Arizona NASA Space Grant Consortium

Thirty-Second Annual Statewide Student Research Symposium

ARIZONA SPACE GRANT CONSORTIUM

Presentations by Space Grant Students from:

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

April 22, 2023
DoubleTree by Hilton, Tempe, AZ

2022-2023 Arizona NASA Space Grant Consortium
Statewide Student Research Symposium
April 21-22, 2023

Welcome to the 32nd annual Arizona NASA Space Grant Statewide Student Research Symposium!

The Symposium consists of four parallel topical sessions, with a morning break for coffee, afternoon lunch, and refreshments at the end of the day. We encourage you to use these breaks 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 166 students, with 4 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, Casa Grande Union High School, Central Arizona College, Diné College, Glendale Community College, Phoenix College, Pima Community College, and Arizona Western College (honorable mention) 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, UA

Thomas G. Sharp, Associate Director
ASU NASA Space Grant

Michelle Coe, Manager
Arizona Space Grant Consortium, UA

Desiree D. Crawl, Sr. Coordinator
ASU NASA Space Grant

Deborah Bair, Business Operations
ASU NASA Space Grant

Saturday, April 22, 2023, DoubleTree by Hilton Phoenix Tempe

8:30-8:50 a.m. WELCOME & INTRODUCTION

FIESTA BALLROOM II & III

Thomas G. Sharp, Associate Director, Arizona State University NASA Space Grant

Room	Tempe	Fiesta I	Coronado	Redrock
TIME **(MST)**	**Moderators:** Dorothea Ivanova, Michele Zanolin **Session A** **TOPICS IN MATH, PHYSICS & CHEMISTRY** (9:00 AM – 10:10 AM) **---** **Moderators:** Anne Boettcher, Ashley Rea **Session B** **EDUCATION & PUBLIC OUTREACH** (10:30 AM – 11:20 AM) **---** **Moderators:** Elliott Bryner, Paloma Rose Davidson **Session C** **AEROSPACE TECHNOLOGY: SPACEFLIGHT & ENGINEERING PROGRAMS** (11:20 AM – 3:30 PM)	**Moderators:** Clayton Jacobs, Tom Sharp **Session D** **ASCEND** (9:00 AM – 11:30 AM) **—** **Moderators:** Joseph Foy, Michele Zanolin **Session E** **ASTRONOMY & SPACE PHYSICS** (11:30 AM-3:30 PM)	**Moderators:** Theodore Kareta, Dante Lauretta, Tim Swindle **Session F** **PLANETARY SCIENCE** (9:00 AM - 2:00 PM) — **Moderators:** Anne Boettcher, Tom Sharp **Session G** **EXPLORATION SYSTEMS ENGINEERING** (2:00 PM-3:10 PM)	**Moderators:** Michelle Coe, Chandra Holifield Collins **Session H** **Earth & Environmental Science & Engineering** (9:00 AM – 2:00 PM) **---** **Moderators:** Jisoo Kim, Yabin Liao **Session I** **AERONAUTICS** (2:00 PM-3:20 PM)

9:00-9:10	[A-1] *John Hardy* Helical-Shaped Tungsten Oxide as Active Layer for Resistive Random-Access Memory Applications	[D-1] *Arizona State University ASCEND* Analysis of Attitude Determination and Controls on a High Altitude Ballooning Payload with Long Range HAM Radio Communication and UV-Exposed Plant Seeds	[F-1] *Laurinne Blanche* Structured Light Scanner Use in OSIRIS-REx Sample Analysis	[H-1] *Tracey Begaye* Protecting Forests and Infrastructure from Fire with Drones
9:10-9:20	[A-2] *Kaylee Freudenthal* Very Strongly Connected Graphs	[D-1] *Arizona State University ASCEND* Analysis of Attitude Determination and Controls on a High Altitude Ballooning Payload with Long Range HAM Radio Communication and UV-Exposed Plant Seeds	[F-2] *Claire Blaske* Impactor-Atmosphere Interactions Above the Surface of Venus	[H-2] *Mikayla Bia* Applying Conventional Navajo Knowledge When Investigating DRUM Sites Within the Navajo Nation
9:20-9:30	[A-3] *Eric Gutierrez* Growing Boron Nitride Films for Alpha and Neutron Detectors in Radiation Settings	[D-2] *CGUHS ASCEND* ASCEND High Altitude Balloon - Casa Grande Union High School	[F-3] *Emily Clark* The Effects of Space Weathering on Airless Bodies	[H-3] *Lynn Carroll* Intermittent Performance of Pilot Scale Off-Grid Nanofiltration System
9:30-9:40	[A-4] *Marshall Hammond* Deep Machine Learning in Holography	[D-3] *Central Arizona College ASCEND* CAC ASCEND	[F-4] *Jacqueline Do* Arizona NASA Eclipse Ballooning Project	[H-4] *Sofia Delgado* US Fish and Wildlife Service Info Sheets
9:40-9:50	[A-5] *Jaxson Mitchell* A Time-Frequency Analysis of Chirps in Gravitational Wave Data	[D-4] *Embry-Riddle Aeronautical University ASCEND* Long-Distance Video and Telemetry Streaming	[F-5] *Jacob Eaton* Organosulfurs in Meteorites	[H-5] *Simon Fronmueller* Where Are All of the Ammonia Oxidizers?: A Yellowstone Mystery
9:50-10:00	[A-6] *Jack Nichols* Molecular Structure of Deuterated 2-aminopyridine	[D-5] *Glendale Community College ASCEND* GCC's Team Icarus	[F-6] *Greta Freeman* Exploring the Limits of Mineral Abundance Retrievals in the Thermal Infrared from Laboratory Particulate Spectral Analysis	[H-6] *Charlie Kruger* Radiocarbon Dating in Arctic Lakes
10:00-10:10	[A-7] *Olivia Pitcl* Machine Learning Approach in ATLAS Particle Energy Calibrations	[D-5] *Glendale Community College ASCEND* GCC's Team Icarus	[F-7] *Rachel Fry* An Apparatus for the Experimental Simulation of the Effects of Wind Transport on Martian Sands	[H-7] *Ellie Laton* Reductive Degradation of Insensitive Munitions Compound (IMC) Mixtures using Iron-Based Reactive Minerals
10:10-10:30	**MORNING BREAK IN FOYER**			

10:30-10:40	[B-1] *Kylianne Chadwick* Bridging the Gap Between STEM Professionals and "Everyone Else"	[D-6] *Glendale Community College ASCEND* GCC's Team AstroPeeps	[F-8] *Moises Gomez* Laboratory Measurements of the Thickness, Index of Refraction, and Density of Ices Important to Planetary Science	[H-8] *Trisha Jean Lane* Influence of Woodland Encroachment on Vegetation, Soils, Hydrology, and Erosion on Sagebrush Rangelands
10:40-10:50	[B-2] *Hayden Estrella* Combatting Fake Science Online	[D-6] *Glendale Community College ASCEND* GCC's Team AstroPeeps	[F-9] *Aidan Madden-Watson* Optical Constants of CH_4 + N2 Ice Mixtures and Outer Solar System Objects	[H-9] *Sophia Dixon* Effects of Biological Soil Crust Cover on Rainfall Runoff
10:50-11:00	[B-3] *Khushi Patel & Namita Shah* AI-Enhanced Education: Generalized Planning and Reinforcement Learning in Space Exploration	[D-7] *Phoenix College ASCEND* Phoenix College NASA ASCEND	[F-10] *Daniel Gonzalez* Contour Mapping of the Crustal Magnetism on Mars	[H-10] *Emma Lintz* Assessment of Extinction Risks of Sonoran Desert Plants
11:00-11:10	[B-3] *Khushi Patel & Namita Shah* AI-Enhanced Education: Generalized Planning and Reinforcement Learning in Space Exploration	[D-7] *Phoenix College ASCEND* Phoenix College NASA ASCEND	[F-11] *Jonas Hallstrom* The Formation and Thermal Evolution of Itokawa's Parent Body	[H-11] *David Lopez* A Microclimate Case-Study Comparison of Arizona Soundings
11:10-11:20	[B-4] *Katrina Robertson* Fostering Educational Equity in Engineering	[D-8] *Pima Community College ASCEND* High Altitude Crustaceans	[F-12] *Madeline Hart* Reconstructing the Real Chirp of the MARSIS Radar	[H-12] *Bo Manuszak* Space Exploration for Sustainable Development
11:20-11:30	[C-1] *Anna Alfermann* Remote Sensing of Vegetation and Geomorphic Change Along 11.75 km of the Paria River	[D-9] *University of Arizona ASCEND* UArizona ASCEND: High-Altitude Data Collection With a Custom CubeSat Payload	[F-13] *Jessica Maldonado Olivas* SNAPS: Real Time Outlier Detection	[H-13] *Cameron Morgan* Carbon Dioxide Capture in Spacecraft Using Novel Microsphere-Loaded Polymers
11:30-11:40	[C-2] *Nicolas Blanchard* Subterranean Exploration Using a Train of Autonomous Vehicles	[E-1] *Justin Klingele* Predicting Limits for Diffuser-Assisted Photometry of Transiting Exoplanets	[F-14] *Sarah Nielsen* Hydrothermal Alteration on Earth and Asteroids	[H-14] *Yamini Patel* Textural Analysis of Airfall Deposits From the Most Recent Explosive Eruption at the Valles Caldera, NM
11:40-11:50	[C-3] *Zoe Brand* Investigation of Total Momentum Ratio	[E-2] *Hanga Andras-Letanovszky* A Deuteration Survey of Dense Prestellar Cores in Taurus	[F-15] *Melissa Kontogiannis* Carbonate Clues for Hydrothermal Alteration History of Carbonaceous Chondrites	[H-15] *Annika Revis* Potential Effects of Endophytes in Tillandsia Usneoides
11:50-12:00	[C-4] *Jessica Dudek* General Dynamics Mission Systems	[E-3] *Naomi Carl* In with the Old, Out with the Young:	[F-16] *Adriana Olvera* Remote Sensing Compositional	[H-16] *Benjamin Ryan*

	Explorer GPS Receiver Production Testing & Improvements	Stellar Clusters in NGC 3344	Analysis of Unvegetated Meandering Stream Basins	Drought Impact on Cold Tolerance in Pinyon Pine
12:00-1:20	**LUNCH IN FIESTA BALLROOM I & II**			
1:20-1:30	[C-5] *Calvin Henggeler & Tyler Thurman* EagleSat-2: Memory Degradation Experiment	[E-4] *Logan Caudle & Brandon Pillon* Testing and Construction of a Short-Arm Interferometer and Low Frequency Prototype of Laser Interferometer Suspensions for Gravitational Wave Detection	[F-17] *Shradhanjli Ravikumar* A Potential Mechanism for Nitrogen Storage in the Earth's Mantle Transition Zone	[H-17] *Siena Smania* Meals for Microbes: How Do Energy Supplies of Hot Springs Vary with Geothermal Mixing?
1:30-1:40	[C-6] *Shae Henley* CatSat: Satellite Flight Hardware and Ground Station Assembly	[E-5] *Sadie Cullings* Signatures of Traversable Wormholes	[F-18] *Lucas Reynoso* Laboratory Analysis of Ceres Analogue Minerals	[H-18] *Brooke Sullivan* Sensitivity of North American Monsoon Convective Precipitation Flooding in Arizona to the Atmospheric Boundary Layer and Circulation
1:40-1:50	[C-7] *Alex Higuera Pierre Noel* The Effects of the Martian Atmospheric Conditions on a NACA 4412 Airfoil	[E-6] *Peter Hartman* A Kinematic Analysis of Proplyds in NGC 1977 and the ONC	[F-19] *Tessa Richardson* Echeclus Data Analysis of Phase Curve and Composition	[H-19] *Camille Tinerella* Measuring Dioxin and Dioxin-Like Compounds in Soil and Sediments Impacted by Wildfires and Flash Flooding
1:50-2:00	[C-8] *Shannon Moore & Hayden West* Centrifugal Nuclear Thermal Propulsion Ammonia Propellant Thermal Analysis	[E-7] *Amanda Holdsworth* The Spectroscopic and Visual Orbit of the Nitrogen-rich Massive Binary WR 138	[F-20] *Alejandro Romero-Lozano* Mechanical Assembly for NUV CCD Camera Telescope	[H-20] *Lauren Vasquez* Navajo Nation Municipal Water Reuse Feasibility Analysis
2:00-2:10	[C-9] *Tristan Muzzy* Analysis of Thermodynamic Cycles for Nuclear Thermal Rockets	[E-8] *Randy Loberger & Tri Phan* The Energetics of the Colliding Wind Binary γ2 Velorum: Multi-wavelength Studies in Optical X-rays	[G-1] *Hope Elmer* Investigation of Stress Concentrations in Parts Manufactured with Fused Deposition Modeling	[I-1] *Jackson Barger* Design and Implementation of a Focused Laser Differential Interferometer for Hypersonic Boundary Layer Transition Measurements
2:10-2:20	[C-10] *Andrew Purkeypile* Proximity Operation Maneuvers at Asteroidal Deep Space In-Situ Resource Utilization Stations	[E-9] *Nicolas Mazziotti* Identifying Diffuse Galaxies through Citizen Science	[G-2] *Adeeb Hossain* Quantitative Analysis of Bone Regenerated Using Patient Specific 3D Printed Scaffolds	[I-2] *Andrew Frisch* Effects of Structural Motion on Swept Wing Aerodynamics
2:20-2:30	[C-11] *Walter Rahmer* CatSat: Problem Solving for CubeSat Engineering, Integration, and Communication	[E-10] *Breck Meagher* Characterization of Oval Defects in Crystalline Optical Coatings	[G-3] *Loren Larrieu* Multi-Spectral Thermal Infrared Imager for UAV Based Remote Sensing	[I-3] *Morgan Goz* Transitional Shock-Boundary Layer Interactions at Mach 5

2:30-2:40	[C-12] *Hayden Roszell* Design and Implementation of the Onboard Computer for EagleSat-2	[E-11] *Jamesen Reese* Energy Partitioning and Particle Acceleration at the Bow Shock of Saturn	[G-4] *Stephany Maldonado* Choice of Best HA Coated Sensors to Measure Bone Maintaining Activity in Space	[I-4] *Lucas Guaglardi* Analysis and Optimization of Electric Ducted Fan Nacelle Geometry
2:40-2:50	[C-13] *Logan Ruddick* EagleSat-2: Attitude Determination and Control System Monitoring and Management	[E-12] *Maxwell Rizzo* Revisiting the FUSE Data Archive - Finding O VI Emission	[G-5] *Katie Twitchell* Zernike Wavefront Sensing for Adaptive Optics	[I-5] *Alec Maloney* Fin-induced Shock/Boundary Layer Interactions at Mach 5
2:50-3:00	[C-14] *Avery Stockdale-Stephens* Investigation of Wakes Behind Blunt-Bodies During Re-Entry	[E-13] *Calvin Sam & Tristen Sextro* X-ray Binaries as Flashlights to Map the Universe through Stellar Wind Studies	[G-6] *Mairely Urias* Space Environment Radiation Testing on Electrical Components	[I-6] *Nicholas Mammana* Force and Moment Measurements in the Arizona Polysonic Wind Tunnel
3:00-3:10	[C-15] *Lillian Sudkamp* The EagleSat 2 Structure	[E-14] *Meghan Speckert* The Stellar Content of IC1310	[G-7] *Edrik Vachier* Satellites and the World of RF	[I-7] *David Ordaz Perez* Aero-Thermodynamic Loads on Space Shuttle Orbiter Ascent
3:10-3:20	[C-16] *Jacob Chambers* Simulator and Flight Software Testing for Aspera SmallSat Telescope	[E-15] *Reynier Squillace* Nitrogen Isotopic Fractionation in Prestellar Core L43E		[I-8] *Samantha Stevens* Numerical Investigation of Hypersonic Boundary-Layer Transition for an Ogive Geometry
3:20-3:30	[C-17] *Pablo Luna* Data-driven Laser Powder Bed Fusion Distortion Prediction Using Geometric Parameters	[E-16] *Jake Summers* Observing Magellanic System Stars in the SMACS J0723-73 JWST ERO		
3:30 -	**AFTERNOON REFRESHMENTS, EVALUATIONS & NETWORKING IN FOYER**			