Charlottesville Welcomes the 2022 Conference of

The National Society of Black Physicists

Emerging from the Event Horizon and Beaming for the Future

November 6-9, 2022

Omni Hotel Charlottesville

The NSBP conference is the largest academic meeting of minority physicists in the United States. The goal of the conference is to provide mentorship opportunities, increase participant access to recruiters, offer networking opportunities and inform the broader physics community on best practices

Co-Hosted by **National Radio Astronomy Observatory**

OFFICE OF THE PRESIDENT
The National Society of Black Physicists

Dear NSBP 2022 Participant:

On behalf of the Executive Board of the National Society of Black Physicists, I am delighted to invite you to the 2022 National Society of Black Physicists Annual Conference. This year, the NSBP Annual Conference will be co-hosted by the National Radio Astronomy Observatory (NRAO) and the Associated Universities, Inc. (AUI), and partially funded by the National Science Foundation (NSF) and National Aeronautics and Space Administration (NASA). The theme of this year's conference — our first in-person meeting in three years — is ***Emerging from the Event Horizon and Beaming for the Future***.

NSBP 2022 aims to ***promote the professional*** well-being of African American physicists and physics students within the scientific community and society at large. We strive to develop and support efforts to increase opportunities for our members in physics and to advance the visibility of their scientific works and service. We further aim to support professional development and persistence at every career stage and modality that physicists contribute to society including academia, industry, government, philanthropy, education, national defense, and much more.

To achieve these aims, we actively partner with synergistic organizations to provide expert consultation in educational, training, and mentoring efforts directed at underrepresented educational and research institutions, including historically black colleges and universities (HBCUs). Our involvement with various workshops, meetings, and conferences with these organizations (1) ensures the diversity and inclusion of minorities in new physics research collaborations, and (2) encourages our members to ***connect and persist in physics*** at their host facilities or institutions.

The Program Committee has provided a safe forum for everyone to interact, engage and expand partnerships through our three full days of scientific and educational sessions, exhibitions, and interactive networking events. All participants are encouraged to join as a member and/or become actively involved in initiating, planning, and executing current or forthcoming NSBP initiatives. We welcome you and appreciate your participation in ***NSBP 2022***.

Sincerely,

Hakeem M Oluseyi, Ph.D. NSBP President

National Radio Astronomy Observatory
Welcome from NRAO Director Tony Beasley

The National Radio Astronomy Observatory (NRAO) and the National Society of Black Physicists (NSBP) have enjoyed a long, mutually supportive and beneficial relationship. This relationship has spanned the personal, the professional, and organizational. Over the years we have developed strong collaborations that are focused largely on a priority that we both share: the current and future generation of scientists. Through two major efforts, the National Astronomy Consortium (NAC) and RADIAL, we are working together to ensure that Astronomy and related STEM fields are places in which students and scientists thrive.

We are very excited about this opportunity to sponsor the 2022 NSBP Annual Conference in Charlottesville, Virginia, the site of NRAO's Headquarters.

In its role as a facility of the National Science Foundation (NSF), operated under cooperative agreement by Associated Universities, Inc. (AUI), the NRAO provides state-of-the-art radio telescope facilities for use by the international scientific community. Our mission statement reflects our commitment to science and society. In partnership with the scientific community, we:

- Provide world-leading telescopes, instrumentation, data and expertise;
- Train the next generation of scientists and engineers;
- Advance broader, equitable, inclusive participation in science and engineering; and
- Promote astronomy to foster a more scientifically literate society.

I hope that you will take a moment to learn more about the NRAO, our mission, and our commitment to being a world-class, inclusive Observatory. More information about the Observatory can be found at www.nrao.edu. This link (NRAO Mission Statement Update) offers more information about our commitment to broadening participation in STEM.

Please stop by our booth and look out for NRAO staff who are looking forward to talking with you about your interests and your careers.

Welcome to Charlottesville!

Tony Beasley, Director

National Radio Astronomy Observatory

Dear Colleagues:

On behalf of Associated Universities, Inc. (AUI) I wish to welcome you to the 2022 Annual Conference of the National Society of Black Physicists "**Emerging from the Event Horizon and Beaming for the Future**". Over the years, NSBP has worked diligently in its efforts to diversify the STEM workforce, and to promote opportunities for students and members of the professional physics and astronomy communities. It is an honor to be here with you, and to have had the opportunity to collaborate with NSBP in support of this event.

This Annual Conference brings together a broad range of experts in multiple fields of physics and is one of the largest academic meetings of minority physicists in the United States. Further, the conference presents a unique opportunity to evaluate the needs of minority physicists and promote professional well-being within the international scientific community and society at large. It is our fundamental belief that diversity improves both the quality of life for all, as well as the quality of the research we do.

The 2022 Program Committee has worked hard to organize an excellent group of speakers and learning opportunities for you. Throughout the Conference we encourage you to participate in scientific sessions, and interact with colleagues from across the country as we work to create a stronger and healthier nation through a diverse and representative STEM enterprise. We gratefully acknowledge the support of the National Science Foundation, the National Radio Astronomy Observatory, and all our sponsors that made this conference possible.

We look forward to a successful meeting and the opportunity to share with you in our collective passion for science and progress as we work together to meet today's challenges, and those yet to come.

Best wishes,

Tim Spuck

Tim Spuck, Ed.D.
Director of Education & Public Engagement
Associated Universities Inc.

Opening Presidential Remarks

Dr. Hakeem Oluseyi

Monday, November 7th
Location: Paramount Theater
Time: 8:00 am – 9: 15 am

Hakeem Oluseyi graduated with a B.S. in Physics and Mathematics from Tougaloo College, and M.S. and Ph.D. degrees in Physics from Stanford University. He is an astrophysicist, inventor, renowned science communicator, global STEM education advocate, and US military veteran. He has held professorships at the Florida Institute of Technology, MIT, University of California at Berkeley, University of Washington, and the University of Cape Town. He has also served as the Space Science Education Manager for the Science Mission Directorate at NASA Headquarters, and Chief Science Officer for Discovery Science. He is currently an Affiliated Professor of Physics and Astronomy at George Mason University and President of QuarkStarr, Inc. He is the current sitting president of the National Society of Black Physicists.

General Session

Dr. Damian Rouson

Tuesday, November 8th
Location: Paramount Theater
Time: 8:00 am – 9: 15 am

Damian Rouson is a mechanical engineer with extensive experience in software design and development for multi-physics modeling, including classical, quantum, and magnetohydrodynamic turbulence and multiphase flow. He co-authored the textbook Scientific Software Design: The Object-Oriented Way (Cambridge University Press, 2011) and has been contracted to teach related courses at supercomputer centers and universities in the U.S. and Europe. He has been a PI or Co-I on research funded by the National Science Foundation, the Office of Naval Research, and the National Institute of Standards and Technology and has held visiting and tenure-track appointments at universities in the U.S. and in Europe. He holds a B.S. from Howard University and an M.S. and Ph.D. from Stanford University, all in Mechanical Engineering. He is also a licensed Professional Engineer (P.E.) in the State of California. In February 2013, Dr. Rouson entered Sandia National Laboratory's Entrepreneurial Separation to Transfer Technology (ESST) program to launch Sourcery, Inc., a software consultancy founded by and for computational scientists, engineers, and mathematicians. In July 2015, Dr. Rouson founded the California public-benefit nonprofit corporation Sourcery Institute. In August 2015, the U.S. Internal Revenue Service approved Sourcery Institute's application for 501(c)(3) tax-exempt status for conducting research and education in computational science and engineering.

Luncheon Session II

Dr. Asmeret A. Berhe

Tuesday, November 8th
Location: Paramount Theater
Time: 12:00 pm – 1: 15 pm

Dr. Asmeret Asefaw Berhe is the Director of the Office of Science for the U.S. Department of Energy. Dr. Berhe was most recently a Professor of Soil Biogeochemistry; the Ted and Jan Falasco Chair in Earth Sciences and Geology; and Interim Associate Dean for Graduate Education at the University of California, Merced. Her research was at the intersection of soil science, global change science, and political ecology with an emphasis on how the soil system regulates the earth's climate and the dynamic two-way relationship between the natural environment and human communities. She previously served as the Chair of the US National Committee on Soil Science at the National Academies; was a Leadership board member for the Earth Science Women's Network; and is currently a co-principal investigator in the ADVANCEGeo Partnership – a National Science Foundation funded effort to empower (geo)scientists to respond to and prevent harassment, discrimination, bullying and other exclusionary behaviors in research environments. Her scholarship on how physical processes such as erosion, fire, and changes in climate affect the biogeochemical cycling of essential elements in the earth system and her efforts to ensure equity and inclusion of people from all walks of life in the scientific enterprise have received numerous awards and honors. She is a Fellow of the American Geophysical Union and the Geological Society of America, and a member of the inaugural class of the US National Academies New Voices in Science, Engineering, and Medicine. Berhe was born and raised in Asmara, Eritrea. She received a B.Sc. in Soil and Water Conservation from the University of Asmara, an M.Sc. in Political Ecology from Michigan State University, and a Ph.D. in Biogeochemistry from the University of California, Berkeley. In 2020 she was named a Great Immigrant, Great American by the Carnegie Corporation of New York.

Special Session

LaTonya Pegues

Wednesday, November 9th
Location: Ashland & Highlands
Time: 10:00 am – 11: 30 am

As CEO of BOAZ Enterprises, LaTonya J. Pegues brings a wealth of experience and non-traditional strategic solutions to BOAZ Enterprises clientele. Under her leadership, BOAZ Enterprises has provided services for clients in Africa, Asia, Europe, and throughout North America. She has trained the United States Department of Commerce Minority Business Development Agency's (MBDA) staff and clients on a range of topics that include Cultural Competency, and International Relations. She has provided both facilitation and training services on a variety of topics that have reached "across the aisle" to raise awareness on difficult issues on topics such as, unconscious bias, sexual harassment prevention, team building, image and public optics, customer service, diversity, equity, inclusion, and more. She has been an advisor and facilitator on a number of topics where organizations have needed a neutral party to help them work through challenging issues.

Ms. Pegues was an Unconscious Bias panelist during the fifteenth annual National Diversity Council's conference where President Barack Obama, and General Colin Powell gave keynote addresses. In February, 2021, she was a speaker/trainer at the same NFBPA conference as National Institute of Allergy and Infectious Diseases director, and Medical Adviser to President Joe Biden, Dr. Anthony Fauci.

She is an enthusiastic graduate of Howard University, based in Washington, D.C, where she studied physics and mathematics.. She is also an alumna of the UCLA Anderson School's Riordan MBA Fellows Program, and has been acknowledged by the Austin, TX branch of the NAACP as recipient of their Community Service Award. Be on the lookout for her new upcoming book, "Unconscious Bias Revealed, How to Recognize and Un-do Bias." To read her weekly blog, listen to her podcast, or watch video clips from her training, visit: www.theUBtrainer.com and follow Ms. Pegues on social media @theUBtrainer.

Closing Luncheon/Keynote Speaker

Dr. Calvin Mackie

Wednesday, November 9th
Location: Omni – Jefferson Ballroom
Time: 8:00 am – 9: 15 am

Dr. Calvin Mackie is an award-winning mentor, inventor, author, former engineering professor, internationally renowned speaker, and successful entrepreneur. In 2013, Dr. Mackie founded STEM NOLA, a non-profit organization created to expose, inspire, and engage communities in the opportunities in Science, Technology, Engineering and Mathematics (STEM). To date, STEM NOLA has engaged over 100,000 K-12 students in hands-on project-based STEM activities. In 2021, he launched STEM Global Action to advance K-12 Stem education across the U.S. and the world.

A lifelong resident of New Orleans, Dr. Mackie graduated from high school with low test scores requiring him to take special remedial classes at Morehouse College. In 1990, he graduated Magna Cum Laude from Morehouse College with a B.S. degree, as a member of the prestigious Phi Beta Kappa National Honor Society. Simultaneously, he was awarded a B.S. degree in Mechanical Engineering from Georgia Tech, where he subsequently earned his master's and Ph.D. in Mechanical Engineering in 1996.

While pursuing a doctorate degree, Dr. Mackie served as an instructor of mathematics at Morehouse College. Following graduation, he joined the faculty at Tulane University, where he pursued research related to heat transfer, fluid dynamics, energy efficiency, and renewable energy. In 2002, he was promoted to Associate Professor with tenure. Mackie's eleven-year academic career ended in June 2007, when Tulane University disbanded the engineering school in response to financial hardship induced by Hurricane Katrina. During 2004-2005 academic year, Mackie served as a visiting professor in the Department of Chemical Engineering at the University of Michigan. He enjoyed a respected academic career, before pivoting his career towards entrepreneurship, consulting, and professional speaking.

Mackie is also the President and CEO of the Channel ZerO Group LLC, an educational and professional development consulting company he co-founded in 1992. He has presented to numerous civic and educational institutions, government entities, professional association, and businesses of every size and industrial focus. He has won numerous awards including 2019 Congressional Black Caucus Foundation Board's Chair Phoenix Award, which recognizes individuals whose extraordinary achievements strengthen communities and improve the lives of individuals and families, nationally and globally. In 2003, he was awarded the 2003 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring in a White House ceremony. Dr. Mackie's is the author of two award-winning books: A View from the Roof: Lesson for Life and Business and Grandma's Hands: Cherished Moments of Faith and Wisdom. Dr. Mackie is a devoted husband to his wife, Tracy, and father to his two sons, Myles Ahmad and Mason Amir. For more information, visit www.stemnola.com and stemglobalaction.com. Listen to Dr. Mackie's podcast series, "Let's Talk Stem with Dr. Calvin Mackie," https://www.iheart.com/podcast/269-lets-talk-stem-with=dr-cal-84984352?cmp=ios_share&sc=ios_social_share&pr=false&autoplay=true

2022 NSBP Conference Sponsors & Exhibitors

Institution	Assigned Table Number	Sponsorship/Exhibitor
National Radio Astronomy Observatory	1/2	Co-Host/Partner
The National Science Foundation	14/15	Co-Partner
Associated Universities Inc	3	Co-Host/Partner
Corning Inc	4	Gold Sponsor
Optica	5	Silver Sponsor
Facility for Rare Isotope Beams	6	Silver Sponsor
University of Southern California	7	Evaluation Team
Heising-Simons Foundation	8	Platinum Sponsor
UT Knoxville	9	Gold Sponsor
Oak Ridge National Laboratory	10	Collaborator
University of Virginia	12/13	Gold Sponsor
NASA Goddard Space Flight Center	1	Bronze Plus Sponsor
University Of Wisconsin-Madison	2	Exhibitor
Lawrence Berkeley National Laboratory	3	Exhibitor
University of Wisconsin- Madison	4	Exhibitor
University of Delaware	5	Exhibitor
American Astronomical Society-AAS	6	Exhibitor
U.S. Compact Muon Solenoid Collaboration	7	Exhibitor
Massachusetts Institute of Technology /MIT	8	Exhibitor
Boston University	9	Exhibitor
Yale University	10	Exhibitor
Howard University	11	Exhibitor
SLAC National Accelerator Laboratory	12	Exhibitor
NSF's NOIRLab	13	Exhibitor
Space Telescope Science Institute	14	Exhibitor
Johns Hopkins University	15	Exhibitor
Cornell Tech	16	Exhibitor
Rochester Institute of Technology	17	Exhibitor
University of Illinois at Urbana Champaign	18	Exhibitor
APS	19	Exhibitor
U.S. Department of Energy	20	Exhibitor
Morgan State University	21	Bronze Plus Sponsor
University of Notre Dame	22	Bronze Plus Sponsor
Research Opportunities for Undergraduates	23	Exhibitor
University of Dayton	24	Exhibitor
University Of Maryland	25	Exhibitor
University of California Santa Cruz	26	Exhibitor
William & Mary	27	Exhibitor
Fermi National Accelerator Laboratory	28	Exhibitor
TAE Technologies	29	Bronze Plus Sponsor
National Institute of Standards and Technology	30	Exhibitor
Brookhaven National Accelerator Laboratory	31	Exhibitor
Princeton University	32	Exhibitor
The University of Texas MD Anderson Cancer Center UTHealth Houston Graduate School of Biomedical Science	33	Exhibitor
American Physical Society	34	Exhibitor
University of Utah	35	Exhibitor

Georgia Institute of Technology	36	Exhibitor
Oak Ridge Associated Universities	37	Exhibitor
Pennsylvania State University	38	Exhibitor
Harvard University	39	Exhibitor
University of Kansas	40	Exhibitor
American Physical Society	41	Exhibitor
University of California, Berkeley	42	Exhibitor
Caltech	43	Exhibitor
Stanford University	44	Exhibitor
The Ohio State University	45	Exhibitor
University of Michigan	46	Exhibitor
University of California San Diego	47	Exhibitor

SUNDAY, NOVEMBER 6, 2022 (ALL TIMES IN EASTERN TIME ZONE)	
9:00AM - 11:00AM	*NSBP BOARD MEETING (CLOSED EXECUTIVE SESSION)*
12Noon - 8:00PM	*CONFERENCE CHECK-IN & BADGE PICK-UP*
12Noon	*EXHIBIT SETUP (OMNI BALLROOM)*
1:00PM - 5:00PM	*OFF-SITE TOURS (NRAO & UVA PHYSICS/ASTRONOMY/ENGINEERING)*
3:00PM	*HOTEL CHECK-IN (Luggage storage for early arrivals -- James Monroe room)*
6:00PM - 8:00PM	*OPENING WELCOME RECEPTION & EXHIBIT OPENS (OMNI BALLROOM)*
8:00PM - 9:00PM	*EXHIBITORS' HANGOUT SESSION (by INVITATION only)*
MONDAY, NOVEMBER 7, 2022 (ALL TIMES IN EASTERN TIME ZONE)	
	Conference Schedule Overview
6:30AM - 7:45AM	*ATTENDEE BREAKFAST (OMNI ATRIUM)*
7:00AM - 7:45AM	*POSTER SESSION SET-UP #1 (RESIDENCE INN BALLROOM)*
7:30AM - 6:30PM	*CONFERENCE CHECK-IN & BADGE PICK-UP*

7:45AM - 8:00AM	***Walk to Paramount Theater***							
8:00AM - 9:15AM	***OPENING PRESIDENTIAL REMARKS (PARAMOUNT THEATER)*** ***Greetings from Charlottesville, Sponsors & Special Guests***							
9:15AM - 9:30AM	***Walk to Omni Hotel***							
Meeting Rooms	**Montpelier (20)**	**Lewis & Clark (50)**	**Ashlawn & Highlands (60)**	**CODE Bldg (150)**	**Monroe (75)**	**Business Center (75)**	**Monticello (20)**	**Madison (20)**
9:30AM - 11:00AM	**Evaluation Team**	**CMMP-1**	**NPP-1**	**Astro-1**	**POP/AMO-1**	**CGR-1**	**EPSS-1**	**SOT/PER-1**
Chairs/Leads	D. Cole	W. Ratcliff	P. Gueye	G. Mosby	T. Searles	H. Feldman	L. Quick + A. Evans	M. Murdock
10:00AM - 11:30AM	***AM COFFEE BREAK / EXHIBITS & CAREER FAIR (JEFFERSON BALLROOM)***							
11:00AM - 12:00PM	***POSTER SESSION #1 - Followed by REVIEW AND JUDGING (Closed session beginning at 12:00pm -- Open to Judges only)***							
11:30AM - 12:00PM	***Walk to Paramount Theater & Pick-up LUNCHBOX***							
12:00PM - 1:30PM	***OPENING LUNCHEON SESSION - Panel of Successful Women in Physics*** ***SPEAKERS: Dr. Deborah Jackson, Dr. Arlene Maclin, and Dr. Claudia Rankin*** ***CONFERENCE PHOTO (To be taken at the end of session)***							
1:30PM - 1:45PM	***Walk to Omni Hotel***							
1:45PM - 2:45PM	**Evaluation Team**	**CMMP-2**	**NPP-2**	**Astro-2**	**POP-2**	**MED&CBP-2**	**EPSS-2**	**CGR-2**
Chairs/Leads	D. Cole	W. Ratcliff	P. Gueye	G. Mosby	T. Searles	C. Njeh + W. Ngwa	L. Quick + A. Evans	H. Feldman
2:45PM - 3:00PM	***BREAK (Walk to Paramount Theater)***							

Time								
3:00PM - 4:30PM	**BIG SCIENCE HOUR #1:**							
	NSBP Presents: NSF Quantum Computing & Technologies							
4:30PM - 4:45PM	***PM COFFEE BREAK (Walk to Omni Hotel)***							
4:30PM - 7:30PM	***EXHIBITS & CAREER FAIR (JEFFERSON BALLROOM)***							
4:45PM - 6:00PM	**Special Events**							
	Evaluation Team	**HBCU Chairs/Faculty Listening Session**	**NASA Special Event**	**HBCUs Future of Physics: Next Generation of Materials Discovery**	**Simons-NSBP Scholars**	**NSBP Student Council & Chapters Showcase**	**Workshops: Quantum Mechanics & Inclusive Mentoring**	**Undergrad Workshop: Careers, Grad School & Summer REUs**
	D. Cole	A. Modeste / G. Betancourt-Martinez	P. Boyd / R. Gamble	W. Ratcliff	K. Wagner	E. Price / T. Edwards	C. Singh	B. Conrad
6:00PM - 8:00PM	***DINNER ON YOUR OWN***							
6:00PM - 7:30PM	***HEISING-SIMONS / NASA HBCU/MSI COLLABORATION DINNER (INVITATION ONLY)***							
8:00PM - 10:00PM	***PRESIDENT'S SPONSORS RECEPTION (INVITATION ONLY)***							
TUESDAY, NOVEMBER 8, 2022 (ALL TIMES IN EASTERN TIME ZONE)								
	Conference Schedule Overview							
6:30AM - 7:45AM	***ATTENDEE BREAKFAST (OMNI ATRIUM)***							

7:00AM - 7:45AM	***POSTER SESSION SET-UP #2 & #3 (RESIDENCE INN BALLROOM)***							
7:30AM - 12:30PM	***CONFERENCE CHECK-IN & BADGE PICK-UP***							
7:45AM - 8:00AM	***Walk to Paramount Theater***							
8:00AM - 9:15AM	***General Session (PARAMOUNT THEATER)***							
	Speaker # 3 - Dr. Damian Rouson							
9:15AM - 9:30AM	***Walk to Omni Hotel***							
Meeting Rooms	**Montpelier (20)**	**Lewis & Clark (50)**	**Ashlawn & Highlands (60)**	**CODE Bldg (150)**	**Monroe (75)**	**Business Center (75)**	**Monticello (20)**	**Madison (20)**
9:30AM - 11:00AM	**Evaluation Team**	**CMMP-3**	**NPP-3**	**Astro-3**	**POP/AMO-3**	**PER-2**	**EPSS-3**	**CGR-3**
Chairs/Leads	D. Cole	W. Ratcliff	P. Gueye	G. Mosby	T. Searles	J. Burciaga	L. Quick + A. Evans	H. Feldman
10:00AM - 11:30AM	***AM COFFEE BREAK / EXHIBITS & CAREER FAIR (JEFFERSON BALLROOM)***							
11:00AM - 12:00PM	***POSTER SESSION #2 - Followed by REVIEW AND JUDGING (Closed session beginning at 12:00pm -- Open to Judges only)***							
11:30AM - 12:00PM	***Walk to Paramount Theater & Pick-up LUNCHBOX***							
12:00PM - 1:15PM	***LUNCHEON SESSION II (PARAMOUNT THEATER)*** ***SPEAKER # 4 - Dr. Asmeret A. Berhe, Director, DOE Office of Science***							
1:15PM - 1:30PM	***BREAK (Lobby of Paramount Theater)***							
1:30PM - 3:00PM	**BIG SCIENCE HOUR #2 (PARAMOUNT THEATER)** **NSBP Presents: Nuclear Fusion & Breakthroughs in Plasma Physics (S. Mtingwa)**							

3:00PM - 3:15PM	*COFFEE/SNACK BREAK (Lobby of Paramount Theater)*							
3:15PM - 4:30PM	**Simons-NSBP Scholars Present**							
Hosted	Summer 2022 Scientific Research							
4:30PM - 5:00PM	**How to Join the Simons-NSBP Scholars Program**							
4:30PM - 4:45PM	*COFFEE/SNACK BREAK (Walk to Omni Hotel)*							
4:45PM - 6:00PM	**Special Events**							
	Small Groups Evaluation #1 D. Cole	**Scientific Communication** H. Oluseyi	**NSF TIP: Inventions to Impact (Tech Startups)** S. Iqbal	**WorkForce Development at Nat'l Labs** P. Gueye	**Undergrad & Grad Workshop** UVA Physics/Astro/Engr	**LGBTQ+ In Physics** S. Carr / E. Price	**Small Groups Evaluation #2** D. Cole	**Small Groups Evaluation #3** D. Cole
4:30PM - 7:00PM	*EXHIBITS & CAREER FAIR (JEFFERSON BALLROOM)*							
6:00PM - 8:00PM	*POSTER SESSION #3 - Followed by REVIEW AND JUDGING (Closed session beginning at 7:00pm -- Open to Judges only)*							
6:00PM - 8:00PM	*DINNER ON YOUR OWN*							
6:00PM - 8:00PM	*FRIB HBCU/MSI COLLABORATION DINNER (INVITATION ONLY)*							
7:00PM - 9:00PM	*NSBP - Executive Board Session (Invitation Only)*							

WEDNESDAY, NOVEMBER 9, 2022 (ALL TIMES IN EASTERN TIME ZONE)

	Conference Schedule Overview
7:00AM - 8:45AM	*ATTENDEE BREAKFAST (OMNI ATRIUM)*

8:00AM - 10:00AM	***NSBP-ELECTION & BUSINESS MEETING (Closed session for NSBP active members only) -- PRESTON ROOM***							
MEETING ROOMS	**Montpelier (20)**	**Lewis & Clark (50)**	**Ashlawn & Highlands (60)**		**Monroe (75)**	**Business Center (75)**	**Monticello (20)**	**Madison (20)**
10:00AM - 11:30AM	**Conference Survey in Small Groups #1**	**Astro-4**	**Mental Health Awareness (Post-COVID)**		**NSBP Student Council & Chapters**	**NSF/DOE/NASA Funding Agency Session**	**Conference Survey in Small Groups #2**	**POSTER JUDGES**
					AIP TEAM-UP Student Listening Session			
Chairs/Leads	D. Cole	G. Mosby	L. Pegues		E. Price / A. Modeste	G. Tessema	D. Cole	CONVENE
11:30AM - 2:00PM	***CLOSING LUNCHEON / KEYNOTE SPEAKER - DR. CALVIN MACKIE, STEM NOLA / STUDENT POSTER AND ORAL AWARDS - (JEFFERSON BALLROOM - OMNI)***							
2:00PM	***PROGRAM ENDS - DEPARTURES BEGINS***							

MONDAY, NOVEMBER 7TH

EPSS SESSION 1.A - (Location: Monticello/OMNI)
Session Chair(s): L. Quick & A. Evans

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:45 AM	The Effects of Trash, Residential Biofuel, and Open Biomass Burning Emissions on Local and Transported PM2.5 and its Attributed Mortality in Africa ***Janica Gordon, North Carolina A&T State***
9:45 – 10:00 AM	The Dragonfly Student and Early Career Investigator Program: Opportunities for Student Participation on a NASA Planetary Science Mission ***Lynnae Quick, NASA Goddard Space Flight Center***
10:00 – 10:15 AM	What Makes Saturn Ring? A Quest to Quantify the Amplitudes of Saturn's Planetary Normal-mode Oscillations using Ring Seismology ***Victor Afigbo, University of Idaho***
10:15 – 10:30 AM	Shock Synthesis of Organic Molecules by Meteors in the Atmosphere of Titan ***Erin Flowers, Princeton University***
10:30 – 10:55 AM	INVITED The Ice Giants from the James Webb Space Telescope ***Naomi Rowe-Gurney, NASA Goddard Space Flight Center***
10:55 – 11:00 AM	1-Minute Poster Presentations Poster Authors

ASTRO-1 - (CODE Building – 225 W. Water Street/Theater Entrance ONLY)
Session Chair(s): G. Mosby

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:45 AM	Regulating Star Formation with a Hot Circumgalactic Medium ***Chris Carr, Columbia University***
9:45 – 10:00 AM	Asteroseismology: Unveiling Stellar Nature Through Oscillation Pattern Recognition ***Kanah Smith, University of Toronto***
10:00 – 10:15 AM	Novae V745 Sco as a potential Type Ia supernova progenitor ***Isabella Molina, Michigan State University***
10:15 – 10: 30 AM	--Break--
10:30 – 10: 45 AM	Correlating Stellar Mass and Protoplanetary Disk Mass in the Cepheus OB3b Star-forming Region ***Sarai Rankin, Morgan State University***
10:45 – 11:00 AM	Stellar Flybys and Where to Find Them ***Everett McAuthor, Columbia University***

CGR – 1 - (Business Center/OMNI)
Session Chair(s): H. Feldman

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:55 AM	Simulating the Early Universe ***David Garrison, University of Houston Clear Lake***
10:00 – 10:25 AM	Redshifts and locally measured velocities in spherically symmetric spacetimes ***Tehani Finch, James Madison University***
10:30 – 10:55 AM	Physics from the Cosmic Microwave Background and the road to CMB-S4 ***Kevin Huffenberger, Florida State University***

SOT/PER - 1 – (Location: Madison/OMNI)
Session Chair(s): J. Burciaga

9:30 AM – 11:00 AM	**WORKSHOP/INTERACTIVE PRESENTATION**
9:30 – 11:00 AM	Motivating Teachers and Students to Learn Concepts in Quantum Physics via Engaging Activities ***Maajida Murdock, Morgan State University***

CMMP – 1 - (Location: Lewis & Clark/OMNI)
Session Chairs(s): W. Ratcliff

9:30 AM – 11:00 AM	**ABSTRACT/PRESENTER(S)**
9:30 – 10:00 AM	New Spectroscopy Technique for Micron-Scale Materials ***Antonio Levy, Howard University***
10:00 – 10:15 AM	High Curie temperature (MnSb2Te4)x(Sb2Te3)1-x magnetic topological insulator structures grown by molecular beam epitaxy ***Candice Forrester, The Graduate Center (CUNY)***
10:15 – 10:30 AM	High-throughput screening of topological magnetic vdW materials using data-driven approaches ***Romakanta Bhattarai, Rensselaer Polytechnic Institute***
10:30 – 10:45 AM	Data-driven Study of Mangetic Anisotropy in Composite Transition Metal Dichalcogenide Monlayers ***Peter Minch, Rensselaer Polytechnic Institute***
10:45 – 11:00 AM	Corrosion susceptibility of SS316L in Artificial Saliva Containing Citric Acid ***Jennifer Chioma, University of Kansas***

NPP-1 - (Location: Ashlawn & Highlands/OMNI)
Session Chair(s): P. Gueye, *Michigan State University/FRIB*

9:30 AM – 11:00 AM	**ABSTRACT/PRESENTER(S)**
9:30 – 10:00 AM	The study of the properties of isovector giant resonances excited via the 60Ni(3He, t) reaction at 140 MeV/u ***Felix Ndayisabye, Michigan State University***
10:00 – 10:15 AM	Neutrino Flavor Mixing and Modular Symmetries ***Mu-Chun Chen, University of California Irvine***
10:15 – 10:30 AM	Search for Rare Higgs Boson Decays ***Jesse Harris, University of Tennessee Knoxville***
10:30 – 10:45 AM	Deblurring Decay Energy Spectrum in neutron decay reaction ***Pierre Nzabahimana, Michigan State University***
10:45 – 11:00 AM	High Q2 electron-proton elastic scattering at the future Electron-Ion Collider ***Allen Pierre-Louis, Stony Brook University***

EPSS SESSION 1.B - (Location: Monticello/OMNI)
Session Chair(s): L. Quick & A. Evans

1:45 PM – 2:45 PM	**ABSTRACT/PRESENTER(S)**
1:45 – 2:00 PM	Adhesive measurements on CI simulant particles in Vacuum ***Keanna Jardine, University of Central Florida***
2:00 – 2:15 PM	Hydroxylation of the lunar surface and the degassed H2 exosphere ***Orenthal Tucker, NASA Goddard Space Flight Center***
2:15 – 2:30 PM	Effect of Surface Absorbed Water on Mg# Determination in the IMIR Region ***Kierra Wilk, Brown University***
2:30 – 2:45 PM	Origin and Nature of the Lunar Asymmetry ***Alex Evans, Brown University***

ASTRO-2 - (CODE Building – 225 W. Water Street/Theater Entrance ONLY)
Session Chair(s): G. Mosby

1:45 PM – 2:45 PM	ABSTRACT/PRESENTER(S)
1:45 – 2:15 PM	(Invited) Dim and Deserted: What Modest Peaks and Low-density Large-Scale Structures Tell Us About the Cosmology of the Universe ***L. Arielle Phillips, University of Notre Dame***
2:15 – 2:30 PM	Similar Seven: The study of 'Twin' planets in order to isolate correlations of high-altitude aerosol formation rates and physical parameters ***Chima McGruder, Harvard University***
2:30 – 2:45 PM	Disentangling CO Chemistry in Protoplanetary Disks using Machine Learning ***Aminah Diop, University of Virginia***

CMMP – 2 - (Location: Lewis & Clark/OMNI)
Session Chairs(s): W. Ratcliff

1:45 PM – 2:45 PM	ABSTRACT/PRESENTER(S)
1:45 – 2:15 PM	State of Condensed Matter theory ***Jacob Gayles, University of South Florida***
2:15 – 2:30 PM	Demonstrating a Quantum Permutation Algorithm with Higher Qubit Near-term Intermediate Scale Quantum Processors ***Ashley Blackwell, University of Illinois Chicago***
2:30 – 2:45 PM	A DFT Study of the Structural and Electronic Properties of 2D Superatomic Crystals ***Latoya Anderson, Brooklyn College – City University of New York***

NPP-2 - (Location: Ashlawn & Highlands/OMNI)
Session Chair(s): P. Gueye, *Michigan State University/FRIB*

1:45 PM – 2:45 PM	ABSTRACT/PRESENTER(S)
1:30 – 2:00 PM	The 2022 Physicists Inspiring the Next Generation: Exploring the Nuclear Matter ***High School & Undergraduate students***

POP/AMO– 2 - (Location: Monroe/OMNI)
Session Chairs(s): J. Burrow, *Brown University*

1:45 PM – 2:45 PM	ABSTRACT/PRESENTER(S)
1:45 – 2:00 PM	***Rutendo Jakachira, Brown University***
2:00 – 2:15 PM	Demonstrating a Quantum Permutation Algorithm with Higher Qubit Near-term Intermediate Scale Quantum Processors ***Ashley Blackwell, University of Illinois Chicago***
2:15 – 2:30 PM	Development of Attosecond Cross-Correlator for QIS ***Zaiuri Li, University of Dayton***
2:30 – 2:45 PM	Measuring the Knot of Non-Hermitian Degeneracies and Non-Commuting Braids in an Optomechanical System ***Chitres Guria, Yale University***

SOT/PER - 1 – (Location: Monticello/OMNI)
Session Chair(s): J. Burciaga

4:45 PM – 6:15 PM	WORKSHOP/INTERACTIVE PRESENTATION
4:45 – 5:30 PM	Research-Based Tools and Tips for Learning and Teaching Quantum Mechanics ***Chandralekha Singh, University of Pittsburgh***
5:30 – 6:16 PM	Inclusive Mentoring: Using Social Psychological Approaches to Improve Mentoring and Learning of All Students ***Chandralekha Singh, University of Pittsburgh***

TUESDAY, NOVEMBER 8TH

ASTRO-3 - (CODE Building – 225 W. Water Street/Theater Entrance ONLY)
Session Chair(s): G. Mosby

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:45 AM	The Peculiar Warp of HD 110058's Debris Disk ***Ronald Lopez, University of California Los Angeles***
9:45 – 10:00 AM	Exploring the Measurability of Black Hole Shadows Using Space VLBI ***Carissma McGee, Howard University***
10:00 – 10:15 AM	Improving Gravitational Lensing Pedagogy ***Devon Williams, University of California Los Angeles***
10:15 – 10:30 AM	Probing the Multiphase Kinematics of a "Beads on a String" Star Formation Complex in a Cool Core Cluster with Merging Central Galaxies ***Osase Omoruyi, Harvard University***
10:30 – 10:45 AM	Novel Methods to Leverage Spectroscopic Overlap of Imaging Surveys ***Justin Myles, Stanford University***
10:45 – 11:00 AM	Echo Mapping Black Hole Growth: Single-Epoch Masses and Accretion Rates of Quasars ***Gloria Fonseca Alvarez, NSF's NOIRLab***

CGR SESSION – 1 - (Location: Business Center/OMNI)
Session Chair(s): H. Feldman

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:48 AM	Chern-Simons Gravity and Neutrino Self-Interactions ***Cyril Creque-Sarbinowski, Center for Computational Astrophysics***
9:52 – 10:10 AM	An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity ***Marcel Howard, University of Pittsburgh***
10:14 – 10:32 AM	Matter Density Spike around a Rapidly Rotating Black Hole ***Delilah Gates, Princeton University***
10:36 -11:53 AM	A Time-Varying Cosmological Constant from Dynamical Chern-Simons Gravity ***Daniel Tatsuya, Brown University***

PER – 2 – (Location: Business Center/OMNI)
Session Chair(s): J. Burciaga

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 10:00 AM	Equity, Diversity, and Inclusion Efforts in the AIP Federation ***Alexis Knaub, American Association of Physics Teachers***
9:00 – 10:15 AM	Inquiry-Based Learning using the Remarkable Sensors in Smartphones ***David Rakestraw, Lawrence Livermore National Laboratory***
10:15 – 10:30 AM	Identifying Academic Ableism: Case Study of a UDL-Learning Community Participant ***Camille Coffie, University of Central Florida***

CMMP – 3 - (Location: Lewis & Clark/OMNI)
Session Chairs(s): W. Ratcliff

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:45 AM	Recent advances in fusion, space, and low temperature plasma science ***Edward Thomas, Auburn University***
9:45 – 10:00 AM	Machine-Learning Closures of the Kinetic Moment Hierarchy in the Context of Landau Damping ***Nathaniel Barbour, University of Maryland College Park***
10:00 – 10:15 AM	Plasma Diagnostics on C-2W ***Eli Parke, TAE Technologies***
10:15 – 10:30 AM	Investigating the electrical conductivity of warm dense matter using terahertz spectroscopy and electron diffraction ***Benjamin Ofori-Okai, SLAC National Accelerator Laboratory***
10:30 – 10:45 AM	Dynamics of Filamentary Modes in Magnetized Low Temperature Plasma with MDPX ***Elon Price, Auburn University***
10:45 – 11:00 AM	The C-2W Field-Reversed Configuration Plasma with Neutral Beam Injection ***James Titus, TAE Technologies***

NPP-3 - (Location: Ashlawn & Highlands/OMNI)
Session Chair(s): P. Gueye *Michigan State University/FRIB*

9:30 AM – 11:00 AM	ABSTRACT/PRESENTER(S)
9:30 – 9:45 AM	Testing of New Silicon Pixel Detectors for HL-LHC ***Cordney Nash, University of Tennessee Knoxville***
9:45 – 10:00 AM	Resonance systematics for capture reactions using Machine Learning ***Khadim Mbacke, Morehouse College***
10:00 – 10:15 AM	Photoionization Front Experiments at the OMEGA Laser Facility ***Kwyntero Kelso, University of Michigan***
10:15 – 10:30 AM	Application of Machine Learning with the Minimum Bias Detector (MBD) in sPHENIX ***Kolby Davis, Howard University***
10:30 – 10:45 AM	Understanding the Origin of Elements in the Cosmos using Nuclear Techniques ***Gerard Owens-Fryar, Michigan State University***

<u>POP/AMO– 2</u> - (Location: Monroe/OMNI)
Session Chairs(s): J. Mathews, *University of Dayton*

9:30 AM – 11:00 AM	**ABSTRACT/PRESENTER(S)**
9:30 – 9:45 AM	***Joshua Burrow, Brown University***
9:45 – 10:00 AM	Room temperature Photoluminescence of Bulk Ge ***Vijay Gregory, University of Dayton***
10:00 – 10:15 AM	Wavelength Dependence using PUMAS ***Dominique Newell, University of Illinois Chicago***
10:15 – 10:30 AM	Hyperdoped Si photodetectors for high efficiency and extended conversion range ***Yining Liu, University of Dayton***
10:30 – 10:45 AM	***Atiyya Davis, University of Illinois Chicago***

<u>NPP-4</u> - (CODE Building – 225 W. Water Street/Theater Entrance ONLY)
Session Chair(s): P. Gueye, *Michigan State University/FRIB*

4:45 PM – 6:00 PM	**SPECIAL EVENT: Workforce Development at National Labs**
4:45 – 5:05 PM	Research and opportunities at National Labs: an example with Brookhaven National Lab Physics Division ***Hong Ma, Brookhaven National Laboratory***
5:05 – 6:00 PM	Discussion

WEDNESDAY, NOVEMBER 9TH

<u>ASTRO-4</u> - (Location: Lewis & Clark/OMNI)
Session Chair(s): G. Mosby

10:00 AM – 11:30 AM	**ABSTRACT/PRESENTER(S)**
10:00 – 10:15 AM	Reconstructing simulated gravitational-wave signals from binary black hole hyperbolic encounters using bayeswave ***Peter Lott, Georgia Tech University***
10:15 – 10:30 AM	Classifying Galaxies and Predicting their Black hole Masses using Machine Learning Models ***TonyLouis Verber, University of Toronto***
10:30 – 10:45 AM	Accreting Neutron Stars in Galactic Globular Clusters ***Teresa Panurach, Michigan State University***
10:45 - 11:00 AM	Is LTT 1445 Ab a Hycean World or a cold Haber World? Exploring the Potential of Twinkle to Unveil Its Nature ***Caprice Philips, The Ohio State University***
11:00 – 11:15 AM	Ultracool Dwarfs as Tracers for Galactic Structure and Star Formation History: Prospects with Large-Scale Surveys ***Christian Aganze, University of California San Diego***
11:15 – 11:30 AM	Light Curves from Convective Common Envelopes in Low-Mass Binaries ***Nikki Noughani, Rochester Institute of Technology***

Program General Sessions & Plenary Talks

Rouson, Damian - Sourcery Institute

In April, the United States presidential administration announced a whole-of-government effort focused largely on gathering and increasing access to disaggregated data on the experiences of historically underserved groups [1]. The importance of disaggregating the data on specific subpopulations can easily be overlooked in efforts that target diversity broadly. Drawing inspiration from astronomy, this talk will focus on data and analyses related to the hiring of a specific population that is underrepresented in scientific research: African-American doctoral degree holders. Using the Drake equation to frame the discussion, the talk will address the extent to which the search for African-American terrestrial intelligence (SATI) can be understood through the analytical lens of the search for extra-terrestrial intelligence (SETI). With this framing, we will tackle an oft-cited cause for underrepresentation, the pipeline, in light of statistical arguments suggesting the implausibility that pipeline problems fully explain the observed underrepresentation in some elite settings. The talk will briefly touch some unexpected benefits of involving a more diverse population in science, arguing that diverse groups both do scientific research differently and do different scientific research. The talk will conclude with a call for accountability through disaggregating data in diversity, equity, and inclusion (DEI) initiatives.

POSTER PRESENTERS

Residence Inn
Jefferson Ballroom

EPSS POSTERS

PRESENTER	TITLE
Markiesha James, *NCAT*	Real-Time Chemical Characterzation of Primary and Aged Organic Aerosols from African Biomass Fuels
Ashley Walker, *Howard University*	Modeling Aerosol Microphysics in Ice Giant Atmospheres

PER POSTERS

PRESENTER	TITLE
Fana Mulu-Moore, *Aims Community College*	Teaching Physics in an Astronomy Context

ASTRO POSTERS

PRESENTER	TITLE
Teresa Monsue, *NASA GSFC/Catholic University*	Quasi-periodic Pulsations Observed in Stellar UV Flares on a Highly Active Low Mass Star
Hodari-Sadiki Hubbard-James, *Georgia State University*	Spectroscopic Identification of Young and Active K Dwarfs Within 25 Parsecs
Jaid Moore, *Jackson State University*	Analysis of the systematic error of BurstCube
Keith Pritchett Jr, *Siena College*	Photometric Analysis of Nearby Galaxies
Kiersten Boley, *The Ohio State University*	Impacts on Planet Formation: Planet Occurrence Rates in the Metal-Poor Regime
Israel Biniam, *University of Maryland College Park*	Constraints on Dark Matter and Baryon Interaction in the Early Universe
Oge Okoronkwo, *The University of Oklahoma*	Understanding Isolated LMC Mass Analogs and their Satellites
Olufemi Obielodan, *Western Kentucky University*	Comparison of Observed and Theoretical Transit Times of Sagittarius A
Paul Baynard, *Swarthmore College*	Optimizing the Template Bank Size for a Joint Neutrino-Gravitational Wave Search
Daniel Fairfax, *Morehouse College*	Measuring Warm Corona Properties in a Sample of Active Galactic Nuclei
Myles Pope, *Howard University*	Accurate Masses of Extraordinary Red Giants
D. Xavier Lesley, *Southern Connecticut State University*	Kinematic Characterization of Nearby K Dwarfs
Woodkensia Charles, *Haverford College*	Dust Cleaning The Cosmic Microwave Background
Nathnael Kahassai, *University of North Carolina Chapel Hill*	Optimizing Mirror Alignment Algorithm of the Simons Observatory Large Aperture Telescope
Joshua Graves, *Morehouse College/Georgia Tech*	Testing the Reconstruction of White-Noise Bursts with Shapelets using BayesWave

Isiah Holt, *University of Maryland*	An Investigation Into Possible Systematic Effects on Neutron Star Radius Estimates using NICER-like Synthetic Data
Craig Brooks, *University of Kansas*	Quantum Magnetic Collapse In Neutron Star Binary Systems

CMMP POSTERS

PRESENTER	TITLE
Farai Mazhandu, *Colorado School of Mines*	Investigation of the magnetic properties of Cu2OSeO3 (CSO) as a skyrmion host
Stephen Williams, *Auburn University*	Filamentation Morphology in Capacitively Coupled Highly Magnetized Plasmas
Joshua Samba, *Rice University*	Enhancing catalytic nitrite hydrogenation via radiofrequency irradiation of PtFe nanoparticles
Neno Fuller, *The University of Kansas*	Trapping interlayer excitons at van der Waals heterostructure by using molecular dipoles
Nathaniel Barbour, *University of Maryland College Park*	Machine-Learning Closures of the Kinetic Moment Hierarchy in the Context of Landau Damping
Eli Parke, *TAE Technologies*	Plasma Diagnostics on C-2W
Landry Horimbere, *University of Maryland*	64th Annual Meeting of the APS Division of Plasma Physics
Joshua Scales, *The Ohio State University*	Diffraction in bilayer twisted graphene
Jalaan Avritte, *Auburn University*	Molecular Dynamic (MD) simulations of neutron-scattering spectra of d-Si using machine-learning interatomic potentials
Alemayehu Bogale, *University of California San Diego*	Measurements of the effects of an external B-field on backscattered Stimulated Raman Scattering reflectivity
Jordan Coney, *Morehouse College*	Nanoscale Electro-Emission from Individual Single Photon Sources at SiC Surfaces
Yining Liu, *University of Dayton*	Hyperdoped Si photodetectors for high efficiency and extended conversion range

NPP POSTERS

PRESENTER	TITLE
Darryl Williams, *Siena College*	Improving the design of a Peltier-powered cloud chamber
Olivia Bruce, *Spelman College*	Measuring Ions Per Bunch in the RFQ
Cassandra Little *University of Michigan*	Status of the Sterile Neutrino Search with the JSNS2 Experiment
Jean Pierre Twagirayezu, *Michigan State University*	Simulation, Reconstruction, and Discovery Potential of the Pacific Ocean Neutrino Experiment
Laurynette Griffin, *Howard University*	Development of the photon readout electronics for nEXO
Jordan Dias-Gaylor, *Howard University*	Feasibility Studies of Ultraperipheral Collision Physics in sPHENIX
Daniel Terrero, *Duquesne University*	Studies of the Proton fragmentation in the Deep Inelastic Regime
Pierre Nzabahimana, *Michigan State University*	Machine learning framework for decay energy spectrum from invariant mass measurement

Abstracts

What Makes Saturn Ring? A Quest to Quantify the Amplitudes of Saturn's Planetary Normal-mode Oscillations using Ring Seismology

Afigbo, Victor - University of Idaho, Moscow

Certain spiral density waves in Saturn's rings are generated by resonances with planetary normal modes, and as a result, they can be used as probes of Saturn's internal structure. Previous works on these waves have focused mainly on their rotation rates, which have provided precise measurements of the oscillation frequencies of Saturn. However, there are other aspects of the waves that contain information about the planet's interior. Specifically, the amplitudes of the ring waves are determined by the amplitudes of the corresponding planetary normal modes. We have determined the amplitudes of the perturbing potentials responsible for generating dozens of waves by fitting high signal-to-noise profiles derived from Cassini's Visual and Infrared Mapping Spectrometer(VIMS) occultations. This yields a spectrum of mostly f-mode oscillations with relatively low spherical harmonic degree that can provide insights into how these sorts of oscillations are excited inside the planet.

Thickness-Dependent Band Alignment in Heterostructures of Few-Layer MoSe2 and Monolayer WS2

Agunbiade, Gbenga - University of Kansas

Energy band alignment at interface of heterostructures plays a key role in determining their electronic and optoelectronic properties. A type-I alignment drives both electrons and holes to one side of the interface, while a type-II alignment can separate the opposite charge carriers at interface. Recent studies have shown that heterostructures formed by the newly emerged two-dimensional semiconductors, such as transition metal dichalcogenide (TMD) monolayers, often have the type-II alignment. Here we show that the nature of band alignment in TMD heterostructures can be tuned by their thickness. Using MoSe2/WS2 heterostructures as an example, we reveal that multilayer (nL) MoSe2, and monolayer (1L) WS2 form type-I band alignment due to the thickness-dependent band structure of MoSe2. In our experiments, the heterostructure samples are fabricated by dry transfer technique of exfoliated TMD flakes. Photoluminescence spectroscopy and transient absorption measurements reveal photocarrier dynamics in nL-MoSe2/1L-WS2 heterostructures with n = 1-5. In the 1L/1L heterostructure, we observe clear evidence of charge transfer and separation, confirming its type-II band alignment. However, in heterostructures with n = 2-5, photocarriers are found to populate the MoSe2 layer, indicating.......

Ultracool Dwarfs as Tracers for Galactic Structure and Star Formation History: Prospects with Large-Scale Surveys

Aganze, Christian - UC San Diego

Ultracool dwarfs (UCDs) are low-temperature stars and brown dwarfs with masses < 0.1 solar masses. These objects comprise >20% of all stars in the Milky Way, and they have long lifetimes (>1 trillion years). As such, UCDs serve as unique probes of the structure, formation, and evolution of the Milky Way. However, because of their low luminosities, UCD samples have been limited to the local volume (d <100 pc) and have remained under-utilized as tracers for galactic structure. Deep imaging and spectroscopic surveys provide an opportunity to find distant brown dwarfs out to >1 kpc. In this talk, I present my work on finding distant ultracool dwarfs in two HST/WFC3 parallel surveys, WISPS & 3D-HST. I demonstrate how machine learning techniques provide more robust selection than traditional index-based methods in deep spectroscopic samples, and present a sample of 164 late-M, L and T dwarfs extending to 2 kpc. With this sample, I measured population scaleheights and ages as a function of spectral class using a Monte-Carlo simulation framework. I confirm that thin disk L dwarfs are younger than late-M dwarfs due to brown dwarf cooling. I also apply this modeling technique to predict counts, colors and kinematics of UCDs that will be observed by the next generation of observatories.

Pulsed Magnet Station (PUMAS) for Physics Education
Adebayo, Victoria - Howard University

Currently, physics education requires resources that are sometimes expensive and difficult to access. In order to effectively teach and imprint concepts and knowledge upon students, laboratory demonstrations are required. The Pulsed Magnet Station (PUMAS) helps to improve physics education,especially for underrepresented communities and HBCUs, by providing a more simplistic, safe, and cost-effective way to learn about topics such as Faraday's Law of Induction, Ampere's Law, Biot-Savart Law, etc. This research focuses on a safer and more cost-effective way to set up the Faraday Rotation experiment and the Malus Law experiment through the use of inexpensive light sources (LED lights) and increased safety by using a pulsed magnetic field. Throughout our experiments, we found that our safer and more cost-effective experimental setup yielded the same quality results for efficiently performing the Faraday Rotation experiment and the Malus Law experiment.

A DFT Study of the Structural and Electronic Properties of 2D Superatomic Crystals
Anderson, LaToya - Brooklyn College - City University of New York

Research on 2D superatomic crystals is an exciting area of materials science because its complexity produces novel properties compared to its bulk analogues. Here, we use density functional theory to analyze the structural and electronic properties of Re6Se8Cl2, a 2D material that is the first of a new family of semiconductors formed by superatomic clusters. This structure is of particular interest due to its strong in-plane intercluster covalent bonds and weak interlayer van der Waals interactions which allows for mechanical exfoliation and stability under ambient conditions. Using first principles on 2D superatomic crystals to discover novel electronic properties offers opportunities to improve materials design for technologies including solar cells, lithium-ion batteries, and quantum computers.

Molecular Dynamic (MD) simulations of neutron-scattering spectra of d-Si using machine-learning interatomic potentials
Avritte, Jalaan - Auburn University

The thermal conductivity (κ) of d-Si can be calculated with phonon modes using the phonon gas model. At high temperatures, experimental results show κ approaching that of a-Si, which cannot use the phonon gas model. Recent development of machine-learning (ML) interatomic potentials provides new opportunities to accurately calculate neutron scattering phonon spectra beyond the conventional perturbation approximation. I will present our recent ML-based molecular dynamics (MD) simulation study of neutron scattering spectra of silicon crystals from 300K to 1800K. Our MD simulated neutron scattering data reveal many spectra features that are not yet observable even in the state-of-the-art neutron scattering experiment. We implemented a novel decomposition algorithm to quantitatively analyze the contributions due to single-phonon processes, multiple phonon processes, and the interference between the single phonon and multiple phonon processes. We find that the phonon gas approximation remains valid for the low-frequency acoustic phonons even at temperatures close to the melting point. Yet, the onset of break-down of the simple relaxation time approximation (RTA) starts around 600K for many optic phonons. We will discuss the implication of the break-down of the RTA to κ.

Demonstrating a Quantum Permutation Algorithm with Higher Qubit Near-term Intermediate Scale Quantum Processors
Blackwell, Ashley - University of Illinois Chicago

TBD

Constraints on Dark Matter and Baryon Interaction in the Early Universe
Biniam, Israel - University of Maryland/College Park

Using Bayesian techniques, we derived upper limits on the momentum-transfer cross section between dark matter and baryonic matter particles in the early universe assuming a power-law dependence on the cross section We performed this task using likelihoods derived for the Planck and Atacama Cosmology Telescope DR4 datasets, as well as the Cosmic Linear Anisotropy System Solver (CLASS) and Cobaya packages for setting priors and determining posterior probabilities. We also discuss implications of the ACT DR6 data which is yet to be released.

Machine-Learning Closures of the Kinetic Moment Hierarchy in the Context of Landau Damping
Barbour, Nathaniel

A common approach to understanding microscale dynamics in fusion plasmas is to study the time evolution of the kinetic distribution function. Recently, the GyrokinetX (GX) code demonstrated an efficient method of analysis in the gyrokinetic limit [1]. By taking fluid moments of the fundamental equations (integrating the fundamental equations over velocity space with orthonormal basis weights), it is possible to derive a hierarchy of coupled equations with an attractive feature: near-locality in velocity space. We aim to improve the fidelity of low-resolution simulations by integrating a machine learning algorithm into a numerical solver to develop an artificial closure of the moment hierarchy. We demonstrate the successful application of this method to a variation of the canonical problem of Langmuir wave damping in an unsheared slab, studied by Landau [2] and revisited by Hammett and Perkins with analytic closures [3]. The promising results of our method suggest that machine-learned closures of the full moment hierarchy may be possible to achieve.

Measuring Ions Per Bunch in the RFQ
Bruce, Olivia

TBD

Optimizing the Template Bank Size For a Joint Neutrino-Gravitational Wave Search
Baynard, Paul

TBD

Measurements of the effects of an external B-field on backscattered Stimulated Raman Scattering reflectivity
Bogale, Alemayehu

Laser-plasma instabilities such as Stimulated Raman Scattering (SRS) play a detrimental role in inertial confinement fusion. SRS leads to a loss of energy due to light scattering and preheating of the fuel by suprathermal electrons generated through the decay of electron plasma waves. Recent numerical work has shown that a moderate external magnetic field can mitigate SRS through its influence on wave-particle interactions. A novel platform at the OMEGA-EP laser was developed to study the effect of a 25 T perpendicular magnetic field (using MIFEDS coils) on the backscattered SRS (BSRS) light spectrum from an Argon gas jet target. The Sub-Aperture Backward Scatter diagnostic was fielded to measure the BSRS spectra with a time resolution that enables probing of different plasma conditions on the same shot, via the use of a train of short pulses for the excitation beam. The results attest to a kinetic effect that the B-field has on BSRS reflectivity: (i) when $n_e<11\%n_{cr}$, the BSRS reflectivity is enhanced, and (ii) when $n_e >11\%n_{cr}$,the B-field reduces the BSRS reflectivity. The X-ray spectrometry confirms that the BSRS occurs in the expected kinetic regime ($k\lambda_D \sim 0.2$-0.3). Experimental and computational results will be shown and discussed.

Quantum Magnetic Collapse In Neutron Star Binary Systems
Brooks, Craig

Quantum magnetic collapse is a possible phenomenon that corresponds to the collapsing of stars due to the generation of high magnetic field. Such stars are highly magnetized objects (such as neutron stars) where the particle processes take place in the presence of very high external magnetic field B. When the magnetic energy inside the star exceeds the internal energy of electrons and/or positron fluids it will lead to the breaking of hydrostatic equilibrium. In the astrophysical context, this will occur when B corresponds to electron mass (10^13 Gauss). At this energy, there is a collapse of the neutral matter with a magnetic moment since the pressure transverse to the magnetic field vanishes. We develop a method for calculating the particle number N in the static case, then extend this to the accreting system to calculate the dynamical particle number density with the orientation of using this result for calculating the magnetization as it changes in time.

Fizzy Planets: Mass-Radius Relationships for Carbonated Magma Oceans
Boley, Kiersten

Terrestrial planets are thought to transition through a magma ocean phase during their evolution in which they exhibit globally molten mantles. These magma oceans have the capacity to store a significant amount of volatiles (i.e, H2O , CO2 , etc.), thereby affecting the observed properties of the planet. Volatile storage is a particular concern for planets on close-in orbits because the magma ocean phase can be long-lived due to the planet's proximity to its star. To date, many terrestrial planets have been discovered on close-in orbits making them likely hosts of global magma oceans. However, there has been minimal research into the observational impacts that the storage of volatiles within a magma ocean has on the mass and radius of the planet. We present the first mass-radius relationships for carbonated magma ocean planets along with updated relationships for hydrous magma oceans using ExoPlex, a thermodynamically self-consistent planet interior software.

Impacts on Planet Formation: Planet Occurrence Rates in the Metal-Poor Regime
Boley, Kiersten

Planet formation models predict that below a certain protoplanetary disk metallicity, the surface density of solid material is too low to form planets. Observationally, previous works have indicated that short-period planets preferentially form around stars with solar and super solar metallicities. Given these findings, it is challenging to form planets within metal-poor environments. Due to the target selection process of previous surveys, there is little constraint on planet occurrence rates below [Fe/H] ~ -0.5, which is still higher than the predicted metallicity at which planet formation cannot occur. Expanding upon previous works, we construct a large sample of ~100,000 metal-poor stars with spectroscopically-derived stellar parameters observed by TESS. With such a large sample, we probe planet formation within the metal-poor regime (-1.0 ≤ [Fe/H] ≤ -0.4) placing the most stringent upper limits on planet occurrence rates around metal-poor stars.

High-throughput screening of topological magnetic vdW materials using data-driven approaches
Bhattarai, Romakanta

First-principles calculations combined with machine learning techniques are used to investigate the monolayers of the form AB2X4 based on the well-known intrinsic topological magnetic vdW material MnBi2Te4. In this study, we consider a very large number of candidate materials (~ 105) formed by different elements occupying the A, B, and X sites. Investigating this enormous number of candidates by first-principles calculations or experiments is prohibitive. The use of machine learning is a promising way to efficiently explore the entire chemical space to accelerate materials discovery. We select an initial subset of 240 structures to calculate the thermodynamic properties, electronic properties, such as the band gap, and magnetic properties, such as the magnetic moment, magnetic order, and the exchange energy using density functional theory (DFT). Finally, machine learning methods are employed to gain insight into the microscopic origin of materials properties in the entire chemical space of candidate materials. Our analysis shows that the formation energy of the system depends largely on the A and B sites. This study creates avenues for predicting novel materials with desirable properties that are crucial for spintronics, optoelectronics, quantum computing & quantum communication.

Regulating Star Formation with a Hot Circumgalactic Medium
Carr, Chris

Galactic models have typically assumed that supernova-driven outflows regulate star formation in galaxies by ejecting a large fraction of the gas which enters the disc, even though such heavily mass-loaded winds are at increasing tension with observations and high-resolution simulations of supernovae in the interstellar medium (ISM) environment. In this talk, I will introduce our simple gas-regulator model to study the key processes governing star formation in galaxies, where the ISM, the stellar mass, and the circumgalactic medium (CGM) are modeled as distinct reservoirs which exchanges mass, energy, and metals at different rates within a growing halo. By reproducing the stellar-to-halo mass relation, I will show that the primary role of SNe-driven outflows in regulating star formation is not by ejecting large portions of gas out of the galaxy as the traditional models have assumed, but by launching hot, energy-loaded winds that heat the surrounding CGM and restrict the cooling efficiency of CGM gas, preventing its accretion to the ISM and limiting star formation in the galaxy.

Neutrino Flavor Mixing and Modular Symmetries
Chen, Mu-Chun

The discovery of non-zero neutrino masses has provided arguably the most compelling evidence for Physics beyond the Standard Model. Their observed small masses hint at Physics at a very high energy scale, and thus offers a unique window into the theory that underlies the Standard Model of Particle Physics.

In this talk, I will discuss some recent developments aiming at understanding the origins of neutrino masses, flavor mixing, and CP violation. In particular, I will describe how the pattern of neutrino masses may be closely connected to the intricate mathematics of modular symmetries.

Chern-Simons Gravity and Neutrino Self-Interactions
Creque-Sarbinowski, Cyril

Dynamical Chern-Simons gravity (dCS) is a four-dimensional parity-violating extension of general relativity. Current models predict the effect of this extension to be negligible due to large decay constants f close to the scale of grand unified theories. Here, we present a construction of dCS allowing for much smaller decay constants, ranging from sub-eV to Planck scales. Specifically, we show that if there exists a fermion species with strong self-interactions, the short-wavelength fermion modes form a bound state. This bound state can then undergo dynamical symmetry breaking and the resulting pseudoscalar develops Yukawa interactions with the remaining long-wavelength fermion modes. Due to this new interaction, loop corrections with gravitons then realize a linear coupling between the pseudoscalar and the gravitational Chern-Simons term. The strength of this coupling is set by the Yukawa coupling constant divided by the fermion mass. Therefore, since self-interacting fermions with small masses are ideal, we identify neutrinos as promising candidates. For example, if a neutrino has a mass $m_\nu \lesssim$ meV and the Yukawa coupling is order unity, the dCS decay constant can be as small as $f \sim 10^3 m_\nu \lesssim$ eV. We discuss other potential choices for fermions.

Identifying Academic Ableism: Case Study of a UDL-Learning Community Participant
Coffie, Camille

To improve accessibility and inclusion in postsecondary STEM education, we propose implementing Universal Design for Learning (UDL) based practices to meet the needs of a variety of learners. The UDL is a design framework aimed at improving and optimizing teaching and learning for all people, regardless of their disability status. As part of a larger professional development project, interviews were conducted with members of a faculty learning community to discuss their instructional practices and to offer feedback regarding opportunities to remove barriers to access and participation. We focus on an interview with a physics instructor and examine their beliefs about students with disabilities as evidenced by the disability-specific language used in the interview. This prompted a new perspective on professional development regarding accommodating students with disabilities that focuses on confronting ablest beliefs as a crucial component in promoting inclusion in STEM education.

Nanoscale Electro-Emission from Individual Single Photon Sources at SiC Surfaces
Coney, Jordan

The goal of this project this summer is to interrogate the semiconductor Silicon Carbide (SiC) using a Scanning Tunneling Luminescent Microscope (STLM) and to find a) the electroluminescent properties of SiC, b) measure and record the topography of the SiC sample, and c) see if there is a specific mode of emission from the SiC sample. The SiC sample that is used in this experiment is made with oxide defects in its band-gap structure. The SiC sample is arranged in macrosteps and microsteps where macrostep is composed of one long terrace and many small step structures called risers (each macrostep making an edge-like structure). A microstep would be each riser in the macrostep. Experiments using photoluminescence on this sample have occurred in the past and these experiments showed more light emissions from the risers in the SiC sample than in the terraces. Part of the motivation for wanting to find the electroluminescence of SiC is to compare the results from the photoluminescence experiment and determine if the sample would behave similarly.

Disentangling CO Chemistry in Protoplanetary Disks using Machine Learning
Diop, Amina

TBD

Feasibility Studies of Ultraperipheral Collision Physics in sPHENIX
Dias-Gaylor, Jordan

Ultraperipheral Collisions (UPC's) are collisions where two ions in a collider are separated by more than the ion radius. Instead of a direct collision between the two ions, the particles interact via electromagnetic and photonuclear exchanges. The sPHENIX experiment is an upgrade of the PHENIX experiment which will increase the data acquisition (DAQ) rate capability. sPHENIX will collect significantly more data about the Quark Gluon Plasma, which is created in RHIC's particle smashups. To best exploit this capability, triggers will be devised so that we can accurately identify special events such as the creation of UPC J/Psi particles and record those events. I analyze simulations of UPC events in the sPHENIX detector to devise triggers that have good efficiency and low noise. Additionally, I will study the feasibility of sPHENIX to measure various UPC physics channels. I will determine the acceptance for the UPC J/Psi events in the sPHENIX detector, establishing that sPHENIX will have substantial statistics for a UPC J/Psi analysis. These feasibility studies will promote research towards the understanding of photoproduction in heavy ion collisions.

Application of Machine Learning with the Minimum Bias Detector (MBD) in sPHENIX
Davis, Kolby

The PHENIX detector is one of two main detectors used to track high-energy collisions at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory. Designed to collect nuclear data for analysis, these detectors have expanded our collective knowledge of quark-gluon plasma (QGP). An upgrade to PHENIX, called sPHENIX, will enable far better measurements of upsilon production and heavy flavored jets. The MBD is a subsystem of sPHENIX that acts as the primary trigger for collisions and uses the original beam counter (BBC) from PHENIX. Instead of using standard digital signal processing techniques to extract the time of arrival and charge in the MBD, we will use machine learning techniques such as boosted-decision trees, random forest regressors, and convolutional neural networks to obtain these values. To achieve this goal, we will build various models utilizing these techniques and compare the accuracies and mean-squared errors (MSE). These models will then be trained using data from prototype MBD electronics. At the beginning of data-taking, this program, and sPHENIX, will be used to conduct the extraordinary experimentation studying the QGP matter that dominated the early universe, one-millionth of a second after the Big Bang.

Origin and Nature of the Lunar Asymmetry
Evans, Alex

The notable lunar asymmetry between the lunar nearside and farside hemispheres permeates nearly every global dataset of the Moon (e.g., geochemistry, topography, and crustal thickness). The persistence and the long-wavelength signature of the lunar hemispherical asymmetry strongly intimate that it is indeed a primordial feature of the Moon, likely requiring the evolution of these two hemispheres to have diverged early in the Moon's history during either the crystallization of the lunar magma ocean or occurring shortly thereafter.

Based, in part, on new insights from lunar missions, we examine several facets of the lunar asymmetry, such as the nearside localization of KREEP, and identify critical implications and constraints for the Moon's early lunar and chemical evolution. Applying a combination of lunar interior modeling and data analyses, we characterize the overwhelming importance of the SPA and Imbrium impacts to the ancient lunar asymmetry and the capability of these two impact events to have catalyzed an early geochemical asymmetry of the Moon.

Process Characterization via Automation of Photonic Integrated Device Measurement
El-Amin, Ihsaan

TBD

Investigating different causes of failures between the Imaging and Radiation Oncology Core (IROC) moving lung and SBRT spine phantom irradiation results
Edward, Sharbacha

The Imaging and Radiation Oncology Core (IROC) moving lung and SBRT spine phantoms are irradiated annually by various institutions across the U.S., as a check of their radiation therapy (RT) delivery process. The failing results (158 cases) between 2012-2018 were evaluated and categorized by failure type. Majority of the lungs (50%) failed due to localization errors, i.e. motion related, while the spine was plagued by dose calculation errors. These results have clinical implications and highlight the areas within the RT community that need to be improved, to deliver more accurate radiation treatment to cancer patients nationwide.

Shock Synthesis of Organic Molecules by Meteors in the Atmosphere of Titan
Flowers, Erin

Shock energy applied to an atmosphere with the N2/CH4 composition of Saturn's moon Titan will efficiently synthesize organic molecules. Meteors sufficiently large compared to the atmospheric mean free path will generate such shocks during atmospheric entry. But while the microscopic dust flux at Saturn had long been measured, the meteor flux in the millimeter- to meter-size range has been unknown, making it impossible to quantify reliably the importance of this effect. However, the Cassini spacecraft imaged the results of multiple meteoroid impacts on Saturn's rings, allowing for the first time an empirical estimate to be made of the flux and size-frequency distribution of meteoroids at Saturn. We combine these results with an atmospheric entry model and measured shock production efficiencies for the N2/CH4 atmosphere appropriate to Titan, and calculate shock production rates for HCN, C_2H_2, C_2H_4, C_2H_6, and C_3H_8, as well as the resulting H_2 generation. We find that in the optimistic estimate for particle flux onto Titan, for example, HCN and C_2H_2 are produced at rates as high as 24% of the production rate due to UV photochemistry, suggesting that these particles are more important to Titan's atmospheric chemistry than previous thought.

Trapping interlayer excitons at van der Waals heterostructure by using molecular dipoles
Fuller, Neno

TBD

Redshifts and locally measured velocities in spherically symmetric spacetimes
Finch, Tehani

A number of spherically symmetric spacetimes are prominent exact solutions of General Relativity. As such, many aspects of these geometries are well known. However, certain quantities, including locally measured velocity of a freely-falling object and redshift of signals received from a great distance, have mostly been treated in the basic case of a pure Schwarzschild geometry. In this work, we expand these calculations to other spherically symmetric spacetimes that contain horizons, with particular focus on the Schwarzschild-de Sitter solution.

Echo Mapping Black Hole Growth: Single-Epoch Masses and Accretion Rates of Quasars
Fonseca Alvarez, Gloria

Understanding supermassive black hole growth requires accurate measurements of their masses and accretion rates across cosmic time. This has been limited by the availability of accurate black hole masses for diverse samples with a wide range of redshifts. The Sloan Digital Sky Survey Reverberation Mapping Project resulted in black hole masses for > 100 quasars from emission-line reverberation mapping and revealed problems with single-epoch methods overestimating black hole mass. This sample also has contemporaneous multi-wavelength coverage, allowing us to construct UV/Optical SEDs and measure accretion rates for a large number of quasars. This talk will also explore how current and upcoming large scale time-domain surveys can expand our understanding of supermassive black hole growth.

Measuring Warm Corona Properties in a Sample of Active Galactic Nuclei
Fairfax, Daniel

TBD

High Curie temperature $(MnSb_2Te_4)_x(Sb_2Te_3)_{1-x}$ magnetic topological insulator structures grown by molecular beam epitaxy
Forrester, Candice

The interaction between magnetic ions and topological electronic states of 3D topological insulators (TIs) has attracted many studies of predicted exotic phenomena, which may lead to the observance of quantum anomalous hall effect (QAHE) and realizations of quantum computing, among others.1 Mixing Mn, Sb and Te during crystal growth forms a new crystal phase, $MnSb_2Te_4$, with septuple layers (SL) rather than quintuple layers (QL) in undoped TIs. These magnetic TIs display antiferromagnetic (AFM) behavior in bulk, which is not conducive for QAHE, and typically have high bulk conductivity, which limits the ability to detect the surface states. Previously, it was shown that we can control

$(MnSb_2Te_4)_x(Sb_2Te_3)_{1-x}$ structures by optimizing Mn incorporation and inducing FM coupling;2 $(MnSb_2Te_4)_x(Sb_2Te_3)_{1-x}$ with 70-85% SL exhibited high Curie temperatures (TC) as high as 80K. Here we report further enhancement of the TC and magnetic coupling by modifying the MBE growth conditions: Mn beam equivalent pressure (BEP) ratios and growth rates varied in this study. Reducing Mn BEP ratio to levels of 0.04-0.06 showed evidence of the coexistence of FM and AFM phases and reduced GR yielded high TC. These high TC values are significantly higher than any values reported to date for these materials.

Modeling of Cardiopulmonary Resuscitation (CPR) Simulation
Ferrus, Celeste

Remote communities & astronauts may not have much in common, but they both are in similar dire need of emergency health attention while waiting for a medical professional's arrival. A CPR administrator using hemodynamics to guide the procedure can and has been the difference between life and death. The algorithm used in the following research both gives the theoretical outputs for the necessary hemodynamics, while displaying recommendations for a layperson to follow. Further validation needs to be run by the adjacent engineering team building the device for CPR to cross-reference the theoretical outputs to the model outputs.

The Effects of Trash, Residential Biofuel, and Open Biomass Burning Emissions on Local and Transported PM2.5 and its Attributed Mortality in Africa
Gordon, Janica

TBD

Simulating the Early Universe
Garrison, David

The Numerical Cosmology Group at UHCL has been working for several years to develop the most accurate simulations of the Early Universe possible in order to answer several basic questions, such as when did the first magnetic fields develop? In addition, our numerical code can be used to test several fundamental theories in physics. In this presentation, I plan to talk about how we developed this simulation software and what we have already learned from using it. The primary focus of this talk will be Magnetogenesis, or the creation of the first magnetic fields in the universe and predictions on the generation of Primordial Gravitational Waves from the Electroweak and QCD Phase Transitions.

Measuring the Knot of Non-Hermitian Degeneracies and Non-Commuting Braids in an Optomechanical System
Guria, Chitres

TBD

Matter Density Spike around a Rapidly Rotating Black Hole
Gates, Delilah

We consider adiabatic growth of a black hole within a cloud of particles. This growth causes particle redistribution resulting in the matter density to spike just outside the event horizon. For a high-spin black hole, this process results in a finite, nonzero matter density within the near-horizon region and matter current that respects the emergent symmetry of the near-horizon region. As the black hole tends towards maximal spin, the near-horizon region develops a throat-like geometry of logarithmically divergent proper volume. Therefore, while the matter density remains finite, the total mass enclosed within the near-horizon region diverges, with potentially observable consequences.

Room temperature Photoluminescence of Bulk Ge
Gregory, Vijay

Over the past 50 years, silicon (Si) based complementary metal oxide semiconductors (CMOS) have been fundamental within the electronics industry. The stable oxide, silicon dioxide (Si0_2), as well as the abundance of Si, has allowed for the growth of a multi-billion-dollar industry. The demand for Si electronics is high, but increasing interest lies in photonic-integrated circuits. If a proper light source could be achieved on Si it would revolutionize the photonics industry. Signal processing speed could be increased by orders of magnitude resulting in greater bandwidth in signal transmission. However, the limitations of Si prevent it from being used as an efficient light source. It has been shown that germanium (Ge), a group IV element like Si, can be successfully grown on Si without the need of strenuous manufacturing processes as with III-V materials on Si. Lasing has been achieved in Ge on Si, but the efficiency remains low. Though gain has already been observed, it is possible to increase the emission by improving the quality of the material. In this research, the optical properties of Ge will be studied through its photoluminescence (PL). The PL intensity will show the quality of Ge materials that could lead to significant technological developments.

Development of the photon readout electronics for nEXO
Griffin, Laurynette

One sensitive technique to determine the nature of the neutrino and any new physics that entails is to look for a neutrinoless double beta decay. nEXO is a 5 ton liquid Xenon time projection chamber that is being proposed to search for such a decay, and is the most sensitive detector being proposed for this search. Brookhaven National Laboratory is developing readout electronics for the photon detectors in nEXO, which will detect the scintillation flash produced when a beta decay event occurs. I will contribute to developing the nEXO photon readout by evaluating the performance of prototypes of the readout. In order to achieve this I have used Python code to create a Monte Carlo to simulate the bit error rate. Using Python, I have also analyzed data gathered from a prototype of the readout electronics to determine if a test of the Silicon PhotoMultipliers is possible to carry out at room temperature.

Testing the Reconstruction of White-Noise Bursts with Shapelets using BayesWave
Graves, Joshua

TBD

3D reconstruction of human lymphocytes using novel computation by confocal microscopy
Greene, Marion

TBD

An Exact Fermionic Chern-Simons-Kodama State in Quantum Gravity
Howard, Marcell

The Chern-Simons-Kodama (CSK) state is an exact, non-perturbative wave function in the Ashtekar formulation of classical General Relativity. In this work, we find a generalized fermionic CSK state by solving the extended gravitational and fermionic Hamiltonian constraints of the Wheeler-DeWitt equation exactly. We show that this new state reduces to the original Kodama state upon symmetry reduction to FRW coordinates with perturbative fermionic corrections, making contact with the Hartle-Hawking and Vilenkin wave functions of the universe in cosmology. We also find that when both torsion and fermions are non-vanishing, the wave function possesses a finite amplitude to evade the Big Bang curvature singularity.

Spectroscopic Identification of Young and Active K Dwarfs Within 25 Parsecs
Hubbard-James, Hodari-Sadiki

We present the results of an ongoing spectroscopic study of the ages and activity levels of over 1,200 K dwarf stars within 40 parsecs of the Sun and found in the sky between declinations +30 and −30. In an initial benchmark study, we used high resolution (R=80000) spectra from the CHIRON echelle spectrometer on the SMARTS 1.5m telescope to distinguish young and active stars based on specific spectral lines. Namely the Hα absorption line (6562.8 Å) and the Li I resonance line (6707.8 Å).

A larger sample of 280 K dwarfs within 25 parsecs has also been observed with CHIRON and analyzed using the benchmark calibration set results. Surprisingly, it appears that as many as ∼5% of these K dwarfs have spectroscopic features indicating that they are young and/or active. Upon completion, this study will serve as an excellent resource to evaluate host stars for exoplanet habitability.

Search for Rare Higgs Boson Decays
Harris, Jesse

In 1964 the Higgs boson was predicted by the Standard Model of particle physics. In 2012 the first evidence of the Higgs was discovered at the Large Hadron Collider (LHC) in Geneva, Switzerland. This boson plays the fundamental role of generating particle's mass. At present, its properties are studied in great detail with large detectors at the LHC. So far, all measurements have been consistent with the standard model. We know the Standard Model is incomplete and cannot yet be applied at higher energies closer to the Big-Bang. Therefore, new forces and particles are expected to exist. They might be observed at energies directly accessible with the LHC, or if more energetic, they can indirectly change properties of the Higgs boson. Rare decays of the Higgs boson would be sensitive to this presence of beyond the standard model physics. I use a data sample of proton-proton collisions collected at a center-of-mass energy of 13 TeV in the years 2015 - 2018 with the Compact Muon Solenoid detector to search for some of these rare decay channels. I employ traditional maximum likelihood techniques combined with machine learning to establish an upper limit to the decay channels Higgs to Z, Upsilon, and Higgs to Z, J/psi.

Physics from the Cosmic Microwave Background and the road to CMB-S4
Huffenberger, Kevin

The Cosmic Microwave Background (CMB), the radiation afterglow of the Big Bang, provides us with both a snapshot of the early Universe and a backlight that illuminates all the later-developing structure. The statistics of this light provide avenues to detect beyond-the-standard-model physics from inflationary gravitational waves or light relic particles. The growth of large-scale structure, measured by gravitational lensing of the CMB, provides information on the mass of neutrinos and on dark energy. Both the intensity and the polarization of the microwave light are crucial. Electron scattering of CMB photons allows us to find distant galaxy clusters via their gas content. With good time resolution, CMB surveys can identify and measure variable and transient objects from flaring stars to gamma-ray bursts to supermassive black holes in active galactic nuclei, and can play a role in multimessenger astronomy. I will briefly tour ground-based experimental efforts at the South Pole and in Chile, including the South Pole Observatory, Atacama Cosmology Telescope, Simons Observatory, and their successor, CMB-S4, a project rated highly by the Decadal Survey of Astronomy and Astrophysics.

Study of Light Emission from GeSbTe Phase-change Materials
Hilton, Brandon

TBD

64th Annual Meeting of the APS Division of Plasma Physics
Horimbere, Landry

Dipolarization fronts are regions of stressed plasma that are suspected to be the source of broadband electrostatic and electromagnetic emissions in the Earth's magnetosphere. It has been posited that after highly impulsive reconnection events, they can develop an electric field and shear layer with gradient length scales smaller than the ion gyroradius. Researchers at the Naval Research Laboratory have developed models for the spectrum of electrostatic and electromagnetic waves produced by the Electron-Ion Hybrid (EIH) instabilities of such a compressed front. In this work, I analytically calculate the dispersion relations for the Kelvin-Helmholtz (KH) and electrostatic EIH instability for both a single piecewise continuous shear layer and a piecewise continuous symmetric double shear layer. I find that both the KH and EIH modes exhibit instabilities at arbitrarily low velocities but that the wavelength of the fastest-growing EIH mode also diverges at low-velocity shears. I also perform particle-in-cell simulations of the evolution of unmagnetized and magnetized plasma jets and compare the numerical and analytical results to measurements from the NRL space simulation chamber. I find that, in agreement with theory, the amplitude of the waves detected grows with the applied field.

An Investigation Into Possible Systematic Effects on Neutron Star Radius Estimates using NICER-like Synthetic Data
Holt, Isiah

TBD

Real-Time Chemical Characterization of Primary and Aged Organic Aerosols from African Biomass Fuels
James, Markiesha

Biomass burning (BB) particulate matter (PM) emissions contribute to radiative forcing via scattering and absorption of solar radiation, ultimately affecting temperature, precipitation patterns, climate, and visibility. BB-derived organic aerosol (OA) emissions influence solar radiation via absorption and scattering of radiation, which is related to their physical characteristics and chemical composition, which can change upon atmospheric ageing. Here, an aerosol chemical speciation monitor (ACSM) and a scanning mobility particle sizer (SMPS) are used to systematically examine the compositional-resolved mass concentration (i.e., primary and secondary OA) and aerosol size distributions, respectively, under dry and elevated relative humidity conditions in the NC A&T University smog chamber facility. We report the OA mass spectral profiles (fragment ion intensity versus mass-to-charge ratio, m/z) for different types of African solid fuels, including wood, grass, and dung. During ageing experiments, we monitor, the source-specific time evolution of the size distribution and geometric mean diameter of the organic-rich aerosols, the fraction of characteristic marker ions (i.e. f43, f44, and f60), the elemental ratios of atomic hydrogen-to-carbon (H/C), the oxygen-to-carbon (O/C) ratio,

Adhesive measurements on CI simulant particles in Vacuum
Jardine, Keanna

TBD

Equity, Diversity, and Inclusion Efforts in the AIP Federation
Knaub, Alexis

The member and affiliate societies in the American Institute of Physics Federation have been collaborating on multiple projects to improve equity, diversity, and inclusion (EDI) including the Physics and Astronomy STEMM Equity Achievement (SEA) Change project and the AIP Collective Impact project. This talk will provide an overview of some of these efforts and what they are planning to do in the future.

Optimizing Mirror Alignment Algorithm of the Simons Observatory Large Aperture Telescope
Kahassai, Nathnael

TBD

Photoionization Front Experiments at the OMEGA Laser Facility
Kelso, Kwyntero

Photoionization fronts are meaningful drivers of transformation for astrophysical phenomena. Generating sufficiently intense x-rays in laboratory experiments has been a difficult challenge. We attempt to create an environment relevant to astrophysical systems in which intense photon fluxes drive ionization and dynamics. Experiments at the OMEGA Laser Facility can create relevant photoionization conditions. One can generate a backlighter X-ray source through the ablation of an 860 micron diameter spherical nickel lined CH capsule. A laser irradiated gold foil generates an intense, thermal X-ray source (80-90 eV) which propagates into a gas cell filled with argon for the investigation of the Ka-absorption edge (3.203 keV). We present the preliminary results from an analytical study of the cold argon gas K-shell edge line absorption, characterized with a streak x-ray spectrometer using an RbAP crystal. We measured the K-edge of X-ray absorption spectra of argon gas using 2-4keV continuum photon energy from the capsule implosion.

Hyperdoped Si photodetectors for high efficiency and extended conversion range
Liu, Yining

Hyperdoped silicon is a promising photodetection material with extended infrared response. Supersaturated solutions of impurities in Si are produced to create intermediate bands (IBs) in between the valence and conduction bands. As the defect atoms are incorporated into the Si lattice at increasing concentration, the wave functions of the impurities begin to overlap, and the discrete energy levels associated with the defects begin to spread out and form a band. This new IB serves on sub-band gap absorption. Ion implantation followed by pulsed laser melting has been demonstrated as a method to produce concentrations of impurities in Si that are well above the solid solubility limit. In this work, we look at Si hyperdoped with Au or Ti.

To achieve devices that could be commercialized for photodetectors or other demanding applications, efficient ones will require significant optical absorption and high quality Ohmic contacts for carrier extraction. We fabricated Si layers hyperdoped with Au or Ti at varying thickness, attempted to form Ohmic contacts to the layers and fabricated prototype PN junction photodiodes. The results show a significant improvement of Hyperdoped Si sub bandgap detection which provides potential for commercialized photodetections.

Status of the Sterile Neutrino Search with the JSNS2 Experiment
Little, Cassandra

The JSNS^2 (J-PARC Sterile Neutrino Search at the J-PARC Spallation Neutron Source) experiment aims to search for sterile neutrinos near $\Delta m^2 \sim 1~\text{eV}^2$ over a 24 m short baseline at the J-PARC Materials and Life Science Experimental Facility (MLF). The JSNS^2 near detector has a fiducial volume of 17 tonnes and is filled with gadolinium (Gd) loaded liquid scintillator (LS). A pulsed neutrino source from muon decay at rest (DAR) is created with a 3 GeV proton beam from the Rapid Cycling Synchrotron (RPS) and spallation neutron target. JSNS^2 is searching for the appearance of electron antineutrinos oscillated from muon antineutrinos via the inverse beta decay (IBD) reaction $\bar{\nu}_e + p \rightarrow e^+ + n$ followed by gammas from neutron capture on Gd. The JSNS^2-II upgrade will feature a far detector with 32 tonnes of fiducial volume 48 meters from the source. This two-detector scheme will allow for much better sensitivity, especially in the low Δm^2 region. Here we will present the status of JSNS^2which began data taking in January 2020 and has already accumulated $\sim 3.12\times10^{22}$ Proton-On-Target (POT), $\sim 26.54\%$ of the experiments total.

Reconstructing simulated gravitational-wave signals from binary black hole hyperbolic encounters using bayeswave
Lott, Peter

Of the 90 gravitational wave (GW) signals observed by the Laser Interferometer Gravitational-Wave Observatory (LIGO) so far, all exhibit the chirp-like profile associated with Compact Binary Coalescences (CBCs). However, CBCs are not the only black hole (BH) arrangement which emit GWs. A binary black hole (BBH) hyperbolic encounter is a binary arrangement in which the trajectory of the secondary black hole is perturbed by the gravitational influence of the primary. Physically, this is a classical BH scattering problem which can be modelled using a small number of parameters related to the geometry of the problem. Although GWs from hyperbolic encounters have not yet been detected,
they are expected to have an event rate of 0.43 per year for solar mass BHs in dense globular clusters. Hyperbolic encounters are also of cosmological interest due their possibility as a potential source under the primordial black hole (PBH) hypothesis.
This presentation will introduce the methods in development for these astrophysical interests. I acknowledge the support of the NSF through grant GR00011184.

The Peculiar Warp of HD 110058's Debris Disk
Lopez, Ronald

We present scattered-light images in the near infrared of the spatially resolved debris disk around HD 110058 in H-band total intensity using observations from Gemini Planet Imager (GPI). With near-infrared scattered-light imaging, we can examine the population of some of the smallest dust grains that populate the disk, and attempt to probe part of the dynamical history of the planetary system by examining its structure. Dynamical interactions between planetesimals, dust, radiation, and possibly planets, work in tandem to shape dust into unique morphologies. For HD 110058, we discuss the morphological characteristics of its edge-on debris disk and the methods that will be used to study the disk's dynamical history. The presence of an asymmetric warp in the disk at a radius of 0.35 arcseconds (~38 AU) is revealed in PSF subtracted total intensity images, sharing some characteristics with the disk around β Pictoris. The warp suggests the existence of large-scale dynamical perturbations due to a possible unseen planet or other dynamical processes such as stellar flybys, or massive collisions.

Analyzation of Autism Spectrum Disorder Data
Lewis, Naiyah

Autism spectrum disorder (ASD) is a behavioral and neurological disorder affecting how one communicates, learns, behaves, and interacts with others. ASD affects 1 in 68 individuals and has significant heterogeneity. The causes of the genetic variants and cellular mechanisms leading to ASD are not fully understood. Due to the limited understanding of ASD, using SeqWeaver, software that predicts the functional effects of noncoding mutations, to analyze large whole genome sequencing datasets will help to discover genetic variations linked to ASD We begin looking at datasets from Simons Foundation Powering Autism Research for Knowledge (SPARK) and Simons Simplex Collection (SSC). Both studies have different requirements for participants and biospecimen collection styles. We analyzed each study to understand each participant's family structure and demographics. Our next step is to begin data analysis on the SPARK WGS dataset.

Kinematic Characterization of Nearby K Dwarfs
Lesley, D. Xavier

We report systemic and UVW space velocities for 287 K dwarf systems for which we have acquired spectra (R=80,000) using the CHIRON high-resolution echelle spectrometer on the SMARTS 1.5m telescope at CTIO. These curious discoveries are compared to our benchmark set of 35 systems in known moving groups by using their measured gamma velocity (GV) and Gaia astrometry to determine UVW space motions through the Galaxy. The observed stars are part of a large RECONS (REsearch Consortium On Nearby Stars, http://www.recons.org) effort to explore over 1,200 of the nearest K dwarfs, all within 50 pc.

The sample described here consists of systems within 25 pc of the Sun that lie in the equatorial region of the celestial sphere, between declinations +30 and -30 degrees. Our GVs ranged from −133 km/s to +176 km/s. Ultimately, our study aims to use diagnostics of age, activity, and kinematics, along with spectroscopically-derived stellar properties to identify the best K dwarfs for habitable planetary companions. This effort has been supported by the NSF through grants AST-1517413 and AST-1910130 via observations made possible by the SMARTS Consortium.

Investigation of the magnetic properties of Cu2OSeO3 (CSO) as a skyrmion host
Mazhandu, Farai

Cu2OSeO3 is a ferrimagnetic insulator with broken inversion symmetry. It is also a cubic helimagnet that hosts a magnetic skyrmion lattice, which makes it a potential material for spintronic applications. Magnetic skyrmions are quasiparticles that show vortex-like spin properties with nontrivial topology. Previous research on Cu2OSeO3 has used single crystals, and even investigations of thin layers of Cu2OSeO3 were done by milling down bulk single crystals. The skyrmion lattice phase in films is typically more stable and broader in the H-T phase diagram than in bulk crystals, such that films are of interest for experimental investigations of the effects of thermal energy on skyrmion behavior. Additionally, thin films are more suitable for device applications. We investigated the magnetic properties of Cu2OSeO3 thin film using temperature-dependent magnetic susceptibility and Arrott plot analysis. We compare the results of the Cu2OSeO3 thin film characterization with data collected on a single crystal.

Quasi-periodic Pulsations Observed in Stellar UV Flares on a Highly Active Low Mass Star
Monsue, Teresa

Stellar atmospheres encompass an abundance of waves and oscillations. This includes those associated with flares. Oscillatory and pulsating signatures, commonly known as quasi-periodic pulsations (QPPs), are observed at many wavelengths during both solar and stellar flares. These oscillatory phenomena travel on magnetic field lines in the star's atmosphere and can provide insight into the astrophysical processes of flares. We present a study of flare oscillations in a nearby, active M dwarf star. We use high cadence data (~1 sec, near-UV) from NASA's Swift mission to measure QPP properties and place constraints on the fundamental processes driving flares at different layers of the stellar atmosphere. We present preliminary results to be incorporated with high-cadence TESS 20-second flare data for future studies.

Stellar Flybys and Where to Find Them
McArthur, Everett

TBD

Novel Methods to Leverage Spectroscopic Overlap of Imaging Surveys
Myles, Justin

Large galaxy imaging surveys promise to deliver extraordinary datasets to answer open questions about the nature of dark matter and dark energy, but these surveys suffer from challenges arising from the difficulty in constraining galaxy redshift. I will discuss three projects that leverage spectroscopic observations of small, well selected subsets of galaxies observed in imaging surveys to improve the utility of photometric datasets for cosmological experiments. First, I will describe the new methodology used for the Dark Energy Survey Year 3 weak lensing source galaxy redshift calibration and the resulting DES Y3 cosmology constraints. Second, I will present a novel algorithm for accurately propagating uncertainties of probability distributions and illustrate the application of this algorithm to redshift calibration. Third, I will show results using archival spectroscopy of redMaPPer galaxy clusters to measure the impact of projection effects on these clusters and comment on how this measurement relates to the DES Y1 cluster cosmology results. In summary, my talk will present promising paths forward to take full advantage of forthcoming surveys to constrain the cosmological model.

Data-driven Study of Mangetic Anisotropy in Composite Transition Metal Dichalcogenide Monlayers
Minch, Peter

TBD

Analysis of the systematic error of BurstCube
Moore, Jaid

Gamma Ray Bursts (GRB) are high energy events theorized to be caused by mergers.
BurstCube is a nanosatellite (CubeSat) that will detect GRBs in the energy range of 50 keV -1 MeV. BurstCube is set to enter Earth’s orbit February 2023. Its research objective is to
broaden our short GRB coverage in addition to our current detectors. Its use of silicon
photomultiplier contributes to the next generation of GRB detectors. BurstCube has a more compact design and lower energy consumption than its predecessors. Prior to operation, the systematic error of the localization algorithms must be identified and assessed. Given a spectral hypothesis F(E)∼E^α, I evaluated how the assumed spectral index α affects the detector accuracy to locate a source using simulations of sources with a known spectrum. By inputting varying combinations of indices, the resulting uncertainties can be calculated and used for future detection. For our first toy model, we found that a .1-.2 index variation maintains a systematic error below the statistical error of BurstCube’s algorithm.

Novae V745 Sco as a potential Type Ia supernova progenitor
Molina, Isabella

Not much is known about the progenitors of Type Ia supernova, but one possible class of progenitor systems are white dwarfs that accrete material from evolved companion stars. If the white dwarf is very massive or if the accretion rate is high, these systems may undergo frequent nova outbursts, recurring on human timescales. Hence these “recurrent novae" are potentially useful models for studying paths to white dwarf growth and eventual explosion. Radio observations of novae can give us information on the physical characteristics of the white dwarf and the process that the binary undergoes during the nova outburst. In this talk, I will discuss new observations of the recurrent novae V745 Sco and the implications for its status as a potential Type Ia supernova progenitor.

Teaching Physics in an Astronomy Context
Mulu-Moore, Fana

Learn about new research-based astrophysics teaching resources produced by the AAPT/Temple University team as part of NASA Space Science Education Consortium. These resources include a collection of hands-on activities, lecture tutorials, concept tests, and diagnostic tools that strategically fill in gaps in existing astrophysics content. All materials are developed through educational research in our own classrooms and are small-scale and modular, designed to fit into and enhance existing physics and astronomy courses.

Similar Seven: The study of 'Twin' planets in order to isolate correlations of high altitude aerosol formation rates and physical parameters
McGruder, Chima

There is a wide gap in our understanding of which system parameters (i.e. stellar, planetary, and system parameters), if any, correlate with observed atmospheric properties in exoplanets. For example, there has been no strong correlation found with high altitude aerosol formation in giant close in planets (hot Jupiters) and their system parameters. However, finding such correlation would be revolutionary in exoplanetology, and would be key for optimal target selection for JWST, ARIEL, and the next generation of ground-based telescopes. To this end, we have identified a subset of planets that can be used to test correlations between stellar metallicity or high-energy irradiation levels and aerosol coverage in exoplanet atmospheres. These systems match in most parameters and can provide a more efficient means to search for correlations with specific properties. I will present the whole sample of systems, their redefined system parameters, and two of their transmission spectra, which show tentative correlations. These planets could be cornerstone systems for understanding the physics behind high altitude aerosol formation in hot Jupiters, and guide identification of planets best suited for detailed atmospheric studies.

Exploring the Measurability of Black Hole Shadows Using Space VLBI
McGee, Carissma

TBD

Setup for measurement of Phase Change Materials
Malone, Trent

In order to switch Phase change materials with applications in the Infrared regime a 1550 laser is used for telecommunication applications. An arbitrary waveform generator sets the pulse shape and repetition rate. The pulse width is set to 70ns with a fall time of 30ns. The sample to be heated quickly and cooled quickly to lock the sample into the crystalline states. In thermodynamics this would be described as an adiabatic process. The use of an erbium doped fiber amplifier is needed to amplify the pulse to its final power. The pulse parameters and power enable crystalline switching of germanium antimony telluride (GST). The coupling of 1550nm and 1590nm gives you the intensity needed to optically switch. Since these wavelengths are not visible an 820nm laser is used for alignment purposes. A pulse delay generator and electro-optic modulator receives a signal to open an close to enable switching of the sample. Once it sees the trigger signal it waits for the amount of time the delay is set and then sends a square electrical pulse with voltage and width as set by the user to the high voltage switch. A microscope with a beam splitter is used to send 50% of the beam to the sample, and the other 50% is send to the camera for viewing or to the detector for a reflection measurement.

Motivating Teachers and Students to Learn Concepts in Quantum Physics via Engaging Activities
Murdock, Maajida

Informal science education activities (ISEA) have long played an essential role in helping create and recruit the next generation of scientists. Researchers not having constraints from the curriculum, textbooks, and tests have a freedom that allows creative and culturally relevant learning experiences of science. This freedom can present opportunities for engagement by presenting key concepts to the K-12 teachers and students and communicating exciting results from the researcher's work allowing K-12 teachers and students to have more access to science. The audience is the focus of this presentation, which is one of the four stakeholders that benefit from ISEAs – the audiences, the researchers, the institutions, and the field of quantum science. This presentation will demonstrate the use of the two-way interactive method to bring science "alive," spark interest and stimulate curiosity.

Resonance systematics for capture reactions using Machine Learning
Mbacke, Khadim

TBD

A scintillating fiber-based dual beam and neutron monitoring device
Marshall, Joshua

TBD

The study of the properties of isovector giant resonances excited via the 60Ni(3He, t) reaction at 140 MeV/u.
NDAYISABYE, FELIX

Nuclear charge-exchange reactions at intermediate energies are powerful probes of the isovector response of nuclei. They provide an opportunity to study isovector giant resonances, such as the Gamow-Teller resonance and the isovector giant monopole and dipole resonances. The properties of these giant resonances provide important insights into the bulk properties of nuclear matter and have important implications for neutrino and astrophysics. In this work, the focus is on studying the properties of isovector giant resonances excited via the 60Ni(3He, t) reaction at 140 MeV/u. The (3He,t) reaction was us

Deblurring Decay Energy Spectrum in neutron decay reaction
Nzabahimana, Pierre

The measured decay energy spectra from invariant mass spectroscopy can give insights into the shell structure of particle-unbound systems. However, it is challenging to extract the underlying physics from the measured spectrum due to detector resolution and acceptance effects. We introduce a deblurring method that utilizes the Richardson-Lucy algorithm, which has proven to be successful in optics. The method does not require any prior knowledge about the resonance states in the observed spectrum, and it circumvents the singularity issue by iteratively adjusting a positive definite distribution. The only inputs are the observed energy spectrum and the detector's response matrix also referred to as the Transfer Matrix (TM). We tested the method’s performance on a simulated spectrum generated using the in-house simulation package for the MoNA-LISA-Sweeper setup and the associated TM. Finally, the approach is applied to the energy spectrum of the 26O system decaying into 24O + n +n, from an experiment conducted at NSCL by the MoNA Collaboration. We demonstrate its successful performance in restoring the resonance states in the decaying systems from decay energy measurement.

Light Curves from Convective Common Envelopes in Low-Mass Binaries
Noughani, Nikki

The presence of an orbiting companion can significantly affect the evolution of a star. For close binaries, radial expansion of the primary's envelope during the post-Main Sequence, coupled with mass-loss from winds, can destabilize the orbit such that the companion plunges into the primary star.
Such common envelope (CE) events are thought to be the primary mechanism for forming close binaries in the universe, as the orbital separation rapidly shrinks. Despite its importance and predicted ubiquity, the details of stellar evolution through the CE phase remain highly uncertain. In this work, we construct theoretical light curves for convective CE events. The effects of convection impart a distinct, long-term signature in the light curves, which should be detectable with upcoming transient surveys.

Testing of New Silicon Pixel Detectors for HL-LHC
Nash, Cordney

The mission of the Large Hadron Collider is to find new forces and new particles in collisions of protons. This new physics might be observed directly as new signals, or indirectly as deviations from theoretical predictions. To be able to resolve small effects with particles from collisions, the LHC will be upgraded to higher beam intensities. To measure such particles emanating from proton collisions close to the point where they are created, new highly pixelated detectors that are fast and radiation hard are needed. I am testing prototype detectors and their readout technology in the laboratory to understand their applicability and characterize them.

Wavelength Dependence using PUMAS
Newell, Dominique

There is a disparity in science education specifically Physics education due to the lack of resources and monetary restrictions that many underrepresented colleges and universities face each year. In order to properly offer a larger scale of individuals the ability to learn the fundamental concepts of physics, there is a need to develop a simpler and more cost-efficient method in comparison to the current techniques and equipment that many do not have access to utilize.
The core physics concepts such as electricity, magnetism, and optics can all be demonstrated and further analyzed by using the Pulsed Magnet Station (PUMAS) to conduct the research. Experiments like Malus's Law and Faraday's Law of Induction shows the connection between all three concepts and can be conducted using cost-effective equipment and the Techspin's Faraday's Rotation device to generate a magnetic field. Through experimentation and analysis our original goal of developing a cost-effective alternative that still gives us valid and accurate results regarding the two experiments conducted were obtained.

Machine learning framework for decay energy spectrum from invariant mass measurement
Nzabahimana, Pierre

The measured decay energy spectra from invariant mass spectroscopy can give insights into the shell structure of particle-unbound systems. However, extracting the underlying physics from the measured spectrum is challenging due to detector resolution and acceptance effects. The traditional approaches rely on fitting methods such as the chi-square that require the number of resonance peaks in the spectrum to be known a priori, information that is not always accessible. We developed a machine learning model that uses a deep neural network (DNN) classifier to identify resonance states from the measured decay energy spectrum. We input a spectrum into the model, which automatically outputs the number of peaks in the spectrum. We tested the performance of the methods on simulated data and experimental measurements. Then we applied the technique to the decay energy spectrum for 26O decays into 24O + n +n measured via invariant mass spectroscopy by the MoNA Collaboration at the National Superconducting Cyclotron Laboratory(NSCL). DNN approaches suggest that the raw decay energy spectrum of 26O has three peaks at approximately 0.15 MeV, 1.5 MeV, and within 4 to 6 MeV, and the corresponding mean width are 0.29 MeV, 0.8 MeV, and 1.85 MeV, respectively.

Understanding Isolated LMC Mass Analogs and their Satellites
Okoronkwo, Oge

The Large Magellanic Cloud (LMC) is the largest satellite galaxy of the Milky Way. Cosmological models predict that the LMC was once an isolated galaxy and estimated to be surrounded by its own satellite companions. Over the course of billions of years, the LMC and its satellites fell into the gravitational potential of the Milky Way. In recent years, the Dark Energy Survey (DES) has discovered dozens of ultra-faint dwarf satellites in the Milky Way. However, the DES footprint is very close to the LMC, opening the question of just how many Milky Way satellites may have originally been satellites of the LMC. Using large scale simulations of various environments, I study isolated LMC sized galaxies and their satellites to predict a distribution of an isolated LMC and understand its evolution. Each of the simulated galaxies are unique in shape, size, and environmental characteristics. These identifiers can be utilized to isolate the role of star formation history, star population density, and galaxy interaction between host galaxy and satellite(s).

Understanding the Origin of Elements in the Cosmos using Nuclear Techniques
Owens-Fryar, Gerard

TBD

Comparison of Observed and Theoretical Transit Times of Sagittarius A
Obielodan, Olufemi

The Indlebe Radio Telescope (IRT) is a small transit telescope which works at a wavelength, λ=21 cm. It was constructed by South African students at the Durban University of Technology. The IRT detects Sagittarius A daily. There are four variables that determine the transit time: Sag A's right ascension and declination and the longitude and latitude of the IRT. However, these four variables are affected by our wobbly earth. Specifically, Sag A's transit time is influenced by precession, nutation, polar motion, aberration, celestial pole offset, proper motion, length of the terrestrial day, and variable ionospheric refraction. Of these eight factors there are three that are measured quantities– proper motion, polar motion and the length of the terrestrial day. Moreover, three more factors can be predicted with a high degree of accuracy– precession, nutation and aberration. However, celestial pole offset and variable ionospheric refraction are not predicable. Currently, we are comparing the transit times of Sag A observed by the IRT to the calculable predications of the U.S. Naval Observatory in order to obtain information over these two factors, in hopes of better understanding them. This project is still in its beginning stages and thus we are still analyzing and comparing data.

Investigating the electrical conductivity of warm dense matter using terahertz spectroscopy and electron diffraction
Ofori-Okai, Benjamin

Warm Dense Matter (WDM) refers a regime where materials possess a simultaneously high density ($\rho \sim 1$ g/cm3) and temperature ($T \sim 1$ eV = 11605 K). It has recently become possible to transiently drive materials into this exotic state by using intense lasers pulses to rapidly thin metal foils thus permitting investigation of WDM. Understanding the properties of materials in WDM conditions is crucial to fields such as planetary astrophysics and fusion energy. In particular, the electrical conductivity is vital for developing accurate models of planetary formation and inertial fusion ignition.

Here we present measurements of the electrical conductivity of laser-generated warm dense Al (WD-Al). The electrical conductivity was measured using terahertz (THz) spectroscopy. THz pulses are ideal for measuring electrical conductivity on ultrafast timescales. While the pulses are short (~1 picosecond) the electric field of THz radiation oscillates slowly. Using single-shot pump-probe techniques, we determined the electrical conductivity at several WDM conditions and investigated the effect of electron temperature and structure on the electrical conductivity. We observed a dramatic decrease when heated into the WDM regime, and show initial comparisons between our data and theory.

Probing the Multiphase Kinematics of a "Beads on a String" Star Formation Complex in a Cool Core Cluster with Merging Central Galaxies
Omoruyi, Osase

Studies of the central galaxies in galaxy clusters have found mounting evidence for a top-down picture of multiphase condensation, in which the hot, diffuse gas permeating through the cluster rapidly cools, driving a steady inflow of thermally unstable, multiphase gas toward the galaxy's center, which then powers star formation and black hole accretion. "Radio-mode" feedback in the form of radio jets launched by the central black hole is thought to play a key role in this process, for it provides the heating needed to keep the cluster thermally stable, and significantly reduces the amount of cooled multiphase gas, matching observations. Understanding the extent to which this picture accurately describes cluster properties, however, requires detailed observations of the hot, warm, and cold gas phases within a variety of galaxies at different evolutionary stages and across different environments. To this end, we present a multi-wavelength study of a galaxy cluster that shows stunning features of beads-on-a-string star formation without strong signatures of radio mode AGN feedback: SDSS J1531+3414. Using new Chandra, ALMA, GMOS-N IFU, and VLA observations, we investigate the origin of the beaded star formation and explore potential sources of heating besides AGN feedback.

Accreting Neutron Stars in Galactic Globular Clusters
Panurach, Teresa

Accreting neutron stars in low-mass X-ray binaries show outflows—and sometimes jets—in the general manner of accreting black holes. However, the quantitative link between the accretion flow (traced by X-rays) and outflows and/or jets (traced by radio emission) is much less well understood for neutron stars than black holes. We use data from the MAVERIC radio continuum survey, Swift/X-Ray Telescope and the Chandra X-ray Telescope for a systematic radio and X-ray study of six persistently accreting neutron star X-ray binaries, as well as two other transient systems. Overall, our results show that neutron stars do not evince a single relation between inflow and outflow and that the accretion dynamics are more complex than for black holes.

Is LTT 1445 Ab a Hycean World or a cold Haber World? Exploring the Potential of Twinkle to Unveil Its Nature
Phillips, Caprice

We present work on studying the atmospheric composition and detecting a potential biosignature, ammonia (NH3,) in the nearby terrestrial-like planet LTT 1445 Ab. At a distance of 6.9 pc, this system is the second closest known transiting system and will be observed for transmission spectroscopy with the upcoming Twinkle mission. Twinkle is equipped with a 0.45m telescope, covers a spectral wavelength range of 0.5 - 4.5 μm simultaneously with a resolving power between 50 - 70, and is designed to study exoplanets, bright stars, along with solar system objects. We investigate and conclude that Twinkle data can distinguish between a cold Haber World (N2-H2-dominated atmosphere) and a Hycean World with a H2O-H2-dominated atmosphere. Further interior composition analysis favors a Haber World scenario for LTT 1445 Ab. We use petitRADTRANS and a Twinkle simulator to simulate observed transmission spectra for the more likely scenario of a cold Haber World for which NH3 is considered to be a biosignature. We study the detectability under different scenarios: varying hydrogen fraction, concentration of ammonia, and cloud coverage. We find that ammonia can be detected at a ~ 3σ level for optimal non-cloudy optimal conditions with 25 transits and a volume mixing ratio of 4.0 ppm of NH3.

Photometric Analysis of Nearby Galaxies
Pritchett Jr., Keith

Image analysis of galaxies holds important information about their structure, dust content, and formation history. Many different codes currently exist to conduct such analyses, but many take large amounts of time to operate or have difficulty handling the rich complexity of large, angular-diameter galaxies. To address these complications, we utilized a new open-source tool called AutoProf, which will help provide new insights into the physics of galaxy formation. The primary goal of this project is to become familiar with AutoProf and other techniques used to analyze galaxy imaging, and to apply these methods to images of galaxies in the Siena Galaxy Atlas.

High Q2 electron-proton elastic scattering at the future Electron-Ion Collider
Pierre-Louis, Allen

Unpolarized electron-proton elastic scattering cross-section measurements at high Q2 allow for improved extractions of the proton electromagnetic form factors as well as provide constraints on possible hard two-photon exchange effects. We present a detailed study of the feasibility of making these high Q2 e-p elastic measurements at the future Electron-Ion Collider (EIC). The results show that e-p elastic cross sections can be obtained in the momentum transfer range of 6 (GeV/c)2<Q2<40 (GeV/c)2, which would be the highest-ever Q2 values measured. These data will all be at virtual photon polarizations close to unity, $\epsilon \sim 1$.

Dynamics of Filamentary Modes in Magnetized Low Temperature Plasma with MDPX
Price, Elon

Studying complex or "dusty" plasmas will provide valuable insight, from diagnostics to first principles, into interdisciplinary areas of research including astrophysics, energy applications, agriculture, and medicine. Based upon the charge-to-mass ratio of the dust component, a magnetic field of $B \geqslant 1$ T is required to observe effects due to magnetic forces. However, with fields higher than 1.5 T, an instability occurs in the radiofrequency (RF) generated background plasma called filamentation. With the use of optical diagnostics, the spatial morphology of these filaments have been observed and categorized into four different types or filamentary 'modes.' Furthermore, it has been confirmed that the shape and dynamics of the filaments are controlled by the Hall parameter (i.e. a ratio of the gyration radius to the mean free path). In addition, the filaments are not stable. They have both translation and rotational motion and have even appeared to transform modes over time. This poster aims to explore the time-dependence of the spatial modes (without the dust component) through image analysis. Understanding both the spatial and temporal characteristics will support a first principles theoretical framework for this instability.

Plasma Diagnostics on C-2W
Parke, Eli

TAE Technologies, Inc. (TAE) pursues an alternate approach to magnetically-confined fusion, relying on field-reversed configuration (FRC) plasmas. TAE's current experimental device, C-2W [1], is an advanced beam-driven FRC and has achieved record-breaking FRC performance parameters including steady-state sustainment for over 30 ms and total temperature $Ttot > 3$ keV. The performance of these plasmas is measured with an advanced suite of diagnostic systems [2,3], composed of more than 60 diagnostics which generate thousands of signals for each plasma shot. This presentation will highlight some of the primary diagnostics employed on C-2W, including the magnetic sensors and laser diagnostic systems. These diagnostics support a state of the art machine-learning framework for experimental optimization developed in collaboration with Google and a feedback control system implemented to produce consistent FRC performance and reliable machine operation.

Dim and Deserted: What Modest Peaks and Low density Large Scale Structures Tell Us About the Cosmology of the Universe
Phillips, L. Arielle

A recent residency at the Aspen Center for Physics focused on Large Scale Cosmology in light of existing and anticipated big data surveys. In the context of recent breakthroughs in the field of the large scale cosmology, we discuss our work probing the cosmology of the universe using low density environments (voids) and modest peaks in the density distribution (dwarf galaxies, filaments). We study large scale structures, the intergalactic medium (IGM), and the environmental history of galaxies and their circumgalactic medium (CGM) over time using a framework of large scale simulations with different dark matter models and dark energy parametrizations. Analytical tools allow us to parse the cosmic web into clusters/groups, filaments and voids. We discuss our recent insights on the evolution of large scale structure and the environment of galaxies, particularly in dark energy dominated structures and at the interface with dark matter dominated environments, and what these tell us about the cosmology of the universe.

Accurate Masses of Extraordinary Red Giants
Pope, Myles

Mass and radius measurements for red giant stars have been notoriously difficult to find. This presents a problem for multiple reasons, chief of them being that the properties of exoplanets and the dynamics of the system depends on the star. Asteroseismology is a relatively new method to calculate the properties of stars, and it works especially well with red giant stars because of their periodic oscillations. This project attempted to find the mass, radius, and logg of a sample of red giant stars using asteroseismology techniques on TESS data.

The Dragonfly Student and Early Career Investigator Program: Opportunities for Student Participation on a NASA Planetary Science Mission
Quick, Lynnae

NASA's Dragonfly Mission will launch in 2027 and will arrive at Saturn's moon, Titan in 2034. Here we will review the goals of the Dragonfly Mission and the Dragonfly Guest Investigator Program, which provides opportunities for graduate students and postdocs to join our mission team.

The Ice Giants from the James Webb Space Telescope
Rowe-Gurney, Naomi

The Ice Giants, Uranus and Neptune, are the least understood planets in our Solar System. They have only been visited once by flybys (in 1986 and 1989) by Voyager 2. The recently published 2023-2032 Decadal Strategy for Planetary Science and Astrobiology prioritized a flagship orbiter and probe to Uranus with the intent to "...transform our knowledge of ice giants in general and the Uranian system in particular". By using remote sensing to probe their atmospheres, we can begin to understand their composition and complex weather systems in preparation for this future mission. The James Webb Space Telescope (JWST) will provide exceptional near- and mid-infrared spectral coverage of the ice giants, capturing new, critical information on their atmospheric temperatures, their chemical structures, and the flow of energy between their cloud-forming weather layer and their middle and upper atmospheres. This talk will present post-Voyager infrared remote sensing observations of both planets and show how new JWST observations advance our understanding of ice giant atmospheres.

Correlating Stellar Mass and Protoplanetary Disk Mass in the Cepheus OB3b Star-forming Region
Rankin, Sarai

The total dust mass of protoplanetary disks is directly linked to their planet-forming potential. Previous research has focused on the dust content around lower-mass stars, establishing a link between the mass of the host star and the total dust mass of the surrounding disk. Such studies have been limited to exploring the dust masses of stars with a lower mass than our Sun, due to the relative rarity of young, high-mass stars. The Cepheus OB3b star-forming region sits within 1kpc of Earth, and presents a unique opportunity to study the dust content of disks around young stars with spectral types of K4 or earlier. Our observations explore a critical portion of parameter space with substantial implications for planet formation within our galaxy. We detected only 12 objects with a significant signal out of 64 sources via Spitzer targeted at a large fraction of higher mass sources in Cep OB3b to investigate how dust masses depend on higher stellar mass hosts.

Comparing all calculated disks to the mass of their host stars, we find a tentative positive correlation between intermediate-mass stellar objects and the masses of their circumstellar dust, slightly following the trends set by precedent related research. To confirm our observations, we will need to re-observe uncertain sources.

Enhancing catalytic nitrite hydrogenation via radiofrequency irradiation of PtFe nanoparticles
Samba, Joshua

Alternating magnetic fields generated from radiofrequency radiation (AMF-RF) can be used to heat magnetic nanomaterials suspended in fluids. These heated nanomaterials enable the rapid and energy-efficient enhancement of catalytic processes by increasing the surface temperatures of magnetic catalysts (e.g., NiCo, PtFe) directly, instead of indirectly via conventional bulk heating methods (e.g., heat exchangers, oven heating). To demonstrate this enhancement effect, catalytic nitrite hydrogenation was performed over PtFe alloy nanoparticles at room temperature and under the influence of AMF-RF heating. At room temperature, PtFe nanoparticles were active for nitrite hydrogenation, achieving an initial reaction rate of 0.11ppm/min and lowering the nitrite concentration by 26% in 2 hours. Under the influence of AMF-RF heating, the initial reaction rate for the nitrite hydrogenation increased 5x (0.57ppm/min) and lowering the nitrite concentration by ~100% in 2 hours; reaction temperature remained unchanged. In addition, AMF-RF-heated PtFe was >99% selective towards N2, compared to 30% N2 selectivity over pure Pt nanoparticles with and without AMF-RF. This work illustrates the advantages AMF-RF heating has over conventional bulk heating for the enhancement of catalytic reactions.

USA Sky Partners: Expanding Access to Authentic Research Experiences for Undergraduates
Storrie-Lombardi, Lisa

USA Sky Partners is a pilot project, funded through the NSF Partnerships in Astronomy & Astrophysics Research and Education program. The mission is to develop an authentic astronomy research experience for US undergraduates, where they complete the program feeling that the ability to do science is part of their identity. Las Cumbres Observatory (LCO) provides access to their global robotic telescope network and partners with US colleges and universities that reach students from groups underrepresented in astronomy. The goals of the pilot project are:
(1) Fully develop partnerships between LCO, Occidental College, and the University of Puerto Rico-Río Piedras to provide experience for undergraduates at a Hispanic-serving university and a small liberal arts college in Los Angeles with a diverse student population.
(2) Develop the online video and written materials required to implement the student research program, in English and Spanish, and run the program at both university partner institutions.
(3) Recruit additional institutional partners that reach underserved communities to join the partnership for a future NSF proposal.
The student research program is an eight-week workshop that can be done separately or in conjunction with an introductory astronomy course.

Asteroseismology: Unveiling Stellar Nature Through Oscillation Pattern Recognition
Smith, Kanah

Solar-like stars oscillate because of sound and gravity waves propagating through the sphere; the waves allow us to probe the stellar interior for information on its physical properties. These stars will evolve off the main sequence to the red giant branch and subsequently either to the red clump or secondary red clump stages depending on their mass. Additionally, some stars, that we have yet to understand, have low-amplitude (ℓ=1) oscillation modes, dubbed “depressed” stars. Asteroseismology allows us to disentangle the classifications of these stellar evolutionary stages as red giant star populations, on the Hertzsprung-Russell diagram, overlap between these regions. With the amount of currently available data, it is necessary to automate this process. Using machine learning tools, we work to automate this by using seismic data from stellar oscillations, since they are characteristic of stellar age, to further sort these stars according to their evolutionary history. In this research, we classified about 18,000 evolved stars, observed during the Kepler mission, based on their oscillation patterns; this is the largest sample of red giants that has been classified automatically and will allow for better studying of the interior dynamics of evolving solar-like stars.

Diffraction in bilayer twisted graphene
Scales, Joshua

TBD

Recent advances in fusion, space, and low temperature plasma science
Thomas, Edward

Plasmas are systems of freely interacting electrons, ions, and neutral atoms that exhibit both collective behavior, in the form of waves and instabilities, and self-organization, in the form of sheath layers near surfaces or filamentary structures at high magnetic fields. Although the conditions to form plasmas on earth can be extreme, beyond the earth, over 95% of the visible universe is in the plasma state of matter. Moreover, the understanding and application of plasma science has tremendous societal benefits: as the fundamental enabling technology that powers the multi-billion-dollar microelectronics industry; as the scientific framework to understand space weather; as a medium that facilitates the next generation of compact particle accelerators for healthcare to material science; and, as a potential carbon-free, industrial-scale energy source through fusion. Plasma science is also a rich scientific and intellectual endeavor that requires solving highly nonlinear, vastly multi-scale problems - often spanning 10 or more orders of magnitude in both time and space - that couple electromagnetics, statistical mechanics, and quantum mechanics. This presentation will provide a brief introduction to physics of plasmas and highlight a few recent advances.

The C-2W Field-Reversed Configuration Plasma with Neutral Beam Injection
Titus, James

In TAE Technologies' current experimental device, C-2W (also called "Norman"), record breaking, advanced beam-driven field-reversed configuration (FRC) plasmas are sustained in steady state utilizing variable energy neutral beams, advanced divertors, edge-biasing electrodes, and an active plasma control system [1]. The ensemble of neutral beam injectors (NBI) includes: four static energy 15 keV, 140 A hydrogen beams, four tunable energy 15-40 keV, 150 A hydrogen beams, and one diagnostic 40 keV, 15 A beam. Traditionally, NBI provides heating, current drive, and fuel to a plasma system. On C-2W, the heating beams provide stability and sustainment, as well. We will present recent experimental observations of NBI effects on plasma performance. In addition, we will report updates on utilizing feedback control of NBI in conjunction with other control systems, and the use of multiple diagnostics to measure plasma quantities.

Hydroxylation of the lunar surface and the degassed H2 exosphere
Tucker, Orenthal

TBD

Simulation, Reconstruction, and Discovery Potential of the Pacific Ocean Neutrino Experiment
Twagirayezu, Jean Pierre

Pacific Ocean Neutrino Experiment (P-ONE) is a proposed undersea neutrino detector with pathfinders already deployed, targeting a 70-string (1400 digital optical module) full deployment. By deploying in a deep-sea environment, scattering is reduced relative to in-ice experiments, allowing event resolutions at or below a tenth of a degree. Our current event simulation is based on methods developed for existing gigaton-volume neutrino detectors, simulating a particle hypothesis to produce photons and secondary particles, which are propagated through the detector medium to collision with the detection module's photocathode, and through its electronics chain. A panel of basic and robust event reconstructions are applied. In this poster, we present a first detailed event simulation and reconstruction, and estimate the projected discovery potential fluxes for point sources of astrophysical neutrinos in P-ONE.

A Time-Varying Cosmological Constant from Dynamical Chern-Simons Gravity
Tatsuya, Daniel

We revisit the Kodama state by quantizing the theory of General Relativity (GR) with dynamical Chern-Simons (dCS) gravity. We find a new exact solution to the Wheeler-DeWitt equation where the Pontryagin term induces a modification in the Kodama state from quantizing GR alone. The dCS modification directly encodes the variation of the cosmological constant Lambda.

Gap Measurement System
Teller, Jide

TBD

Filamentation Morphology in Capacitively Coupled Highly Magnetized Plasmas
Williams, Stephen

Due to the small charge-to-mass ratio of dust particles, it is often necessary to use large magnetic fields of $B \geq 1$ T, in order to observe the influence of magnetic forces in laboratory dusty plasmas. However, when experiments are performed at high magnetic fields in capacitively coupled, radio frequency discharges used for these dusty plasma experiments, the plasma is often observed to form filamentary structures between the electrodes that are aligned to the external magnetic field which disrupt the uniformity of the plasma and adversely impact some of our dusty plasma experiments. Recent experiments performed in the Magnetized Dusty Plasma Experiment (MDPX) device seek to identify and characterize these filamentary structures. This presentation discusses the morphology of several distinct filamentary modes that are formed in low temperature plasmas with different neutral gases. There is strong evidence that each spatial mode has a threshold condition that is dependent on the ion Hall parameter – which is a function of magnetic field, neutral pressure, and ion mass. The criteria for the formation of the filaments are shown to be consistent with predictions of recent numerical simulations.
This work is supported with funding from the NSF EPSCoR and the NSF/DOE Partnership

Improving the design of a Peltier-powered cloud chamber
Williams, Darryl

Cloud chambers are used to visualize charged particles from radioactive decays or cosmic rays and are great for outreach events and classroom demos. Various designs of a "turnkey cloud chamber" have been created by Siena students over the course of the last nine years, inspired by online tutorials. This updated model of the turnkey cloud chamber contains Peltier thermocoolers to create the necessary temperature gradient instead of dry ice, as well as some components that replaced outdated parts that were required. We also designed new 3D-printed parts to hold everything together. At a very cost efficient price of $150 the cloud chamber has been remodeled to be smaller than previous designs and more portable than before, making it much easier to take to local schools or departmental labs. In this poster, we present the current version and discuss the improvements we have made.

Modeling Aerosol Microphysics In Ice Giant Atmospheres
Walker, Ashley

TBD

Effect of Surface Absorbed Water on Mg# Determination in the IMIR Region
Wilk, Kierra

Remote determinations of mineral compositions is essential for understanding the thermal and chemical evolution of the Moon. Determining mineral composition in the visible-near infrared (VNIR; 0.5 – 3 μm) and mid-infrared (MIR; 8 – 50 μm) wavelength regions, however, is challenging and is often complicated by the effects of space weathering. Recent work has demonstrated that the intermediate infrared (IMIR; 4 – 8 μm) wavelength region has great potential for remotely determining the Mg# (molar Mg/[Fe+Mg] x 100) of both olivine and pyroxene on the lunar surface. The IMIR region also contains the fundamental bending vibration of water at 6 μm, enabling unique identification of OH- vs H2O. It remains unclear, however, how the presence of surface absorbed H2O will affect the determination of Mg# in lunar silicates whose features (located between 5 – 6 μm) may overlap and/or interact with the fundamental bending vibration of water. We measured the reflectance spectra of olivine and enstatite in both humid and dry air conditions to determine the effects of surface absorbed H2O on Mg# determination in the IMIR region. Preliminary results indicate that the detection of olivine and determination of its chemical composition is unaffected by small amounts of surface absorbed water.

Improving Gravitational Lensing Pedagogy
Williams, Devon

Strongly lensed quadruply imaged quasars (quads) are extremely illuminating objects. They are very rare in the sky -- only a few tens are known to date -- and yet they provide unique information about a wide range of topics, including the expansion history and the composition of the Universe, the distribution of stars and dark matter in galaxies, the host galaxies of quasars, and the stellar initial mass function. Finding them in astronomical images is a classic ``needle in a haystack" problem, as they are outnumbered by other (contaminant) sources by many orders of magnitude. To solve this problem, we develop state-of-the-art deep learning methods and train them on realistic simulated quads based on real images of galaxies taken from the Dark Energy Survey, with realistic source and deflector models, including the chromatic effects of microlensing. The performance of the best methods on a mixture of simulated and real objects is excellent, yielding area under the receiver operating curve in the range 0.86 to 0.89. The speed and performance of the method pave the way to apply it to large samples of astronomical sources, bypassing the need for photometric pre-selection that is likely to be a major cause of incompleteness in current samples of known quads.

Understanding the Characteristics of Amelogenesis
Wheeler, Jayla

The aim of this project is to collect data on teeth and understand how different factors in tooth development work together. The specific parameters we’re looking at are perikymata, Enamel Extension Rate(EER) and Daily Secretion Rate(DSR). We want to find the mathematical connections between these parameters. The teeth we collected data from and modeled our simulation after were upper fourth premolars from modern day humans. The project consisted of two phases. Phase 1 is focused on collecting data and making an accurate model of the tooth. To test that the model is accurate, we input the exact parameters of an actual tooth and expect that the model looks just like the example tooth. In Phase 2, we created a simulation that generates parameters to see how they affect the shape or look of the tooth. The simulation from Phase 1 worked well. After segmenting the image of the tooth and using the polyfit tool to create a smoother shape, we were able to model the tooth and its development of perikymata correctly. This will be an important tool for anthropologists and dentists because there is not a lot of information or studies on how these parameters interact and influence each other. The hope for this project is that this topic will gain more interest and therefore research to be st

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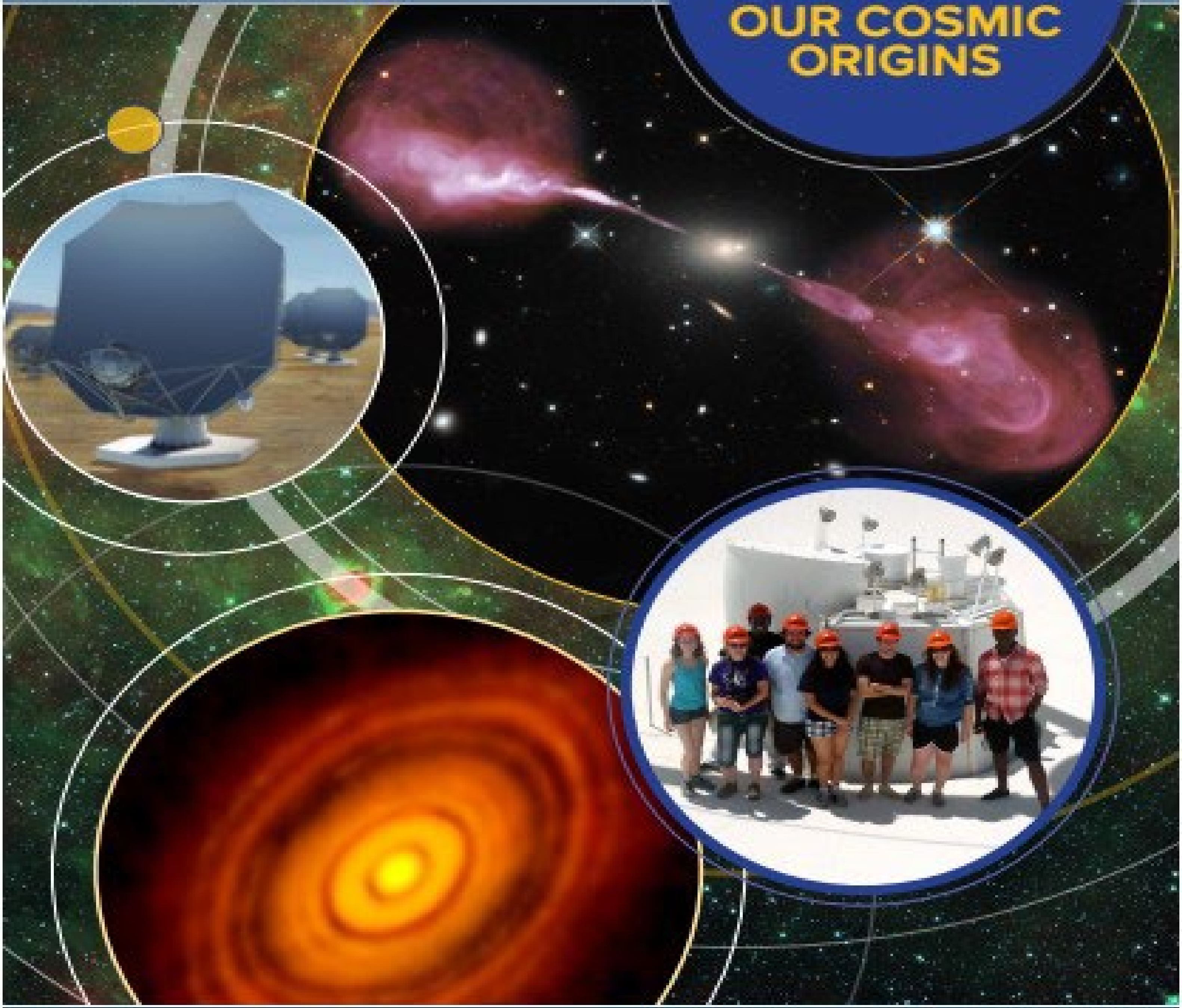

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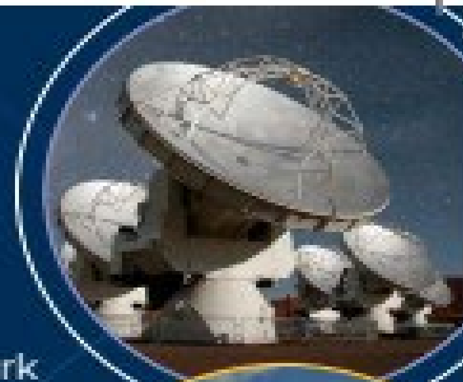


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