in Cameron, AZ, and a full factorial experiment testing biocrust inoculation, soil origin, and water treatments was completed. Soil extraction will be completed for EPS quantification and ICP-MS/MS metal concentration analysis. Anticipated results include metal immobilization by EPS with higher metal concentrations leading to a decreased sequestration rate due to contaminant toxicity and increased movement of soluble metals with higher water addition. Post-experiment analysis will be completed to assess its effectiveness as a nature-based solution for metal reclamation.

Schuetz, Blake (Junior, Space Physics, Embry-Riddle Aeronautical University). Mentor: Darrel Smith, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-1]

Energy Distribution of Cosmic Rays in ERAU Prescott

The Coherent CAPTAIN-Mills detector at Los Alamos National Laboratory is setting new limits to the mass of light dark matter. At the Embry-Riddle campus in Prescott, Arizona, we are assembling 4 Cosmic Watch Detectors (CWDs) to be used as a trigger for our 5-gallon scintillator detector to observe Michel electrons from stopping cosmic muons. Triggering events in a column in the middle of the detector will ensure event locations where the Michel electron light is completely captured. The kinetic energies of the Michel electrons will be plotted and compared to the theoretical distribution to determine the energy scale's upper limit. This will allow the detector to act as a model for other universities supporting the search for dark matter. Future applications of the CWDs include determining the flux and energy as a function of the zenith angle at our location in Prescott, Arizona(34.54 degrees latitude).

Shchetinin, Philipp (First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University). Mentor: Catalina Aranzazu-Suescun, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. [F-10-11]

Radio Frequency Identification Security for IoT Airport Infrastructure

Radio Frequency Identification (RFID) technology is used in airports to track passengers, employees, and luggage. For employees, it controls access to restricted areas based on their roles and permissions. For passengers, RFID tracks and authenticates them throughout airport processes. RFID also plays a key role in luggage tracking, addressing the growing issue of misplaced or lost baggage. This project focuses on developing an IoT-based RFID luggage tracking system to improve luggage management and reduce such incidents. The project aims to enhance the security of RFID IoT systems through four phases. First, an RFID IoT infrastructure testbed was created to assess functionality. Second, a vulnerability assessment identified potential weaknesses in the system. Third, simulated cyberattacks tested the system's integrity and availability under threat. Finally, based on these findings, tailored security recommendations were proposed to strengthen the system's defenses. This approach helps mitigate risks and ensures the system's resilience against cyber threats.

Shepard, Els (Sophomore, Aerospace Engineering, Arizona State University). Mentor: Maitrayee Bose, School of Earth and Space Exploration, Arizona State University. [A-3]

COMPARISON OF THREE-DIMENSIONAL SUPERNOVA MODELS AND STARDUST COMPOSITIONS

We examine outputs of three-dimensional supernova models consisting of location, temperature, and isotopic information for four progenitor stars: (1) a 15 $M_\odot$ asymmetric supernova, (2) a 15 $M_\odot$ symmetric supernova, (3) a 20 $M_\odot$ asymmetric supernova, and (4) a 15 $M_\odot$ supernova accounting for deep convection. We generate delta magnesium isotopes for each model and compare stardust data available in the literature. Plotting δ26Mg and δ25Mg, Models (1) and (2) yield a line with slope ~1 and a loop enriched in δ25Mg and depleted in δ26Mg. Model (3) yields a curve with higher δ25Mg than normal grains. Model (4) yields a line with slope ~1 and no anomalies. Trends in δ26Mg and δ25Mg vary depending on the progenitor star; Model (2) produces the best fit with anomalous Group 1 silicates. The goal of this work is to clarify the origins of silicate and oxide presolar grains with anomalous Mg compositions.

Short, Aleah (Junior, Physics, Astronomy, University of Arizona). Mentor: Christopher Walker, Astronomy, University of Arizona. [A-2]

USING PDR MODELING TOOLS TO SIMULATE SPECTROSCOPIC OBSERVATIONS FROM GUSTO

The evolution of galaxies is driven by the interactions between the clouds of gas and the stars within them. In early 2024, NASA's GUSTO mission completed a two-month flight in the stratosphere above Antarctica where it mapped large regions of our Milky Way galaxy and the nearby Large Magellanic Cloud in ionized carbon and nitrogen. Many of these areas are classified as photodissociation regions (PDRs). These are regions where the physics is dominated by high-energy UV photons from high mass stars. Using modeling programs such as RADEX, PDR Toolkit, and CLOUDY, we are able to simulate the behavior of carbon and other molecules in these regions under varying conditions, e.g., UV-flux, density, and temperature. Spectroscopic observations from GUSTO are being used to constrain these models and thereby provide insight into the nature and physical conditions within these clouds.

Shoulders, Jacob (Sophomore, Biomedical Science, Northern Arizona University). Mentor: Stephanie Hurst, Chemistry and Biochemistry, Northern Arizona University. [B-9]

SYNTHETIC APPROACHES TO CREATING HOLE TRANSPORT MATERIALS

This project focused on a hole transport layer called Spiro-MeOTAD for use in perovskite X-ray detectors. This precursor compound was synthesized utilizing different formulated strategies, with the preferred method being the bromination of the 9H-fluoren-9-one reagent to give 2,7-Dibromo-9-fluorenone (Compound 1). Compound 1 was used to synthesize the brominated Spiro product that opens a multitude of applications. The synthesized complexes were characterized via multidimensional NMR and UV-Vis spectroscopy to confirm the synthesis and plan further experimental approaches.

Sink, Josh (Junior, Aerospace Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

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Smith, Cade (Junior, Computer Science, University of Arizona). Mentor: Pierre Haenecour, Lunar and Planetary Laboratory, University of Arizona. [B-3]

COMPARATIVE MINERALOGY AND CHEMISTRY OF BENNU AND OUED CHEBEIKA 002

Samples from carbonaceous asteroids, such as those from Bennu returned by the OSIRIS-REx mission, provide insight into the primordial building blocks of planets and the delivery of prebiotic compounds and essential elements that may have sparked life on early Earth. Our project utilizes coordinated optical and electron microscopy to investigate the chemistry and mineralogy of three Bennu samples, comparing them to Oued Chebeika 002—a newly discovered CI meteorite that closely resembles Bennu. Our initial results indicate that, while both samples are rich in iron-sulfides with compositions consistent with pyrrhotite, the Bennu samples appear to contain a higher abundance of carbonaceous material. Additionally, Bennu samples often contain higher abundances of Cr-, Ti- and/or Ni-bearing phases than Oued Chebeika 002. Comparing these samples will enhance our understanding of the formation and evolution of carbonaceous asteroids in the early solar system.

Smith, Savannah (Senior, Astronomy, University of Arizona). Mentor: Andrew Ryan, Lunar and Planetary Laboratory, University of Arizona. [B-8]

AN ANALYSIS OF THE PARTICLE SIZE FREQUENCY DISTRIBUTION OF AN AGGREGATE BENNU SAMPLE

The OSIRIS-REx mission returned a sample of near-Earth asteroid (101955) Bennu to improve our understanding of our solar system's formation and evolution. This project examined a 6.4-gram aggregate sample consisting of smaller grains from Bennu’s surface, ranging from less than 17 microns to approximately 5 millimeters. The size of these grains was analyzed and compared to previously studied larger grains and size frequency distribution surveys of other asteroids. Image processing software Ilastik was used for grain segmentation through a Random Forest machine learning algorithm trained on user annotations. The computational analysis of the grain size was conducted using Python SciPy libraries, followed by the generation of a particle size frequency distribution (PSFD). These findings expand our understanding of Bennu’s surface evolution and how the sample may have been altered by agitation during sample collection and Earth return.

Smith, Audrey (Sophomore, Astronomy, Northern Arizona University). Mentor: Will Grundy, Astronomy and Planetary Science, Northern Arizona University. [B-23]

INVESTIGATION OF THE ROLE OF VAPOR PRESSURE DIFFERENCES BETWEEN H_2O AND D_2O

Investigate the role of vapor pressure differences between H_2O and D_2O in the sublimation and 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 to D_2O. The vapor pressure of these isotopologues influences sublimation rates, outgassing processes, and deuterium-to-hydrogen (D/H) ratios. We are using a quartz crystal microbalance to measure the sublimation flux of these volatile ices in the free molecular flow regime. D_2O has a lower vapor pressure than H_2O, leading to preferential sublimation of H_2O ice. This process affects the observed D/H ratios and may contribute to isotopic fractionation.

Sorensen, Anneli (Sophomore, Aerospace Astronautical Engineering, Arizona State University). Mentor: Steve Desch, School of Earth and Space Exploration, Arizona State University. [D-18]

OPTIMIZING ARCTIC ICE PRESERVATION

This study identifies optimal locations for effective water pumping interventions in the Arctic to mitigate regional and global climate impacts. Building upon prior research done in the Arizona Space Grant, utilizing CMIP5 climate model outputs (CNRM-CM5), and Barrett Honors thesis findings by Perry Vargas, this project evaluates regions within the Arctic Ocean where artificial water pumping could significantly influence oceanic and atmospheric conditions. Geographic, oceanographic, and climatic datasets—including temperature, salinity, and ocean currents—

were integrated to assess how targeted pumping interventions affect Arctic ice dynamics and global climate feedback mechanisms. The analysis highlights specific locations where pumping operations could maximize effectiveness by stabilizing ice cover, reducing ice melt rates, and mitigating broader climatic impacts. This research not only informs strategic decision-making for Arctic interventions but also advances understanding of geoengineering approaches aimed at addressing Arctic ice loss.

Soto-Lopez, Alexandra (Junior, Electrical Engineering, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

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Speckman, Emily (Senior, Earth and Environmental Sciences, Arizona State University). Mentor: Kelin Whipple, School of Earth and Space Exploration, Arizona State University. [D-21]

FLOOD PATTERNS IN EAST COAST CATCHMENTS: HOW HAVE THEY CHANGED?

The east coast of the United States has seen strengthening hurricanes, and with them larger floods. This raises the question of whether flood frequency patterns have changed within catchments along the east coast since 2000, and if so, is there any correlation to a catchment being in a hurricane zone? To answer this, catchments were chosen that are within both the 2009 Hydro-Climatic Data Network (HCDM) and the 'Gauges II' datasets. These data sets were chosen so that flood data was over a long enough period, and was in a catchment with little human disruption to flow. A calculation of recurrence intervals was completed to see if there is a quantifiable difference between before and after 2000, or a difference within or outside of the hurricane zone. Preliminary results show a possible difference between recurrence intervals before and after 2000.

Spross, Diego (Sophomore, Aerospace Engineering, Aeronautics, Embry-Riddle Aeronautical University). Mentor: Pragati Pradhan, Physics Department, Embry-Riddle Aeronautical University. [A-17]

HIGH MASS X-RAY BINARIES: STARS THAT SCULPT THE UNIVERSE

High-mass X-ray binaries (HMXBs), consisting of a massive star and a compact object like a neutron star, are key to studying stellar wind dynamics. In these systems, the star's clumpy wind interacts with the compact object, producing variable X-ray emissions. This study investigates the HMXB 4U 1700-371 using NuSTAR data to analyze X-ray variability and characterize wind clumps. By measuring soft X-ray absorption, examining the hardness ratio, and studying iron line emissions, researchers estimate clump size, density, and ionization state. Results reveal significant absorption patterns, offering insights into the wind's inhomogeneity. These findings enhance models of stellar wind behavior, contributing to a better understanding of stellar evolution and high-energy astrophysical processes.

Stockman, Madelaine (Senior, Environmental Science, Northern Arizona University). Mentor: Helen Rowe, School of Earth and Sustainability, Northern Arizona University. [D-16]

SAGUARO AND NURSE ROCKS: WHAT ARE THE UNDERLYING VARIABLES

Saguaros are native cacti to the southwest. Not only are they cultural symbols but they offer a great deal of ecological importance. Yet due to drought and raising temperatures these plants are having issues regenerating within the Southwest. This project aims at continuing an experiment done at Saguaro High School using nurse rocks to test survival rates of saguaros. We took soil samples from these sites and conducted a Microbial Inoculum Potential experiment to see the mycorrhizal effect on the saguaros in this experiment. By analyzing these results it will allow a greater understanding of below the surface effects on saguaros and their survival.

Synan, Dillan (Sophomore, Optical Sciences and Engineering, University of Arizona). Mentor: Brandon Chalifoux, Wyant College of Optical Sciences, University of Arizona. [G-5]

SELECTIVE LASER ETCHING OF SLUMPED MIRRORS FOR X-RAY ASTRONOMY

Future flagship-class X-Ray astronomy missions require thin, high resolution, grazing incidence mirrors. My research group introduces Flex Modules as a solution: all-glass mirror assemblies where mirror segments are figured and aligned after assembly, a significant advantage as segmented mirrors severely deform from coating and assembly. Each mirror segment (Flex Segment) is composed of an outer zone connected to the assembly and an inner optical surface, connected by flexures. My task has been to fabricate these Flex Segments from slumped glass. The digital procedure has been to convert all part geometry into small line segments and project the resulting part into the substrate, matching its curvature and surface imperfections. In-lab challenges have included laser parameters and system operation. This work has created a viable framework for the fabrication of these mirrors, while also being a tool for the future development of a generalizable slicer for any nonlinear 3D selective laser etching.

Tarmann, Rayne (High School Student, Computer Engineering, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

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Thomas, Ervin (Sophomore, Civil Engineering, Central Arizona College). Mentors: Armineh Noravian, Kimberly Baldwin, Alexander Aguilar; Science and Engineering, Central Arizona College. [ASCEND-4]

ON THE DESIGN OF CENTRAL ARIZONA COLLEGE'S HIGH-ALTITUDE BALLOON PAYLOADS

Central Arizona College has developed two high-altitude balloon payloads for the Spring 2025 semester, advancing efforts to monitor atmospheric conditions over Pinal County. The primary payload serves as a control, contributing to a five-year atmospheric data archive. It is 3D-printed from ASA to optimize strength-to-weight ratio for durability in extreme conditions. The secondary payload is designed with a lightweight, FDM-manufactured crumple zone to enhance structural integrity while reducing mass, allowing for additional experimental components. This payload also integrates a LoRa transmitter to evaluate long-range data transmission capabilities in the upper atmosphere.

Truong, Jayden (Junior, Mechanical Engineering, Glendale Community College). Mentors: Tim Frank, Engineering; Rick Sparber, Technology and Consumer Sciences, Glendale Community College. [ASCEND-7]

GLENDALE COMMUNITY COLLEGE TEAM "IRS"

Team “Interdependent Researchers of Space (IRS)” is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from light-weight foam-board, contained analog sensors to measure the interior and external temperatures, pressure, acceleration, and ultraviolet light, along with a GPS receiver to determine its position throughout the flight. There were also two I2C temperature sensors, whose readings were compared with those from the analog sensors. During the flight, a Runcam 2 camera recorded video. The payload also contained an Iridium Satellite modem that was programmed to transmit sensor data and GPS location every 5 minutes, with the transmissions sent to the team members emails in real-time.

Tulino, Aaron (First-Year, Cyber Intelligence and Security, Embry-Riddle Aeronautical University). Mentor: Catalina Aranzazu-Suescun, Cyber Intelligence and Security, Embry-Riddle Aeronautical University. [F-10-11]

RADIO FREQUENCY IDENTIFICATION SECURITY FOR IOT AIRPORT INFRASTRUCTURE

Radio Frequency Identification (RFID) technology is used in airports to track passengers, employees, and luggage. For employees, it controls access to restricted areas based on their roles and permissions. For passengers, RFID tracks and authenticates them throughout airport processes. RFID also plays a key role in luggage tracking, addressing the growing issue of misplaced or lost baggage. This project focuses on developing an IoT-based RFID luggage tracking system to improve luggage management and reduce such incidents. The project aims to enhance the security of RFID IoT systems through four phases. First, an RFID IoT infrastructure testbed was created to assess functionality. Second, a vulnerability assessment identified potential weaknesses in the system. Third, simulated cyberattacks tested the system’s integrity and availability under threat. Finally, based on these findings, tailored security recommendations were proposed to strengthen the system’s defenses. This approach helps mitigate risks and ensures the system’s resilience against cyber threats.

van der Leeuw, Nathaniel (Sophomore, Mechanical Engineering, University of Arizona). Mentor: Jekan Thangavelautham, Aerospace and Mechanical Engineering, University of Arizona. [F-9]

OVERCOMING IMPACT: DEFORMABLE DRONES FOR DYNAMIC OPERATIONS

Commercially available drone frames utilize brittle polymers which easily fracture during high speed impact. A common problem facing the FPV drone industry is how to increase impact resilience while minimizing weight. Flexible drones can dynamically deform to withstand collisions while navigating confined spaces. This project sought to develop an easily manufacturable yet deformable frame for a Tiny Whoop drone which can safely house 27,000 KV brushless motors. Multiple polymer trade studies were analyzed to select for mechanical toughness and durability while maintaining total weight between 15 to 30 grams. These properties were utilized to determine various flight characteristics for three separate designs based on a TPU structure. The optimal design utilizes a hollow structure to enable internal deformation while allowing for the future possibility of a fluid filled structure. Future testing is needed to determine the behavior of both a hollow and fluid filled structure experiencing high speed impact.

Vaughn, Eric (Senior, Chemistry, Biology, Northern Arizona University). Mentor: Gerrick Lindberg, Chemistry and Biochemistry, Northern Arizona University. [H-3]

SPECTROSCOPIC INSIGHTS INTO CO AND CO_2 MIXTURES: IMPLICATIONS FOR PLANETARY ENVIRONMENT ANALYSIS

Understanding the precise behavior of carbon monoxide (CO) and carbon dioxide (CO_2) is essential for interpreting spectroscopic data and advancing our knowledge of the solar system. These molecules are present across a wide range of planetary environments and serve as key indicators of atmospheric composition and conditions. Using quantum chemistry calculations to collect spectroscopic signatures of CO-CO_2 matrices over varying concentrations, we aim to establish a framework to extract environmental information from observational data. Complementary molecular dynamics simulations of crystalline and liquid CO-CO_2 systems provide further context for molecular interactions and their physical manifestations. Our findings reveal that characteristic spectral features directly correlate with molecular structure, orientation, and environmental conditions, offering a robust tool for remote sensing applications and providing new insights into the interpretation of atmospheric spectra.

Verberne, Bryce (Senior, Computer Science, Arizona State University). Mentor: Thomas Sharp, School of Earth and Space Exploration, Arizona State University. [ASCEND-1]

ASU STRATODEVILS: ADVANCING REAL-TIME DATA PROCESSING IN HIGH-ALTITUDE BALLOON SYSTEMS

This semester, the ASU StratoDevils focused on developing a real-time data processing architecture for high-altitude balloon payloads. Our object-oriented flight software, running on a dual-core Raspberry Pi Pico, enables modular sensor abstraction, concurrent data collection, and automatic fault recovery. We implemented a packet-based telemetry system with checksum validation, and developed dual GUI interfaces for decoding data over hardline and radio. Advancing beyond past designs, our team also integrated a 3D data visualization workflow using Cesium.js to map GPS data in real time alongside atmospheric sensor readings. This layering technique enables detailed post-flight analysis of the upper atmosphere. Together, these innovations improve system scalability, telemetry reliability, and data accessibility—setting a new standard for student-built aerospace payloads.

Vicera, Sicily (Junior, Chemistry, Arizona State University). Mentor: Sean Bryan, School of Space and Earth Exploration, Arizona State University. [D-3]

CLIMATOLOGICAL ANALYSIS OF TEMPE TOWN LAKE

Long-term water quality data from an urban reservoir in Tempe, AZ offers an opportunity to analyze biogeochemical processes and the effects of changing climate. We compare 20+ years of data from three sources: weekly data from the City of Tempe (2000–2023), biweekly data from ASU (2005–2024), and high-frequency (30-minute) data from the CAP-LTER program's in situ datasonde (2018–present). We evaluated changes in temperature, dissolved oxygen, pH, and nutrient concentration using Python. Our goal is to determine if there is a climate warming signal in temperature and other parameters. We hypothesize that the lake has warmed over the last 20 years and that there will be related changes in oxygen and nutrients. Preliminary analyses reveal a negative correlation between temperature and oxygen, and a consistent pH between 8.0 and 9.5. By comparing time series data, we can explore changes in the ecosystem over time.

Villanueva, Aliceanna (High School Student, Architecture, Casa Grande Union High School). Mentor: John Morris, CTE Engineering, Casa Grande Union High School. [ASCEND-3]

DEVELOPMENT AND DEPLOYMENT OF HIGH-ALTITUDE BALLOON PAYLOADS FOR ATMOSPHERIC CHARACTERIZATION AND MESH NETWORK PROTOTYPING

This study details the design, construction, and deployment of high-altitude balloon payloads for atmospheric characterization and technological development. Employing Arduino Nano microcontrollers, payloads collected temperature, pressure, humidity, and UV-C data up to 100,000 feet, complemented by 4K and 360-degree imagery for Earth observation. Initial missions focused on stratospheric and ozone layer traversal, demonstrating data logging to microSD cards. Subsequent iterations introduced an innovative enclosure design and dual payloads, incorporating RF transceivers for inter-payload communication and internal temperature monitoring. This work marks the team's first custom PCB development, integrating the microcontroller, RF, and temperature sensors. This research serves as a foundation for developing a mesh network for air-to-ground communication with autonomous rovers, advancing high-altitude balloon capabilities for scientific and technological applications.

Wadnola III, Frederick (Senior, Mechanical Engineering, Embry-Riddle Aeronautical University). Mentor: Ahmed Sulyman, Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University. [F-5-6]

EAGLESAT 2

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 Lunch Initiative, and aligin with NASA's scientific objectives. EagleSat uses commercial grade hardware and systems designed and manufactured in-house. EagleSat 2's mission is to study the effects of solar radiation of various types of Random Access Memory (RAM). Development of EagleSat 2 was completed in December 2024 and is currently being integrated with the NG-22 resupply mission to the International Space Station (ISS). Once deployed, communication with the satellite will be established using the EagleSat ground station and the SatNogs network.

Walter-Cardona, Dario (Sophomore, Space Physics, Embry-Riddle Aeronautical University). Mentor: Quentin Bailey, Physics and Astronomy, Embry-Riddle Aeronautical University. [A-7]

NONLINEAR DIFFERENTIAL EQUATIONS FROM A VECTOR MODEL OF LORENTZ SYMMETRY BREAKING

In this presentation, I go over a vector model of Lorentz symmetry breaking coupled to the bumblebee model of gravity, where the vector field does not lie at a minimum. Using a modified electrodynamics model paired with a nonlinear interaction term, I study the flat spacetime solutions in the form of an ordinary second order nonlinear differential equation. The nonlinear interaction term takes the form of a quadratic term or that of the Kummer Confluent Hypergeometric function. With the flat spacetime solutions' various forms found through substitutions, and a knowledge of other known and solved differential equations and techniques, I investigate the behavior of the equation both analytically and numerically.

Wee, Isabel (Junior, Industrial Engineering, University of Arizona). Mentor: Michelle Coe, Lunar and Planetary Laboratory, University of Arizona. [ASCEND-10]

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, spectral, and UV sensor, and atmospheric profiling system to measure conditions of Earth's atmosphere up to approximately 100,000 feet above MSL.

Weissbluth, Eyan (Junior, Astrophysics, Arizona State University). Mentor: Tuna Yildirim, Physics, Arizona State University. [C-4]

THE ROLE OF PHILOSOPHY OF SCIENCE IN SCIENCE EDUCATION

Today, STEM education is largely focused on understanding how to use sets of formulas to obtain desired results that can be used to produce a product. These formulas come from our current understanding of nature, through the process of measurement and analysis that we call science. However, little attention is paid to the philosophical pillars that science stands on, from which we derive how best to conduct science. This area of study is called philosophy of science. The goal of this project is to understand this disconnection in greater detail through survey data of researchers and teachers centered around the current role of philosophy of science plays in STEM education along with what role it should ideally have, ultimately culminating in an improvement in science education.

Wheeler, Makena (Sophomore, Aerospace Engineering, University of Arizona). Mentor: Alex Craig, Aerospace and Mechanical Engineering, University of Arizona. [F-12]

CRYOGENIC COOLING OF A 3D PRINTED CONE MODEL FOR HYPERSONIC WIND TUNNEL EXPERIMENTATION

Boundary layer stability is important for the advancement of hypersonic vehicles as the state of the boundary layer significantly impacts aerodynamic heating. In many hypersonic wind tunnels, free stream temperatures are much colder than in flight, which requires a cooled model to more accurately replicate the ratio of vehicle surface temperature to free stream temperature. This temperature ratio affects the stability of the boundary layer, causing cooled models to experience different instabilities. However, the structure of cone shaped models creates difficulties achieving uniform cooling towards the model tip. This experiment tested a cooling system that pumped liquid nitrogen through coiled channels inside a 3D printed cone model. To assess the performance of this approach, temperature measurements from thermocouples on the model surface and infrared imaging during testing of the system were compared to Ansys thermal simulations. Future iterations of this system will be capable of cooling during wind tunnel experiments.

Wochner, Ryan (Senior, Physics & Astrophysics, Northern Arizona University). Mentor: Stephen Tegler, Astronomy and Planetary Science, Northern Arizona University. [B-22]

MEASURING OPTICAL CONSTANTS FOR SEMI-HEAVY AND HEAVY WATER

Determining the optical constants for semi-heavy water (HDO) is crucial for understanding the formation history and habitability potential of solar system objects. By simulating outer space conditions using an ultra-high vacuum, cryocooler, and spectrometers, we can measure the spectral absorbance of molecular ices and analyze their optical properties. A 2% HDO mixture with H2O was prepared, and infrared and ultraviolet spectra were collected to determine the sample's absorbance and thickness. Using reflective geometry analysis, we derived the optical constants of HDO and identified a distinct temperature dependence in its spectral features, which can serve as a temperature probe for planetary environments. Our data enables future experiments to construct models that will determine the D/H ratio on solar system objects, providing valuable insights into their formation processes.

Yamaner, Anil (Senior, Industrial Engineering, University of Arizona Yuma). Mentor: Samuel Peffers, Systems and Industrial Engineering, University of Arizona. [ASCEND-2]

EXPLORING ATMOSPHERIC DYNAMICS/ HIGH-ALTITUDE PAYLOAD DESIGN

This project focuses on the design, construction, and testing of a lightweight, durable payload capable of reaching altitudes of 100,000 feet. Featuring a 3D-printed structure, the payload protects internal components while ensuring modularity and robustness. Key enhancements include improved wiring reliability for consistent performance and the integration of a 360-degree camera for detailed environmental data collection. Retaining sensors from prior iterations, this design emphasizes structural integrity and operational efficiency. Rigorous testing in extreme conditions will validate the payload's resilience and performance in near-space environments. The primary goal is to explore atmospheric dynamics, supporting future scientific discoveries and advancing engineering innovation.

Young, Sean (Senior, Aerospace Engineering, University of Arizona). Mentor: Trent Tresch, Center for Human Space Exploration, University of Arizona. [E-3]

DEVELOPMENT OF A LOW-COST HIGH ALTITUDE MANNED BALLOON CAPSULE

The stratosphere remains one of the least explored regions on Earth due to the challenges of accessing and operating in this extreme environment. Most current research relies on uncrewed balloons or rockets, which are limited in capability, prone to failure, and unable to adapt to dynamic research needs. This project aims to design, manufacture, and test a low-cost, human-rated pressure vessel for gas balloon research flights. Multiple capsule designs were analyzed for safety, weight, and cost-effectiveness, leading to the construction of a full-scale prototype. Upcoming tests are planned in a thermal vacuum chamber at the University of Arizona to evaluate the craft's ability to maintain pressure under stratospheric conditions. Future research will include human factors, interior optimization, structural performance under various flight loads, and crewed test flights. This platform could offer an affordable and reusable option for both emerging and established space programs to conduct crewed research in near-space environments.

Youssfi, Lina (Junior, Aerospace Engineering, Aeronautics, Arizona State University). Mentor: Gokul Pathikonda, School of Engineering, Matter, Transport and Energy, Arizona State University. [E-2]

Boundary Layer Separation over Porous Media

Boundary layer separation is a critical phenomenon in fluid dynamics, often leading to increased drag and flow instability in aerodynamic applications. This research explores the effects of porous substrates on boundary layer separation, focusing on their potential to delay or mitigate separation. Using a combination of particle image velocimetry (PIV) and experimental analysis, this study examines how different porosity levels and substrate geometries influence velocity profiles, pressure distributions, and turbulent flow characteristics. The results aim to provide insight into optimizing porous surface designs for improved aerodynamic efficiency in applications such as airfoils and turbine blades. By deepening our understanding of porous media interactions with boundary layers, this research contributes to advancing sustainable and high-performance engineering solutions in aerospace industries.

Yu, Kaye Adrianne (Sophomore, Electrical Engineering, Glendale Community College). Mentor: Tim Frank, Engineering, Glendale Community College. [ASCEND-6]

Collecting Data Using a Particle I2C Sensor to Test for Residual Particles in the Arizona Atmosphere from the California Wildfires

Team “Flight Club” is one of two ASCEND teams of five students from Glendale Community College, building a small payload of approximately 1.5-lb, to attach to a high-altitude weather balloon for a flight on March 29, 2025. The balloon reached approximately 100,000-ft before bursting, and a parachute allowed the payload to slowly glide back to Earth. The payload, constructed from foam-board, contained analog sensors to measure temperature, pressure, and acceleration, an I2C particle sensor, and a GPS receiver. The data collected from the particle sensor is used to test whether the pollutants released from the recent wildfires in southern California have migrated into the upper atmosphere above central Arizona. Besides these sensors, the payload also includes an Insta360 X2 camera, which provided a 360-degree view from the payload, and an Iridium Satellite modem to transmit data and the GPS location during the flight.

Zelaya-Armenta, Emmanuel (Sophomore, Computer Science, Glendale Community College). Mentor: Tim Frank, Engineering, Glendale Community College. [ASCEND-6]

Collecting Data Using a Particle I2C Sensor to Test for Residual Particles in the Arizona Atmosphere from the California Wildfires

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2024-2025 Arizona NASA Space Grant Program Mentors

Organized by mentor's last name.

Affinati, Suzanne (Geosciences, Northern Arizona University) See: Durica, Zoe [B-11].

Aguilar, Alexander (Science and Engineering, Central Arizona College)
See: Canales, Emmanuel [ASCEND-4]
Fisher, Cortney [ASCEND-4]
LaFaut, James [ASCEND-4]
Maziarka, Elizabeth [ASCEND-4]
Mountz, Elijah [ASCEND-4]
Thomas, Ervin [ASCEND-4]
Garcia, Itxclari [ASCEND-4].

Ali, Hadi (Aerospace Engineering, Embry-Riddle Aeronautical University)
See: Bossi, Emanuele [E-4]
Mayrend, Gabriella [F-14].

Anbar, Ariel (School of Earth and Space Exploration, Arizona State University) See: Rajopadhye, Aseem [D-13].

Antoninka, Anita (School of Forestry, Northern Arizona University) See: Saville, Embrey [D-4].

Apai, Daniel (Steward Observatory, University of Arizona) See: Klawender, Veronica [B-12].

Aranzazu-Suescun, Catalina (Cyber Intelligence and Security, Embry-Riddle Aeronautical University)
See: Higgins, Benjamin [F-10-11]
Shchetinin, Philipp [F-10-11]
Tulino, Aaron [F-10-11].

Bailey, Quentin (Physics and Astronomy, Embry-Riddle Aeronautical University)
See: Murray, Hailey [A-In Title Only].
Walter-Cardona, Dario [A-7].

Baldwin, Kimberly (Science and Engineering, Central Arizona College)
See: Canales, Emmanuel [ASCEND-4]
Fisher, Cortney [ASCEND-4]
LaFaut, James [ASCEND-4]
Maziarka, Elizabeth [ASCEND-4]
Mountz, Elijah [ASCEND-4]
Thomas, Ervin [ASCEND-4]
Garcia, Itxclari [ASCEND-4].

Black, Sarah (USGS Astrogeology Center, United States Geological Survey) See: Phippen, Sam [B-5].

Borthakur, Sanchayeeta (School of Earth and Space Exploration, Arizona State University) See: Carl, Naomi [A-8].

Bose, Maitrayee (School of Earth and Space Exploration, Arizona State University)
See: Asadourian, Tatiana [B-7]
Shepard, Els [A-3].

Bryan, Sean (School of Space and Earth Exploration, Arizona State University) See: Vicera, Sicily [D-3].

Budinoff, Hannah (Systems and Industrial Engineering, University of Arizona) See: Auer, Molly [G-3].

Caballero, Lorena (Biological Sciences, Northern Arizona University)
See: Alger, Taylor [D-1-2]
Catania, Skylar [D-1-2].

Chalifoux, Brandon (Wyant College of Optical Sciences, University of Arizona) See: Synan, Dillan [G-5].

Chien, Lisa (Lowell Observatory, Northern Arizona University) See: Kohm, Jack [A-24].

Coe, Michelle (Lunar and Planetary Laboratory, University of Arizona)
See: Adamu, Razak [ASCEND-10]
Blanchard, Sarina [ASCEND-10]
Brown, Colin [ASCEND-10]
Kwolek, Andrew [ASCEND-10]
Mattison, Kane [ASCEND-10]
Miller, Ella [ASCEND-10]
Oler, Natasha [ASCEND-10]
Wee, Isabel [ASCEND-10]

Condes, AnnMarie (Science and Engineering, Pima Community College)
See: Boe, Jordan [ASCEND-9]
Dohaniuk, Hayden [ASCEND-9]
Navarro, Roberto [ASCEND-9].

Corliss, Jason (Lunar and Planetary Laboratory, University of Arizona)
See: Das, Heerok [F-16-17]
Marchinek, Hayden [F-16-17]
Martinez Castillo, Jasmine [F-16-17].

Craig, Alex (Aerospace and Mechanical Engineering, University of Arizona) See: Wheeler, Makena [F-12].

De, Subhayan (Mechanical Engineering, Northern Arizona University) See: Michon, Regen [F-4].

Denny, Angelita (Department of Energy, Legacy Management) See: Bia, Mikayla [D-In Title Only].

Desch, Steve (School of Earth and Space Exploration, Arizona State University) See: Sorensen, Anneli [D-18].

Dubois, Joe (Interplanetary Initiative, Arizona State University) See: Kodancha, Athul [F-8].

Etling, Chris (Editor, Arizona Daily Sun - Flagstaff) See: Blake, Andrea [B-13].

Forsythe, Jeremy (The Center for Ecosystem Science and Society (ECOSS) - Walker Lab, Northern Arizona University) See: Bauck, Kirsten [B-15].

Frank, Tim (Engineering, Glendale Community College)
See: Ayala, Jared [ASCEND-7]
Badiu, Daniel [ASCEND-7]
Faust, Mia [ASCEND-6]
Martinez, Jesus [ASCEND-6]
Massey, Zachary [ASCEND-7]
Pagliuca, Mia [ASCEND-6]
Philippou, Karston [ASCEND-7]
Truong, Jayden [ASCEND-7]
Yu, Kaye Adrianne [ASCEND-6]
Zelaya-Armenta, Emmanuel [ASCEND-6].

Garani, Jasmine (Astronomy and Planetary Science, Northern Arizona University) See: Brooks, Hunter [A-6].

Gibbons, Travis (Biological Sciences, Northern Arizona University) See: Gustafson, Chloe [G-4].

Gretarsson, Andri (Physics and Astronomy, Embry-Riddle Aeronautical University) See: Borg, Naomi [A-11]

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

Grundy, Will (Astronomy and Planetary Science, Northern Arizona University) See: Smith, Audrey [B-23].

Gullikson, Amber (USGS Astrogeology Center) See: Gonzales, Johnelle [D-12].

Haenecour, Pierre (Lunar and Planetary Laboratory, University of Arizona) See: Smith, Cade [B-3].

Hamilton, Christopher W. (Lunar and Planetary Laboratory, University of Arizona) See: Larson, Linae [B-16].

Harig, Christopher (Geosciences, University of Arizona) See: De La Torre, Mateo [D-10].

Holbrook, David (Department of Energy, Legacy Management) See: Engel, Jasmine [D-7].

Hood, Lon (Lunar and Planetary Laboratory, University of Arizona) See: McCray, Aaron [B-14].

Hurst, Stephanie (Chemistry and Biochemistry, Northern Arizona University) See: Shoulders, Jacob [B-9].

Jacobs, Daniel (School of Earth and Space Exploration, Arizona State University) See: Jones, Sara [A-20].

Johnson, Nancy (School of Earth and Sustainability, Northern Arizona University) See: Bass, Alexis [D-6].

Juneau, Stephanie (NOIRLab) See: Olin, Isabella [A-13].

Lauretta, Dante (Planetary Sciences, University of Arizona) See: Paredes Aguilar, Karla [B-10].

Li, Xiangjia (School for Engineering of Matter, Transport and Energy, Arizona State University) See: Lopez Rosas, Cristo [G-6].

Liao, Yabin (Aerospace Engineering, Embry-Riddle Aeronautical University)
See: Hiland, Evan [ASCEND-5]
LaClair, Kyle [ASCEND-5]
Nuno, Santiago [ASCEND-5].

Lindberg, Gerrick (Chemistry and Biochemistry, Northern Arizona University)
See: Herrmann, Thomas [H-1]
Vaughn, Eric [H-3].

Loeffler, Mark (Astronomy and Planetary Science, Northern Arizona University) See: Clark, Emily [B-20].

Massey, Philip (Lowell Observatory) See: Cocke, Breelyn [A-21].

Mathis, Cole (School of Complex Adaptive Systems, Arizona State University) See: Bisson, Charly [B-17].

McClernan, Mark (USGS Astrogeology Center, United States Geological Survey) See: Derusseau, Connor [B-19].

Morris, John (CTE Engineering, Casa Grande Union High School)
See: Buchanan, Zacheriah [ASCEND-3]
Carrera, Axel [ASCEND-3]
Geen, Emily [ASCEND-3]
Howard, Landri [ASCEND-3]
Posey, Peyton [ASCEND-3]
Rodgers, Hailianna [ASCEND-3]
Tarmann, Rayne [ASCEND-3]
Villanueva, Aliceanna [ASCEND-3]
CGUHS ASCEND Team Presentation [D-14].

Noravian, Armineh (Science and Engineering, Central Arizona College)
See: Canales, Emmanuel [ASCEND-4]
Fisher, Cortney [ASCEND-4]
LaFaut, James [ASCEND-4]
Maziarka, Elizabeth [ASCEND-4]
Mountz, Elijah [ASCEND-4]
Thomas, Ervin [ASCEND-4]
Garcia, Itxclari [ASCEND-4].

Ong, Eddie (Physical Sciences, Phoenix College)
See: Fuge, Adam [ASCEND-8]
Garcia Segundo, Elvis Fernando [ASCEND-8]
Muza, Marquis [ASCEND-8]
Okafor, Nathaniel [ASCEND-8]
Pierson, Ethan [ASCEND-8]
Sanchez, Rafael [ASCEND-8].

O'Rourke, Joseph (School of Earth and Space Exploration, Arizona State University) See: Guinan, Emma [B-1].

Oshinubi, Kayode (School of Informatics, Computing & Cyber Systems, Northern Arizona University) See: Ortega, Andrew [H-2].

Parent, Bernard (Aerospace and Mechanical Engineering, University of Arizona) See: Perry, Brendan [F-7].

Pathikonda, Gokul (School of Engineering, Matter, Transport and Energy, Arizona State University) See: Youssfi, Lina [E-2].

Patience, Jennifer (School of Earth and Space Exploration, Arizona State University)
See: Charley, Kiera [B-24]
Headon, Jackson [A-14].

Peffers, Samuel (Systems and Industrial Engineering, University of Arizona)
See: Fletcher, Connor [ASCEND-2]
Martinez, Jose [ASCEND-2]
Resendiz, Ashby [ASCEND-2]
Rojas, Leonardo [ASCEND-2]
Yamaner, Anil [ASCEND-2]
Sarabia, Lizbeth [ASCEND-2].

Pradhan, Pragati (Physics Department, Embry-Riddle Aeronautical University)
See: Busini, Francesco [A-17]
Busini, Francesco [E-4].
Spross, Diego [A-17].

Ramírez-Andreotta, Mónica (Environmental Science, University of Arizona) See: John, Tayler [D-8].

Razavian, Reza (Mechanical Engineering, Northern Arizona University) See: Belasquez, Dom [F-13].

Rea, Ashley (Humanities and Communications, Embry-Riddle Aeronautical University)
See: Clerget, Abigail [C-1]
Hobbs, Taylor [C-1].

Richardson, Noel (Physics and Astronomy, Embry-Riddle Aeronautical University) See: Fabrega, Anthony [A-15].

Robinson, Tyler (Lunar and Planetary Labratory, University of Arizona) See: Cornish, Eleanor [B-21].

Rolston, Nicholas (School of Electrical, Computer, and Energy Engineering, Arizona State University)
See: Hylden, Rayna [G-2]
Monreal, Sierra [G-7].

Rowe, Helen (School of Earth and Sustainability, Northern Arizona University) See: Stockman, Madelaine [D-16].

Rozo, Eduardo (Physics, University of Arizona)
See: Corona, Julio [A-25]
Fiedler, Keenan [A-18].

Rushforth, Richard (School of Informatics, Computing, and Cyber Systems, Northern Arizona University) See: Harper, Aiden [D-20].

Rutledge, Alicia (Astronomy and Planetary Science, Northern Arizona University) See: Mayhook, Margaret [D-In Title Only].

Ryan, Andrew (Lunar and Planetary Laboratory, University of Arizona) See: Smith, Savannah [B-8].

Sawyer, Travis (Wyant College of Optical Sciences, University of Arizona) See: Roy, Supriya [G-1].

Sayres, Scott (School of Molecular Sciences, Arizona State University) See: Nelson, Hailey [A-26].

Sharp, Thomas (School of Earth and Space Exploration, Arizona State University)
See: Arcara, Alec [ASCEND-1]
Bhasker, Divyam [ASCEND-1]
Brooks, Marcelo [ASCEND-1]
Garcia, Eliaz [ASCEND-1]
Gibbons, Amanda [ASCEND-1]
Krishna, Amal [ASCEND-1]
Nielsen, Tyler [ASCEND-1]
Ontiveros, Ricardo [ASCEND-1]
Reyes Villa, Alejandro [ASCEND-1]
Sink, Josh [ASCEND-1]
Soto-Lopez, Alexandra [ASCEND-1]
Verberne, Bryce [ASCEND-1]
ASU ASCEND Team Presentation [D-15].

Shim, Dan (School of Earth and Space Exploration, Arizona State University) See: Campbell, Ava [B-4].

Shirley, Yancy (Astronomy, University of Arizona) See: Harrison, Megan [A-22].

Shkarayev, Sergey (Aerospace and Mechanical Engineering, University of Arizona) See: Garnett, Jasmine [F-3].

Shock, Everett (School of Earth and Space Exploration, Arizona State University) See: Fronmueller, Simon [D-11].

Smith, Darrel (Physics and Astronomy, Embry-Riddle Aeronautical University)
See: Murphy, Lucas [A-1]
Schuetz, Blake [A-1].

Sparber, Rick (Technology and Consumer Sciences, Glendale Community College)

See: Ayala, Jared [ASCEND-7]
Badiu, Daniel [ASCEND-7]
Faust, Mia [ASCEND-6]
Martinez, Jesus [ASCEND-6]
Massey, Zachary [ASCEND-7]
Pagliuca, Mia [ASCEND-6]
Philippou, Karston [ASCEND-7]
Truong, Jayden [ASCEND-7]
Yu, Kaye Adrianne [ASCEND-6]
Zelaya-Armenta, Emmanuel [ASCEND-6].

Stolte, Daniel (University Communications, University of Arizona) See: Duran, Penny [C-3].

Stribling, Eric (ASU Interplanetary Initiative, Arizona State University) See: Moore, James [C-2].

Sulyman, Ahmed (Computer, Electrical, and Software Engineering, Embry-Riddle Aeronautical University)
See: Noble, Bruce [F-5-6]
Ozatay, Ela [F-5-6]
Ribaudo, Joseph [F-5-6]
Wadnola III, Frederick [F-5-6].

Sutton, Sarah (Lunar and Planetary Laboratory, University of Arizona) See: Elalaoui-Pinedo, Dora [B-18].

Tegler, Stephen (Astronomy and Planetary Science, Northern Arizona University) See: Wochner, Ryan [B-22].

Thangavelautham, Jekan (Aerospace and Mechanical Engineering, University of Arizona) See: van der Leeuw, Nathaniel [F-9].

Threadgill, James (Aerospace and Mechanical Engineering, University of Arizona) See: Gold, Anna [E-1].

Titus, Timothy (USGS Astrogeology Center, United States Geological Survey) See: Morton, Lucienne [B-2].

Trembath-Reichert, Elizabeth (School of Earth and Space Exploration, Arizona State University)
See: Boecker-Grieme, Colin [D-17]
Pulliam, Kadin [D-9].

Tresch, Trent (Center for Human Space Exploration, University of Arizona) See: Young, Sean [E-3].

Wadhwa, Meenakshi (School of Earth and Space Exploration, Arizona State University) See: Nirwan, Nidhi [B-6].

Waldrip, Ross (Science and Engineering, Pima Community College)
See: Boe, Jordan [ASCEND-9]
Dohaniuk, Hayden [ASCEND-9]
Navarro, Roberto [ASCEND-9].

Walker, Christopher (Astronomy, University of Arizona) See: Short, Aleah [A-2].

Wehbi, Sawsan (Genetics Graduate Interdisciplinary Program, University of Arizona) See: Manepalli, Nandini [D-5].

Wesson, Kathryn (College of Engineering, Embry-Riddle Aeronautical University)
See: Blackey, Kian [F-1-2]
Maney, Aidan [F-1-2]
Picht, Claire [F-1-2]
Reynolds, Andrew [F-1-2].

Whipple, Kelin (School of Earth and Space Exploration, Arizona State University)
See: Ropati, Tye [D-19]
Speckman, Emily [D-21].

Williams, Cameron (Mathematics, Embry-Riddle Aeronautical University)
See: Mitchell, Jaxson [A-5].
Ortelli, Lara [A-5].

Windhorst, Rogier (School of Earth and Space Exploration, Arizona State University)
See: Cardona, Ashton [A-27]
Conrad, Logan [F-18]
Hinrichs, Tyler [A-4]
Honor, Rachel [A-10]
Ingram, Hal [F-15]
Miller, Megan [A-16]
Perivolotis, Jakob [A-12].

Yildirim, Tuna (Physics, Arizona State University) See: Weissbluth, Eyan [C-4].

Zanolin, Michele (Physics and Astronomy, Embry-Riddle Aeronautical University) See: Biehle, Miriam [A-23]
Markovsky, Jake [A-19].