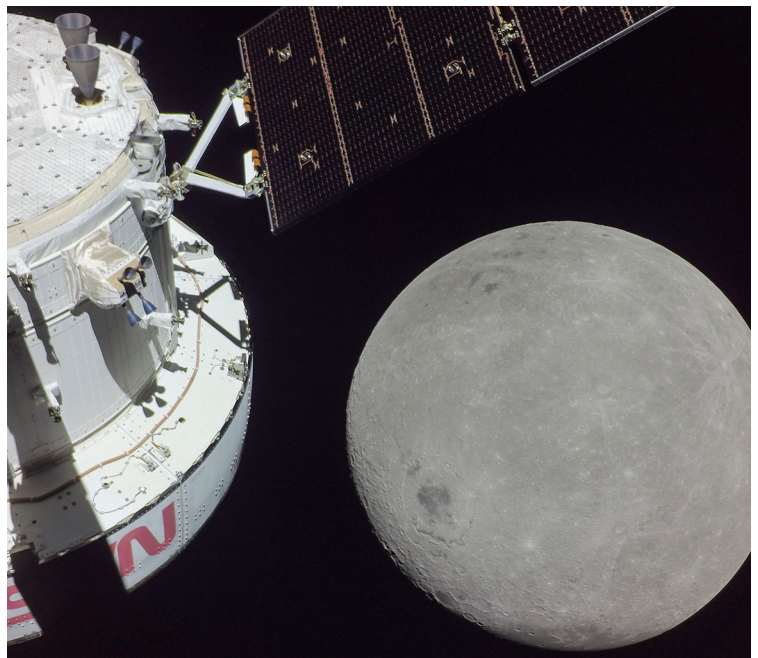


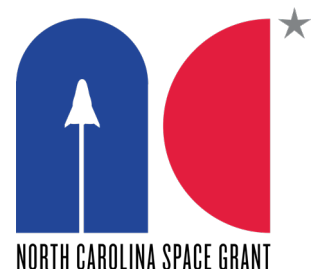
2023 NC SPACE SYMPOSIUM

EXPLORING THE UNKNOWN:

FROM EARTH TO SPACE



**North Carolina Space Grant
NC Space Symposium
April 21, 2023
Raleigh, N.C.**



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Photos courtesy Brian Owen/NC Science Festival; Rafael Loureiro/Winston-Salem State University; Tacho Lycos - High-Powered Rocketry/NC State University; Tim Ritter/UNC Pembroke

Sponsors

Mars Level - \$2,500



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Moon Level - \$1,000



Partners

Our thanks to the following partners who participated in NC Space Symposium sessions:

Appalachian Interdisciplinary Research Facility (AppalAIR), Appalachian State University

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NASA Kennedy Space Center, Exploration Ground Systems Program

NASA Langley Research Center

NASA Marshall Space Flight Center

North Carolina Department of Transportation

North Carolina Museum of Natural Sciences

North Carolina State University

Sierra Space

University of North Carolina at Chapel Hill

University of North Carolina at Charlotte

Guest Speakers

Luncheon Keynote Speaker

Charlie Blackwell-Thompson

Artemis Launch Director, NASA Exploration Ground Systems Program



Charlie Blackwell-Thompson, NASA's first female launch director, serves NASA's Exploration Ground Systems Program (EGS), based at NASA's John F. Kennedy Space Center in Florida. She led the countdown and liftoff of NASA's Space Launch System (SLS) rocket and Orion spacecraft during its first flight test, called Artemis I. She also serves as the cross-program lead to the Launch Integration team. In her role as launch director, she manages the development of all launch countdown plans, philosophy, and launch and scrub turnaround procedures and schedules.

Blackwell-Thompson graduated from Clemson University in 1988 with a degree in computer engineering and joined NASA in 2004 as a NASA test director in the Launch and Landing Division. She has held numerous leadership positions within NASA, serving

as lead in the Electrical Integration Office, lead electrical engineer for Hubble Space Telescope servicing missions, and ground operations integration lead engineer for the Orbital Space Plane.

Before being named launch director, Blackwell-Thompson served as the SLS Test Management Branch chief. She also served as the chief of Launch and Landing through the retirement of the Space Shuttle Program (SSP). During the SSP, Blackwell-Thompson was one of three certified NASA test directors and served as the chief NASA test director from STS-130 until program completion. She is also a qualified tanking test director and served in that position for STS-116, STS-117 and STS-118.

Blackwell-Thompson is the holder of multiple patents and awards, including multiple Space Flight Awareness Team Awards, the astronaut's Silver Snoopy, the NASA Exceptional Achievement Medal, the NASA Outstanding Leadership Medal, and the Rotary National Award for Space Achievement Stellar Award.

Plenary Presenter

Julie Williams-Byrd

Chief Technologist, NASA Langley Research Center



Julie Williams-Byrd is an electro-optics engineer and Chief Technologist at NASA's Langley Research Center in Hampton, Virginia. Williams-Byrd advises the LaRC Office of Director and senior staff on technology matters and provides technical leadership for planning, management and evaluation of center-wide technology development activities. She also leads technology development related studies and data analysis for the NASA chief technologist at NASA Headquarters in Washington.

Prior to becoming chief technologist, Williams-Byrd was a senior systems analyst in the Space Mission Analysis Branch, where she led and managed the integration function for the System Maturation Team (SMT). Under her leadership, the SMT developed methods that identified capabilities which would influence agency investment decisions for human

spaceflight initiatives and enabled the Evolvable Mars Campaign study missions. She performed the assessment of SMT capabilities, functions and performance metrics against human exploration mission goals. These accomplishments -- a first of their kind -- are considered revolutionary, of exceptional technical merit and have provided significant impact for NASA Human Exploration and Operations Mission Directorate and Langley.

Previously, she worked as an electro-optics engineer in the Active Sensor System Branch, providing project leadership for the development of advanced solid-state laser systems. She was also a key figure in coordinating activities with NASA centers, NASA Headquarters, industry, academia and other federal agencies.

Williams-Byrd earned bachelor's and master's degrees in physics from Hampton University in Hampton, Virginia. She is the author of numerous technical publications and is featured on the NASA Modern Figures and Women of NASA websites. She is committed to encouraging young scientists and engineers through mentoring and community outreach activities advocating careers in science, technology, engineering, arts and math.

All speaker bios can be viewed at go.ncsu.edu/2023-nc-space-symposium-speaker-bios

Agenda

7:30 - 8:30 am Lobby	Registration + Student Poster Set-Up + Breakfast (until 8:15am) Check in, enjoy coffee and continental breakfast and begin networking.
8:30 - 8:35 am Room 2	Welcome and Opening Remarks Susan White, Director, NC Space Grant
8:35 - 9:10 am Room 2	Plenary Presentation Julie Williams-Byrd, Chief Technologist, NASA Langley Research Center <i>Step Into NASA's World of Extraordinary Opportunities in STEM Careers</i>
9:10 - 10:10 am Room 2	Session 1: Space Science Moderated by: Rachel Smith , Head of Astronomy and Astrophysics Laboratory, North Carolina Museum of Natural Sciences; Associate Professor, Appalachian State University 9:10 - 9:40 am James Sherman , Senior Research Scientist at the Appalachian Interdisciplinary Research Facility (AppalAIR), Appalachian State University; <i>How is Changing Air Quality in the Background Southeastern U.S. Influencing Solar Radiation Budget: 15 Years of Measurements from the NASA and NOAA Sites at Appalachian State University</i> 9:40 - 9:55 am Aurora Toennisson , Ph.D. Student, NC Space Grant Graduate Research Fellow, NC State University; <i>Evaluating Spaceflight-Isolated Bacteria for Plant Growth Promotion</i> 9:55 - 10:10 am Pa Chia Thao , Ph.D. Student, NC Space Grant Graduate Research Fellow, UNC Chapel Hill; <i>Planetary Origins: Probing the Atmosphere of a 17-Million-Year-Old Hot Jupiter, HIP 67522b</i>
10:10 - 10:20 am	Networking Break
10:20 - 11:05 am Room 1D	Student Poster Session I Odd numbered posters presented
11:05 - 11:15 am	Networking Break
11:15 am - 12:15 pm Room 2	Session 2: Space Technology Moderated by: Rodward Hewlin , Assistant Professor & Research Scientist, Center for Biomedical Engineering & Science, UNC Charlotte 11:15 - 11:45 am Scott Asbury , Senior Director of Programs and Orbital Reef Program Manager, Sierra Space; <i>Future of Space Exploration, Space Destinations – Orbital Reef</i> 11:45 - 12:00 pm Nicholas Mazzoleni , Ph.D Student, NC Space Grant Graduate Research Fellow, NC State University; <i>Toward the Design and Testing of More Compliant Exoskeletons for the Prevention of Astronaut Muscle Atrophy in Microgravity Environments</i> 12:00 - 12:15 pm Austin South , Recent Graduate, UNC Charlotte; 2022 NASA Summer Intern, NASA Marshall Space Flight Center; <i>Using Virtual and Augmented Reality To Enhance Decision-Making</i>

Agenda continued

<p>12:15 - 1:30 pm Room 2</p> <p>Keynote 12:45 - 1:15 pm</p> <p>Q&A 1:15 - 1:25 pm</p>	<p>Luncheon + Keynote Charlie Blackwell-Thompson, Artemis Launch Director, Exploration Ground Systems Program, NASA Kennedy Space Center</p> <p>Introduction of Keynote Chad Brown, Division Chief for The Future Projects Office, Exploration Ground Systems Program, NASA Kennedy Space Center</p>
<p>1:30 – 1:45 pm</p>	<p>Networking Break</p>
<p>1:45 - 2:55 pm Room 2</p> <p>1:45 - 2:05 pm</p> <p>2:05 - 2:25 pm</p> <p>2:25 - 2:40 pm</p> <p>2:40 - 2:55 pm</p>	<p>Session 3: Future Flight</p> <p>Moderated by: Fuh-Gwo Yuan, Samuel P. Langley Professor, Department of Mechanical and Aerospace Engineering, NC State University</p> <p>Riley Beaman, UAS Program Manager, NC Department of Transportation; <i>NC – Beyond The Dunes</i></p> <p>Ashlee Bracewell, Structural Test Engineer, NASA Marshall Space Flight Center; <i>NASA Structural Testing: Pushing Rockets to their Limits</i></p> <p>Sterling Van Adams, Undergraduate Student, UNC Chapel Hill; 2022 NASA Summer Intern, NASA Ames Research Center; <i>Atmospheric Modeling for Predicting Flight Conditions of the Mars Science Helicopter in Martian Atmosphere</i></p> <p>Olivia Scott, Undergraduate Student, NC State University; 2022 Collier Aerospace Intern (NC Space Grant Career Internship Award); <i>The Study of Structural Optimization</i></p>
<p>2:55 - 3:05 pm</p>	<p>Networking Break</p>
<p>3:05 - 3:50 pm Room 1D</p>	<p>Student Poster Session II Even numbered posters presented</p>
<p>3:50 - 4:00 pm</p>	<p>Networking Break</p>
<p>4:00 - 4:55 pm Room 2</p>	<p>Panel: Careers in Space</p> <p>Moderated by: Jeff Mobley, VP Programs, Mechanisms and Motion Systems, Sierra Space</p> <p>Mike Rice, Satellite Missions Operations, KBR</p> <p>Ashlee Bracewell, Structural Test Engineer, NASA Marshall Space Flight Center</p> <p>Riley Beaman, UAS Program Manager, NC Department of Transportation</p> <p>James Ainsworth, Managing Director of Engineering, Collier Aerospace - HyperX Software</p>
<p>4:55 - 5:00 pm</p>	<p>Closing Remarks</p>

Student Posters

Astronomy and Astrophysics (ASTRO)

ASTRO-1 *Ever Elusive Exospheres: 3 Non-Detections of H-alpha Transits for Young Systems*, **Reilly Milburn**, University of North Carolina at Chapel Hill

ASTRO-2 *Spectroscopy of Highly Charged Ions for Astrophysical and Fundamental Physics Applications*, **Samuel DeMay**, Appalachian State University

ASTRO-3 *Using Nearest Neighbors to Explore the Evolution of Galaxy Nuggets*, **Abigail Dunnigan**, University of North Carolina at Chapel Hill

ASTRO-4 *GW Event Research Tool*, **Mike Keohane**, Duke University

ASTRO-5 *The Age of the Carina Stellar Association*, **Mackenna Wood**, University of North Carolina at Chapel Hill

ASTRO-6 *NASA Communications and Public Engagement - Partnership Metrics*, **Teresa Purello**, North Carolina State University

ASTRO-7 *Modeling the Dynamics and Evolution of Jupiter's Great Red Spot*, **Caleb Keaveney**, North Carolina State University

ASTRO-8 *Development of Different Skynet Systems for Astronomy Education and Gravitational Wave Research*, **Logan Selph**, University of North Carolina at Chapel Hill

ASTRO-10 *Using Cloudy Simulations to Evaluate WISE Photometry as a Dwarf AGN Diagnostic*, **Thomas Vivona**, Elon University

Biological Sciences (BIO)

BIO-1 *Antiseptic Compounds from Trees in Papua New Guinea Revealed by High-Resolution Mass Spectrometry*, **Nathan McPherson** and **Alia Wang**, Forsyth Technical Community College

BIO-2 *Effects of UV Radiation on Genetically Altered HA1 Yeast*, **Garrett Goudas**, Caldwell Community College and Technical Institute

BIO-3 *Observation of Simulated Microgravity on the Circadian Clock in Arabidopsis thaliana*, **Blake Horton**, North Carolina State University

BIO-4 *Viability of Selected Freshwater Microorganisms for Spaceborne Air Filtration*, **John Pasour**, Cleveland Community College

BIO-5 *The Impact of Human Interaction on Surrounding Biodiversity*, **Brenna Cafferty** and **Cassidy Holloway**, South Piedmont Community College

BIO-6 *Antibacterial Properties of Endophytic Fungi Cultured in Nutrient Supplemented Lunar and Mars Simulants*, **Rachel Wilson** and **Juan Morales Aguirre**, Davidson-Davie Community College

BIO-7 *Do Restaurants Have Profit or Truth On The Menu?*, **Kylie May**, South Piedmont Community College

Student Posters

BIO-8 *The Combined Effect of Radiation and Microgravity on Cardiomyocyte Survival*, **Evan Yee**, Duke University

BIO-9 *Data Analysis for Piedmont Health*, **Mohammed Amaan Hussain**, Wake Technical Community College

BIO-10 *Predicting Habitat Availability of Swamp Sparrows (*Melospiza georgiana*) in Hyde County, NC: Integrating Habitat Needs into Sea Level Rise Models*, **Allie Best**, University of North Carolina at Wilmington

BIO-11 *White Creek 2023 Field Study*, **Cadence Davis**, Western Piedmont Community College

BIO-12 *Population Dynamics of American Ginseng in the Piedmont Region of NC*, **Gillian Freeze**, Western Piedmont Community College

BIO-13 *Tilling and Its Effect on Martian Regolith-based Crop Growth*, **Sadie White**, Winston-Salem State University

BIO-14 *Evaluation of the Effects of Crop Transferability Stress on Radish Plants Cultivated in Lunar Highlands Regolith*, **Sydney Wharton**, Winston-Salem State University

BIO-15 *Evaluation of the Physiology and Root Morphology of Crops Grown in Lunar and Martian Regolith Exposed to Lunar and Martian Simulated Gravity*, **Taylor Johnson**, Winston-Salem State University

BIO-16 *Phenotypic Responses of Arabidopsis thaliana to Approximated Microgravity: a GWAS Analysis*, **Benjamin Jenkins**, University of North Carolina at Greensboro

BIO-17 *Effects of Full Spectrum Light and Randomized Gravity on Arabidopsis thaliana*, **Katherine Swinson**, University of North Carolina at Greensboro

Computer Science (COMP)

COMP-1 *A Low-overhead Dynamic Formation Method for LEO Satellite Swarm Using Imperfect CSI*, **Chia-Hung Lin**, North Carolina State University

COMP-2 *Enhanced UI/UX for NASA's Valkyrie Humanoid Robot*, **Nathan Couch**, Fayetteville State University

COMP-3 *Campus Compass*, **Brian Peacock, Amy Edward, Dannia Ruiz Mata, David Arnett**, Central Piedmont Community College

COMP-4 *Vision-Based Landing System for Parachute Payloads*, **Justin Goodrich**, Mitchell Community College

COMP-5 *Visual Object Detection and Navigation of Robot Swarms*, **Jonathan Soltren**, Fayetteville State University

COMP-6 *Applications of Frequency-Modulated Continuous Wave LiDAR for Lunar Terrain Navigation and Mapping*, **Niall McKinnon**, University of North Carolina at Wilmington

COMP-7 *The Use of Artificial Intelligence In High Altitude Balloon Flight Path and Landing Predictions*, **Daniel Ward**, Caldwell Community College and Technical Institute

Student Posters

Earth and Environmental Sciences, Technology and Engineering (ENV)

ENV-1 *An Initial Study of Seven Months of Size Number Concentration Data on Atmospheric Aerosols in Boone, NC, **Ethan Barber**, Appalachian State University*

ENV-2 *Newest-generation Handheld Sunphotometer for Validation of Satellite-Measured Aerosol Optical Depth and Air Quality Studies by Citizen Scientists, **Matthew Allen**, Appalachian State University*

ENV-3 *Sedimentology and Stratigraphy of the Flanner Beach Formation (Middle Pleistocene) in Beaufort County, NC, **Garrett Freeman, Christian Knobel** and **Addison Hudson**, Pitt Community College*

ENV-4 *Evaluating Rock Pool Hydroperiod Fluctuation Using Climate Variables to Inform Habitat Monitoring and Protection in the Western Sonoran Desert, **Deirdre An**, North Carolina State University*

ENV-5 *Particle Turbulent Mass Flux Retrievals Through Novel Remote Sensing Methodology, **Ajmal Rasheeda Satheesh**, North Carolina State University*

ENV-6 *Capturing Vegetation Regrowth Dynamics After Prescribed Fire in North Carolina's Piedmont and Coastal Plains, **Nicholas Corak**, Wake Forest University*

ENV-7 *Application of High Spectral Resolution Lidar (HSRL)-based methods for Estimating PM_{2.5} During the DISCOVER-AQ and KORUS-AQ Campaigns, **Bethany Sutherland**, North Carolina State University*

ENV-8 *Tracing the Fate of Phosphorus During Seafloor Weathering Under Varying Oxygenated Conditions, **Stephen Lail**, University of North Carolina at Charlotte*

ENV-9 *Temperature Effect on American Tree Sparrow Breeding Patterns, **Jose Martinez Contreras, Asael Medina** and **Johnny Chinchilla Pinto**, Forsyth Technical Community College*

Mechanical and Aerospace Engineering (MAE)

MAE-1 *Structural Analysis and Optimization at Collier Aerospace, **JD Shropshire, Olivia Scott** and **Jackson Corigliano**, North Carolina State University*

MAE-2 *Helical Screw Drive Propulsion Testing Rig and Terrain Identification Neural Network, **Ryan Lynch**, North Carolina State University*

MAE-3 *Modeling Evaluating the Feasibility of ISAM, **Abigail Wucherer**, North Carolina State University*

MAE-4 *Computational Study of Transonic Buffet's Sensitivity to Reynolds Number and Wind Tunnel Wall Effects, **Ian Eldridge-Allegra**, Duke University*

MAE-5 *Modeling and Propulsion Systems Intern, **Andrew Gantt**, North Carolina State University*

MAE-6 *Nonlinear Aeroelastic Model in High-Speed Flow, **Luisa Piccolo Serafim**, Duke University*

MAE-7 *Evaluating the Feasibility of Euler Equations for Simulating Buffet in Transonic Flow, **Sanjeev Chauhan**, Duke University*

Student Posters

Physical Sciences (PHY)

PHY-1 *The Effects of Structure on the Electronic and Optical Properties of Nanoscale Semiconductors*, **Cullen Walsh**, University of North Carolina at Chapel Hill

PHY-2 *Differential Dynamic Microscopy*, **Hayden White**, North Carolina State University

PHY-3 *Effect of Laser Wavelength on Raman Features of Ti₃C₂T_x MXene*, **Jianna Evans**, Wake Technical Community College

PHY-4 *TardiAMPs: Leveraging the Unique Physiology of Tardigrades for the Identification and Characterization of Novel Antimicrobial Peptides*, **Amanda Smythers**, University of North Carolina at Chapel Hill

Teams

IEEE Southeast Conference Hardware Challenge, **Phillip Smith, Gaetano Edwards, Luke Gutman, Samuel Crane and Varshit Rayapalli**, University of North Carolina at Charlotte

Development of an Autonomous Underwater Vehicle for Application in Hydrographic Surveying, **Tajah Trapier and Christopher Mori**, North Carolina State University

UNC Charlotte Autonomous Lunar Mining Rover Enhancements, **Felix Braun, Amin Alqashash, Jacob Brown, Zebulon Duvall, Victor Kremer, Christopher Lowe, Charlie O'Brien and Manuel Melgoza Rodriguez**, University of North Carolina at Charlotte

Design and Testing of a High-power Rocket and Payload for the 2023 NASA Student Launch Initiative, **Sean McClanahan**, University of North Carolina at Charlotte

Fixed-Wing Autonomous Unmanned Aerial Vehicle Air Drop Delivery, **Blake Monkus, Mitchell Files, Chris Beyrent, Alex Dutterer, Issac Trost and John Wright**, North Carolina State University

UNC-Pembroke Rocket Team, **Billy Ray Pait**, University of North Carolina at Pembroke

Full abstracts for all students and teams can be viewed at
go.ncsu.edu/2023-nc-space-symposium-student-presentations



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Funding Opportunities & Programs

NC Space Grant offers funding opportunities and programs throughout the academic year including higher education, K-12 education, public outreach, and team experience and challenge opportunities.



Photo courtesy UNC Charlotte 49er Rocketry Team



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2024 NC SPACE SYMPOSIUM EXPLORE EARTH

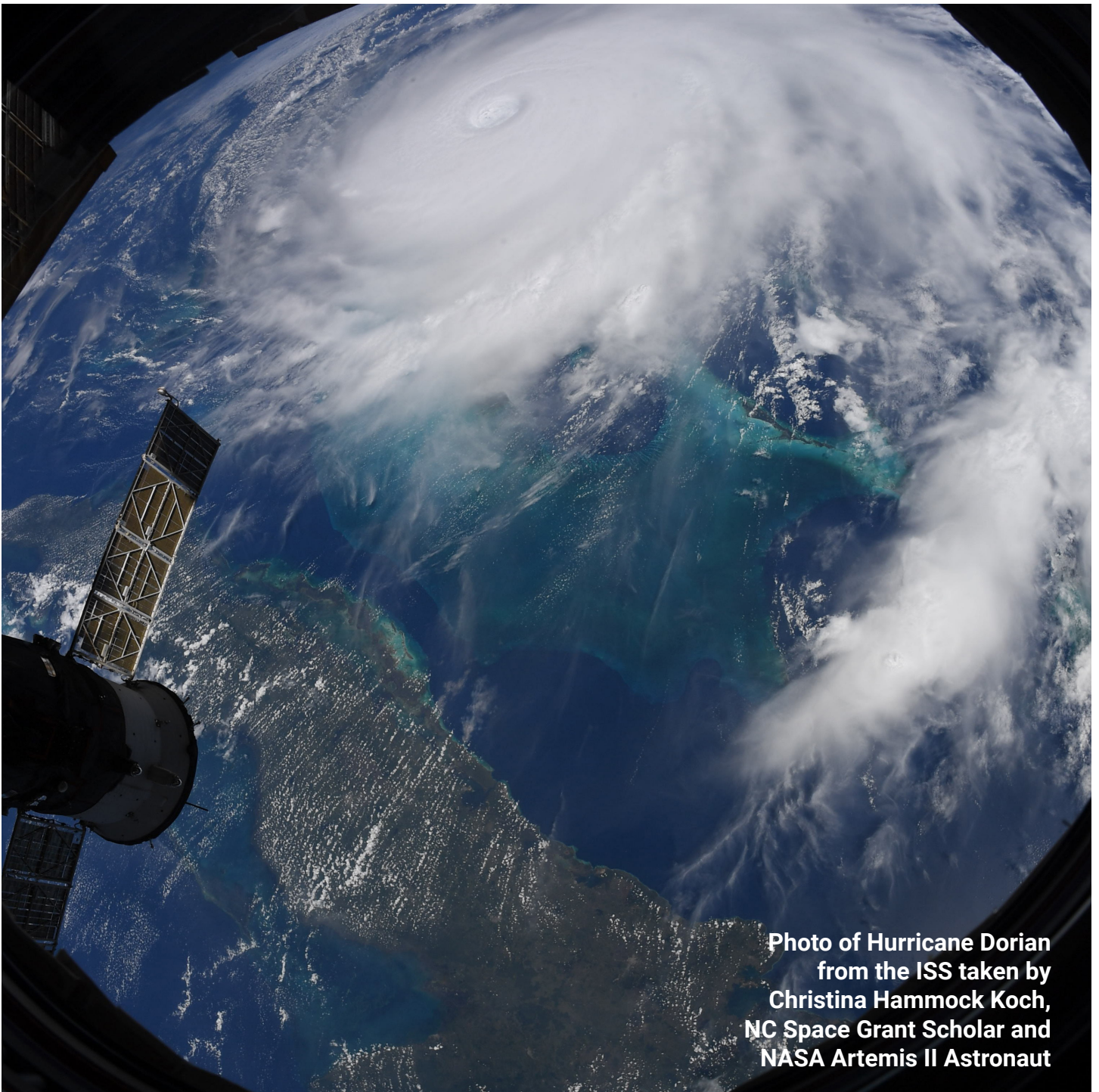
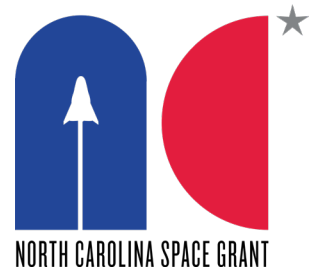


Photo of Hurricane Dorian from the ISS taken by Christina Hammock Koch, NC Space Grant Scholar and NASA Artemis II Astronaut

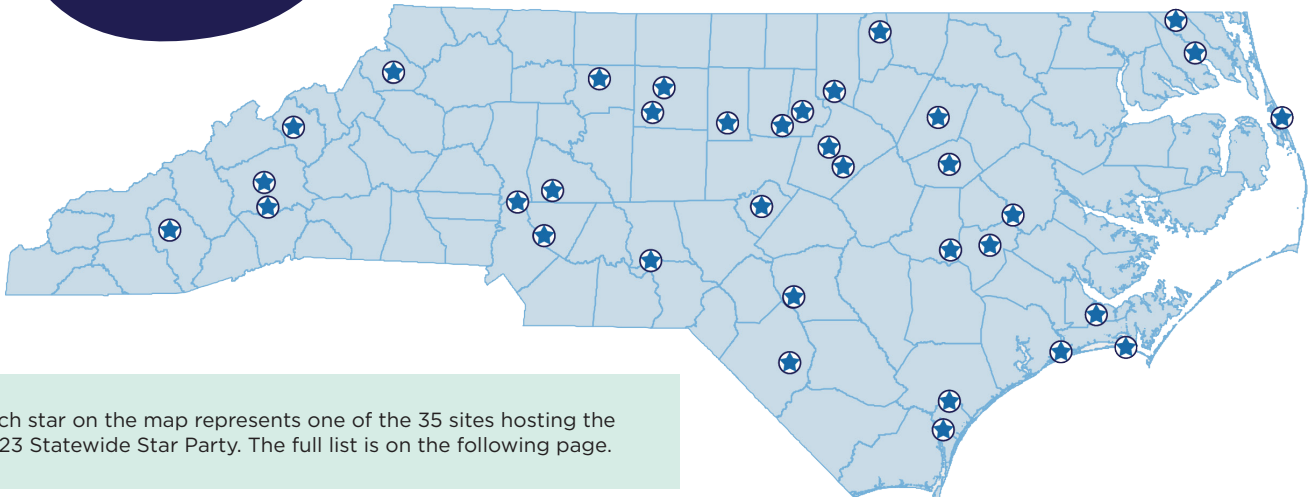
SAVE THE DATE
MARCH 22, 2024
RALEIGH, NC





2023 Statewide Star Party

APRIL 21 AND 22, 2023



Each star on the map represents one of the 35 sites hosting the 2023 Statewide Star Party. The full list is on the following page.

Thanks to generous grant support from the North Carolina Space Grant, the 2023 North Carolina Science Festival will again feature the Statewide Star Party as a signature initiative.

During this eleventh annual Statewide Star Party, 35 hosts will offer public skywatching events across North Carolina on Friday, April 21, and Saturday, April 22, 2023. Star Party hosts include state and local parks, colleges and universities, planetariums, science centers, nature centers, and libraries. About 3,500 visitors are expected to participate.

This year's Star Party theme is "Celebrating the Night Sky." Hosts are provided with a Star Party kit of hands-on activities and NASA resources on this theme.

About NCSciFest

The North Carolina Science Festival is a month-long celebration of science that happens every April. Launched in 2010, the Festival is an initiative of UNC's Morehead Planetarium and Science Center and has grown into one of the largest celebrations of STEM in the world. The Festival highlights the educational, cultural, and financial impact of science in our state. Through hands-on activities, science talks, lab tours, nature experiences, expos, exhibits, and performances, the Festival engages a wide range of public audiences while inspiring future generations. Find out more at ncscifest.org.

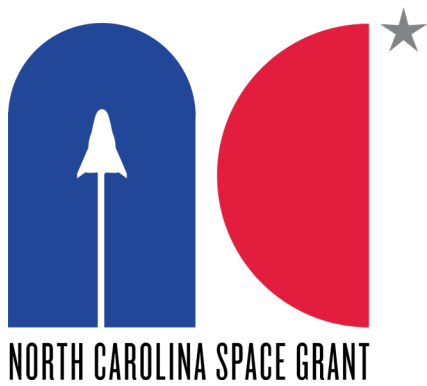


The Statewide Star Party is made possible by the generous grant support of the North Carolina Space Grant.

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