UCF 2023 CUWiP

APS Conferences for Undergraduate Women in Physics
CUWiP

American Physical Society Conference for Undergraduate Women in Physics
The University of Central Florida
January 20-22, 2023

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UCF 2023 CUWiP

Conference Agenda

	Friday, January 20	**Location**
3:00-5:00 pm 5:00-9:00 pm	Check-In: Hotel Check-In: Fairwinds Alumni Center	Celeste Hotel Fairwinds Alumni Center
6:00-6:45 pm	Dinner/STEP UP	Fairwinds Alumni Center
6:45-7:00 pm	Welcome Speech from UCF and APS	Fairwinds Alumni Center
7:00-8:00 pm	Panel Discussion 1: Research; Exploring different areas	Fairwinds Alumni Center
8:00-9:00 pm	Mingling/Poster Setup	Celeste Hotel/ CBII 2nd Floor Atrium
	Saturday, January 21	
7:30-8:00 am	Transport to meeting	Celeste Hotel
8:00-9:00 am	Breakfast/Check-In/Poster Setup	CBII 2nd Floor Atrium
9:00-9:15 am	Introduction	CBII 0201
9:15-9:45 am	Plenary Talk 1: Academia, Dr. Vandana Tripathi	CBII 0201
9:45-10:45 am	Coffee Break, Career fair/Grad fair	CBII 2nd Floor Atrium
10:45-11:30 am	Parallel Session 1 - Research Frontiers: Optics or Physics Education/Outreach - Social Issue: Diversity and biases - Other: Cover letters/grad school application process - Career Readiness: Pursuing a career in industry (business/finance/medical/etc.) - Other: APS Professional Skills Seminar	CBII 0201 CBII 0204 CBII 0206 CBII 0207 PSY 105
11:30-12:00 pm	Group Photo	Memory Mall
12:00-1:00 pm	Lunch	Student Union
1:00-1:45 pm	Parallel Session 2 - Research Frontiers: Astronomy/Planetary Science - LGBTQ+ Roundtable - Career Readiness: Communication, Equal pay, negotiating, knowing your worth - Other: Mentorship; Finding a mentor and being a mentee - Other: Government jobs	CBII 0201 CBII 0204 CBII 0206 CB 0207 PSY 105
2:00-3:30 pm	APS Keynote speech	CBII 0201
3:30-4:00 pm	Coffee Break	CBII 2nd Floor Atrium
4:00-4:30 pm	Career Fair/Grad Fair/Poster Session I	CBII 2nd Floor Atrium
4:30-5:00 pm	Career Fair/Grad Fair/Poster Session II	CBII 2nd Floor Atrium

Prayer/Lactation/Quiet Room in PSY 111

CUWiP Help Desk in Psychology Building First Floor Atrium

Conference Agenda: Continued

	Saturday, January 21	
5:00-6:00 pm	Lab tours at Physics Department Poster clean-up	PSB CBII 2nd Floor Atrium
6:00-7:00 pm	Dinner	Fairwinds Alumni Center
7:00-7:45 pm	Panel Discussion 2: Careers; How do I choose one?	Fairwinds Alumni Center
8:00-9:00 pm	Observatory trip!	Robinson Observatory
	Sunday, January 22	
7:30-8:00 am	Transport to meeting	Celeste Hotel
8:00-9:00 am	Breakfast/Check-In	CBII 2nd Floor Atrium
9:00-9:30 am	Plenary Talk 2: Industry, Rose LeJiste	CBII 0201
9:30-10:15 am	Parallel Session 3 - Research Frontiers: Computational Physics/Condensed matter/Biophysics - Social Issue: Nurturing mental health/maintaining balance - Career Readiness: REU's and Internships - Social Issue: Navigating Male Dominated Spaces - Other: Pursuing a career in industry (traditional/engineering/etc.)	 CBII 0201 CBII 0204 CBII 0206 CBII 0207 PSY 108
10:15-10:45 am	Coffee break	CBII 2nd Floor Atrium
10:45-11:30 am	Parallel Session 4 - Research Frontiers: Nano - Social Issue: Nurturing mental health/imposter syndrome - Career Readiness: Fellowships/prestigious awards - LGBTQ+ Roundtable - Other: Transfer student seminar	 CBII 0201 CBII 0204 CBII 0206 CBII 0207 PSY 108
11:30-12:30 pm	Box lunch	CBII 2nd Floor Atrium
12:30-1:00 pm	Plenary talk 3: Non-Traditional, Dr. Jami Valentine Miller	CBII 0201
1:00-1:30 pm	Awards and closing remarks	CBII 0201
1:30 pm	Conference adjourn	

Prayer/Lactation/Quiet Room in PSY 111

CUWiP Help Desk in Psychology Building First Floor Atrium

Panel Discussion 1 (All attendees!)

Research: Exploring different options

- **Friday, January 20th, 7-8 PM**, Fairwinds Alumni Center
- A panel offering wide perspectives on different areas of research, including experimental physics, computational physics, theoretical physics, and more, as well as other branches of the physical sciences.

Parallel Sessions 1 & 2: Choose your own adventure!

Parallel Session 1: Saturday, January 21st, 10:45-11:30 AM

1. Research Frontiers: Optics or Physics Education/Outreach - CBII 0201
   - Research frontiers offer students the ability to see what research in a specific area of interest looks like. In this parallel session, we explore cutting-edge research in optics and physics education.
2. Social Issue: Diversity and biases - CBII 0204
   - An informative discussion with an emphasis on promoting diversity in the field while recognizing and dealing with our own biases, as well as dealing with the biases others might have against us.
3. Other: Cover letters/grad school application process - CBII 0206
   - A session designed to guide students through writing cover letters and preparing graduate school applications.
4. Career Readiness: Pursuing a career in industry (business/medical/etc.) - CBII 0207
   - A session wherein working professionals describe their career path and how they arrived at their position. Think of this as being the “research frontiers” for non-academics.
5. Other: APS Professional Skills Seminar - PSY 105
   - Professional Skills Development workshop designed to provide physicists with professional training in effective negotiation, communication and leadership skills.

Parallel Session 2: Saturday, January 21st, 1:00-1:45 PM

1. Research Frontiers: Astronomy/Planetary Science - CBII 0201
   - Research frontiers offer students the ability to see what research in a specific area of interest looks like. In this parallel session, we explore cutting-edge research in astronomy, astrophysics, and planetary science.
2. Social Issue: LGBTQ+ Roundtable - CBII 0204
   - A discussion involving the place of queer people in the field, the struggles and joy of being a queer scientist, and the community at large. This session also serves as a place for queer people to commune and feel safe expressing themselves.
3. Career Readiness: Communication, Equal pay, knowing your worth - CBII 0206
   - A session on how to communicate with employers and understanding your worth in the field.
4. Other: Mentorship; Finding a mentor and being a mentee - CBII 0207
   - A discussion-based panel on finding mentors in the field and what it is like to be a mentee.
5. Other: Government jobs - PSY 105
   - A session about pursuing a job as a civil servant and navigating this type of employment.

Panel Discussion 2 (All attendees!)

Careers: How do I choose one?

- **Saturday, January 21st, 7-7:45 PM**, Fairwinds Alumni Center
- A panel offering wide perspectives on different types of career paths for physicists, including research institutes, academia, industry, government, medical, etc.

Parallel Sessions 3 & 4: Choose your own adventure!

Parallel Session 3: Sunday, January 22nd, 9:30-10:15 AM

1. Research Frontiers: Computational Physics/Condensed matter/Biophysics - CBII 0201
   - Research frontiers offer students the ability to see what research in a specific area of interest looks like. In this parallel session, we explore cutting-edge research in computational physics, condensed matter, and biophysics.
2. Social Issue: Nurturing mental health/maintaining balance - CBII 0204
   - A session about putting yourself first in a sometimes draining and competitive field, addressing more sensitive topics like work/life balance, burnout, and more.
3. Career Readiness: REU's and Internships - CBII 0206
   - A session on applying for REU's and internships, including how to find them, how to contact people regarding them, and how to prepare yourself for them.
4. Social Issue: Navigating Male Dominated Spaces - CBII 0207
   - A session on how to insert yourself into a largely male field, including understanding the biases that are often held against minorities in this field and understanding how to cope with those biases, deal with negative and derogatory comments, etc.
5. Other: Pursuing a career in industry (traditional/engineering/etc) - PSY 108
   - A session wherein working professionals describe their career path and how they arrived at their position. Think of this as being the "research frontiers" for non-academics.

Parallel Session 4: Sunday, January 22nd, 10:45-11:30 AM

1. Research Frontiers: Nano - CBII 0201
   - Research frontiers offer students the ability to see what research in a specific area of interest looks like. In this parallel session, we explore cutting-edge nano research.
2. Social Issue: Nurturing mental health/imposter syndrome - CBII 0204
   - A session about putting yourself first in a sometimes draining and competitive field. Here, we discuss imposter syndrome particularly, or the doubts many of us have about our own skills, intelligence, accomplishments, etc.
3. Career Readiness: Fellowships/prestigious awards - CBII 0206
   - A session on preparing yourself for applying to fellowships and awards.
4. Social Issue: LGBTQ+ Roundtable - CBII 0207
   - A discussion involving the place of queer people in the field, the struggles and joy of being a queer scientist, and the community at large. This session also serves as a place for queer people to commune and feel safe expressing themselves.
5. Other: Transfer student seminar - PSY 108
   - A session about navigating a university, especially after entering from a community college or trade.

Plenary Speaker Biographies

Keynote Speaker – Dr. Nadya Mason. Nadya Mason is the Rosalyn S. Yalow Professor of Physics at the University of Illinois at Urbana-Champaign, where she specializes in experimental studies of materials. She received her B.S. from Harvard University and her PhD from Stanford University, both in physics. Dr. Mason's research focuses on the electronic properties of small-scale materials, such as nano-scale wires and atomically thin membranes. Her research is relevant to applications involving nano-scale and quantum computing elements. She currently serves as founding Director of the Illinois Materials Research Science and Engineering Center (I-MRSEC), a $16.1 million multidisciplinary research and education center funded by the National Science Foundation, and was recently named Director of the Illinois Beckman Institute. In addition to maintaining a rigorous research program and teaching, Dr. Mason works to increase diversity in the physical sciences, particularly through mentoring, and is former chair of the American Physical Society (APS) Committee on Minorities. Dr. Mason can also be seen promoting science on local TV, at the Chicago Museum of Science and Industry, and in a TED talk on "Scientific Curiosity." Dr. Mason has been recognized for her work with numerous awards, including the 2009 Denise Denton Emerging Leader Award, the 2012 APS Maria Goeppert Mayer Award, and the 2019 APS Bouchet Award. In 2021 she was elected to both the American Academy of Arts and Sciences and the National Academy of Sciences.

Plenary Speaker, Academia – Vandana Tripathi. Dr. Tripathi was born in Agra, a small town in India, and earned her master's degree from St John's College Agra and her Ph.D in experimental nuclear physics from Jawahar Lal Nehru University in New Delhi, India, working on understanding fusion reactions of subatomic nuclei at energies below the Coulomb barrier. Dr. Tripathi joined the Florida State University as a Post -Doctoral Fellow in 2003 and now serves as an Assistant Professor. Dr. Tripathi's current research focuses heavily on understanding the structure of subatomic nuclei, especially those that are unstable and do not occur in nature but are very crucial to understand nucleo-synthesis as it happened in the early stages of the universe. She employs gamma-ray spectroscopy to obtain information about excited states in the nuclei of interest which then leads to a better understanding of the forces that hold the nucleons together inside the nucleus. Her experiments are carried out both at FSU and national facilities like the National Superconducting Cyclotron Laboratory at MSU and Argonne National Laboratory. As an educator, Dr. Tripathi enjoys teaching the concepts of physics and advancing students' understanding.

Plenary Speaker Biographies

Plenary Speaker, Industry – Rose Lejiste. Rose LeJiste is a proud first generation Haitian-American born and raised in South Florida. She received her bachelor's in industrial engineering at the University of Central Florida and then worked at Kennedy Space Center for 15 years. Rose is the Founder and CEO of RL Engineering and Tech Solutions. She is an expert in data analytics, business intelligence and optimization, process improvement and streamlining, reliability/safety engineering, performance and project management in both government and commercial environments.

Rose's ecosystem building work includes, but it not limited to, a two-year tenure as Executive Director of a local tech nonprofit committed to accelerating minority economic advancement through careers and entrepreneurship in tech; developing and facilitating entrepreneurial development programs that equipped underrepresented startup founders with business knowledge, skillsets, education, and resources; leading an initiative focused on assessing the small business ecosystem in Orange County/Orlando area; and playing an active role as an advocate and collaborator in the Florida innovation and tech community.

Plenary Speaker, Non-Traditional – Jami Valentine Miller. Dr. Valentine Miller , A native Philadelphian, graduated from Florida A&M University (FAMU) cum laude and earned a master's at Brown University. In 2006 Jami became the first African-American woman to earn a Ph.D. in physics from Johns Hopkins University where she studied the spin properties of rare earth metals. This also made her the first female FAMU alumna to earn a Ph.D. in Physics. Later in 2006, she joined the U.S. Patent and Trademark Office where she currently serves as a primary examiner. Dr. Valentine Miller engages in many outreach activities, including speaking to young physicists, future scientists and engineers and those interested in non-academic physics careers, especially intellectual property. She founded a website dedicated to African-American women in physics (AAWiP.com). She is a wife, mother, and in her spare time, a licensed Zumba instructor.

Additional Speakers and Panel Participants

Dr. Laurene Tetard	Associate Professor, UCF
Dr. Flaviane Venditti	Scientist at Planetary Studies Department, Arecibo Observatory
Dr. Denisia Popolan-Vaida	Assistant Professor, UCF
Kathleen McIntyre	7th Year Graduate Student, UCF
Dr. Mélissa Martinot	Postdoctoral Associate, UCF
Dr. Kerri Donaldson Hanna	Assistant Professor, UCF
Dr. Constance Doty	Postdoctoral Researcher, UCF
Dr. Jacquelyn Chini	Associate Professor, UCF
Dr. Chris Kelso	Assistant Professor, UNF
Dr. Paula Mariel Coelho	Assistant Professor, UNF
Dr. Theodora Karalidi	Assistant Professor, UCF
Dr. Audrey Martin	Postdoctoral Scholar, UCF
Dr. Kristin McConnell	Medical Physicist, Baptist Health
Dr. Kathy Blackett	Adjunct Professor/Content Creator, Eckerd College
Cristina Dodge	Diagnostic Physicist
Dr. Talat Rahman	Distinguished Professor, UCF
Autumn Shackelford	3rd Year Graduate Student, UCF
Kayla Schang	2nd Year Graduate Student, UCF
Julia Willison	Graduate Student, UCF
Dr. Grace Bosse	Associate Instructor, UNF
Dr. Ellen Kang	Associate Professor, UCF
Kathleen Lugo	Graduate Student, UCF
Madisyn Brooks	4th Year Undergraduate Student, UCF
Dr. Flavio Fenton	Professor, Georgia Tech
Dr. Adrienne Dove	Associate Professor, UCF
Brittany Harvison	2nd Year Graduate Student, UCF
Max Galloway	2nd Year Graduate Student, UCF

Poster Presenters and Abstracts

Let's Get (Thermo)physical: Recovering & Modeling Data from NEOWISE's Asteroid Survey

Isabella Macias, Joahan Castañeda Jaimes, Dr. Joseph Masiero

I present results from my work identifying previously undiscovered near-Earth asteroid (NEA) detections in the NEOWISE archive. Identifying the composition and orbital path of NEAs will provide a greater understanding of the origins of our solar system and improve our safeguards against these hazardous planetesimals. While a survey of threatening NEAs is currently underway under the NEOWISE mission, our manual search of unreported epochs of asteroids from the NEOWISE archive complements this program and enables us to construct a complete framework of the NEAs' characterizations. We recovered data from the NEOWISE mission's Infrared Science Archive (IRSA) database to be inputted into a Markov Chain Monte Carlo (MCMC) modeling code, which fits a triaxial ellipsoid model to constrain thermophysical properties such as diameter, thermal inertia, and albedo. We reported the observed epochs to the International Astronomical Union's Minor Planet Center's (MPC) database and built tools for locating missing epochs in NEOWISE's search for NEAs.

Population Dynamics of Antibiotic Treated Escerichia coli at the Single-Cell Scale

Vanessa Wildman, Wesley Stine, Dr. Tatsuya Akiyama, Dr. Minsu Kim

Antibiotic resistance is a persistent and major concern in public health because there are a limited number of antibiotics available for human use. Understanding how antibiotic resistance emerges is necessary to improve therapeutic approaches to combat bacterial infections and resistance altogether. At sub-inhibitory concentrations of bactericidal antibiotics, some cells will adapt to the antibiotics and grow while others die. Adaptive resistance is a type of transient resistance, meaning it does not entail a permanent genetic change in the cell. Cells with this resistance have an improved chance of acquiring stable resistance, which subsequently appears through a genetic mutation. Even though the population dynamics of antibiotic treated bacteria can be explained by a stochastic growth and death model, the determinants of adaptive resistance could be transiently inherited through generations. The objective of this study quantitatively determines the presence of transient adaptive resistance by tracking the growth and death dynamics through generations of individual E. coli cells under gentamicin and cefsulodin exposure. It is found that the time of colony extinction and death of single cells is heterogeneous under both antibiotic treatments.

Investigating the flux asymmetry of double-lobed radio sources

Caryelis Bayona Figueroa, Yjan Gordon

A catalog of approximately 15,000 sources from the Very Large Array Sky Survey has been used to analyze extreme lobe-flux-ratio double sources and compare them to normal lobe-flux-ratio sources. The data selection was determined from the percentiles of the normal-like distribution of the lobe-flux-ratio for sources with identified cores and fluxes lower than 200 mJy. The sample was divided into two subsets, the experimental, containing the extreme flux sources from the outer percentiles of the distribution, and the control, with the normal flux sources from the inner percentiles of the distribution. The Zooniverse platform was used to blindly classify 230 sources between real and non-real double sources. A total of 67 real sources were found in the experimental subset, comprising 77% of the total subset, with an uncertainty of +5%/-4%. For the control subset, a total of 133 real sources were found, corresponding to 93% of the whole subset, with an uncertainty of +3%/-2%. These results shed light on the existence of a significant population of extreme lobe-flux-ratio double sources that can be the object of future research. This work was supported by the National Science Foundation REU program in Astrophysics through NSF award AST-2150222.

Assessing the Detectability of Transiting Planets around Small Stars

Dana Yaptangco, Sarah Ballard

While the Solar System has historically been the default blueprint for a planetary system in our galaxy, it is atypical in the Milky Way. Our home star is twice as large as a typical M dwarf star, and these small stars, in reality, comprise 70-80% of the galaxy's stars and host most of its rocky planets. Small M dwarf stars also differ from Sunlike stars in that they are "active" for billions of years or more: rotating quickly, flaring often, and emitting large amounts of UV and X-ray light. Activity makes transit signals more difficult to detect, and M dwarfs exhibit this behavior for thousands of times longer than a typical Sunlike star. It is very important, therefore, to understand our detection sensitivity to planets orbiting small stars. Currently, there are no published studies that quantify the difference in detectability of planets around active versus inactive M dwarfs in transit data in a systematic way. My project seeks to fill this gap in knowledge. I will be presenting my preliminary findings using simulated and TESS stellar data in the form of detectability heatmaps that vary over three parameters: (1) the size of the planet, (2) the size of the planet's orbit, and (3) the age of the star. These sensitivity maps will be broadly useful to the planet community in future searches for exoplanets.

Review of Nuclear Surface Colors and Size Estimates of Centaurs 95P, 158P, 174P, and P/2019 LD2

Seamus Walker, Christina Beck, Charles Schambeau, Yanga Fernandez

Centaurs are a class of icy small bodies that orbit the Sun in the region between Jupiter and Neptune. It is suggested that these objects provide a link between the minimally processed, though distant, trans-Neptunian objects (TNOs) and the heavily processed, much closer, and more observationally accessible, Jupiter-family comets (JFCs). Knowledge of the physical characteristics and activity drivers of Centaurs provides insight into their interior composition, enhancing our understanding of our solar system's origins and evolution. In our investigation we are using Gemini Multi-Object Spectrographs (GMOS) imaging data obtained by the Gemini Observatory's twin 8-meter telescopes to examine the Centaurs 95P/Chiron, 174P/Echeclus, P/2019 LD2 (ATLAS), and 158P/Kowal. We utilized the Gemini Observatory's DRAGONS data reduction software to convert the raw data to science-quality data products ready for analysis. Additionally, we developed a Python-based software suite to perform image stacking, standard star zero-point calibration, and photometry on the reduced data. With this pipeline we determined the magnitudes, colors, and effective sizes of the Centaurs 95P/Chiron and 174P/Echeclus, which we present here. While we were able to produce science-quality data for P/2019 LD2 (ATLAS) and 158P/Kowal, their large comae require additional consideration for analysis. With ongoing improvements to our software, we will be able to report similar characteristics in the near future.

Plastics from Pine Sap: Insight into the Ring–Opening Metathesis Polymerization Thermodynamics of Monoterpenes

Ana Pereira, Mark R. Yarolimek, Brianna M. Coia, Gina A. Guillory, Karl A. Kinner, Heather R. Bookbinder, and Justin G. Kennemur

Monoterpenes are a class of organic molecules that comprise most of the volatile components within the sap of conifer trees. Due to their abundance and ability to be harvested non-destructively, value-added use for these renewable chemical feedstocks, such a precursors to new plastics, are being investigated as potential alternatives to petroleum–derived polymers. Many monoterpenes feature unsaturated cyclic or bicyclic structures, making them candidates for ring–opening metathesis polymerization (ROMP). α-Pinene is the most abundant monoterpene produced yet long-standing attempts to transform it into polymers via ROMP have proven unsuccessful. The Kennemur Group recently utilized a two-step synthetic modification of α-pinene to produce its isomer, δ-pinene, and discovered this transformation leads to successful ROMP with high fidelity. This presentation will discuss insight into the thermodynamic requirements that can optimize the success of this polymerization. In addition to experimentation, density functional theory (DFT) has been employed to further our understanding of both α-pinene and δ-pinene derivatives and how they behave under varying conditions during ROMP. Determining optimal conditions for the ROMP of these terpene monomers is highly crucial: they each have relatively low ring strain, complicating the thermodynamic favorability of the polymerization due to simultaneous loss of entropy. These findings allow for improved predictability of the ROMP reactivity of different cyclic olefins, furthering potential replacements over petrochemicals as the dominant feedstock in plastics manufacturing. Polymer synthesis and ROMP thermodynamics will be discussed in addition to some basic thermal and mechanical properties of the resulting plastics.

Method to mitigate glitches in gravitational-wave parameter estimation

Viviana A. Cáceres, Derek Davis

Correctly recovering the source parameters of gravitational-wave signals is essential to confirm current general relativity models and understand the universe's astrophysical properties. However, glitches in gravitational-wave data may cause inaccurate recovery of source parameters. We use data "inpainting" methods to prevent glitches from contributing to parameter estimation analyses. Using the parameter estimation software Bilby, we study how inpainting increases analysis time. We inject a gravitational-wave signal of a binary black hole merger into Gaussian data and examine how inpainting affects Bilby's ability to recover its parameters. We show that our implementation exhibits the expected behavior of increasing the uncertainty of the recovered parameters without introducing a bias and can now undergo more rigorous testing. This tool will allow us to determine the properties of gravitational-wave signals even if the data contains glitches.

Using Bayesian Statistics Software (BASE-9) to Analyze Binary Stars in Open Clusters M67 and M35

Erin Motherway, Aaron Geller, Anna Childs, Claire Zwicker

Binary systems offer insight into the evolution of open clusters as a result of collisions, gravitational interactions, energy transfers, and other dynamic activity. M35 (~150 Myr) and M67 (~4 Gyr) are open clusters of contrasting ages that are home to extensive binary populations. Using Gaia DR3, Pan-STARRS, and 2MASS photometry with the Bayesian statistical tool, BASE-9, we derive precise cluster parameters (including age, metallicity, distance, and reddening), identify binaries, and extract their mass ratios. We find agreement with previous literature values, where available. Importantly, we extend the binary demographics by many magnitudes faintward of previous (radial-velocity) studies in both clusters. We compare the binary parameters between M35 and M67. This study is a precursor for future work investigating trends across many clusters, with specific emphasis on how binary characteristics evolve over time as a result of the local stellar environment.

EMJ Top Signal Implementation and Analysis Using Pythia 8

Arianna H. Colon Cesani, Scarlet Norberg

Algorithms and simulations can provide predictions for many observables using theoretical models and experimental data. In this project, we perform a computational analysis using the Pythia 8 event generator and simulation program to include a top quark model in the production of emerging jet signals. This program facilitates research in high-energy collisions and complex particle processes. We use codes, scripts, and documentation associated with Pythia 8 and the CMS Emerging Jets (EMJ) analysis. Our goal is to implement strategies in Pythia to create a new signal and further explore the dark sector—a hidden part of the universe that cannot be uniquely described with the Standard Model. This sector could hold vital information concerning the nature and origin of Dark Matter.

Laser particle sizer for lunar plume-surface interaction studies

Julia Zorovich, Robert Peale, Chris Fredricksen, Cameron Kelley, Christian Walker, Camilo Posada, Coleman Cariker, Nagendra Dhakal, Javier Gonzalez, Addie Dove

Surface dust blown by a lunar lander is a threat to operations and assets. Multinational lunar exploitation makes this a potential defense problem. To aid prediction and protection, we are developing a lander-mounted laser-based instrument to obtain empirical particle-size distributions in ejecta plumes. The method is based on analysis of laser propagation decay at multiple wavelengths. After correction for various known artifacts, and in the limit of single particle scattering, the decays in uniform distributions must be exponential. We have investigated two methods of extracting distributions from measured decay constants. The first called “laser sieve” gives the concentration within a size bin determined by two laser wavelengths, and this method works if the distribution function decays faster than the inverse 3rd power of particle diameter, as it does for lunar regolith. The second method is based on matrix inversion, works for arbitrary distributions, and may be extrapolated outside the range of laser wavelengths used, though it is more computationally intensive. These methods are tested and validated by comparison to laboratory measurements on suspensions of submicron TiO2 particles in water, where size distributions are determined by an independent laboratory instrument (Zetasizer Nano ZS). The lander instrument will include eight laser wavelengths and two cameras in a low size, weight, and power package.

Calibrating Chemical Clocks to Probe the Early History of the Milky Way

Katelyn Thomas, Dr. Peter Frinchaboy, Taylor Spoo, Natalie Myers

To better understand the evolution of our Milky Way, astronomers work to age-date stars but determining reliable stellar ages for most field stars is an elusive process. Previous work done by Spoo et al. (2022), used star clusters to determine an empirical relation between surface abundance-ratio of carbon-to-nitrogen ([C/N]) in evolved stars and stellar age. This work was limited to near-solar metallicity stars in the Galactic thin-disk, which does not fully represent all of the Milky Way stellar populations, and therefore needs to be expanded. In this work, we extend the calibration to older and more metal-poor stars by expanding the calibration to include two globular clusters (47Tuc and M71). We use stellar abundances provided by the SDSS/APOGEE DR17 survey, ages from the HST/ACS Globular Cluster Treasury program, and determine cluster star membership probability based on ESA Gaia proper motion observations. This expansion will allow us to probe ages and metallicities of Milky Way thick-disk stars, which were formed earlier in the history of the Milky Way.

Developing Portable Thermoelectric/Solar Power Hybrid for Rural Tanzania

Sarah J. Abdallah, Derick DeTellem, Clayton Baker, Christian Coris, Hannah Kazerounian, Mena Kazerounian, Lauryn Bryce, Caleb Beanblossom, Dr. Frank Biafora JR, Dr. Sarath Witanachchi

This work aims to develop and characterize hybrid thermoelectric and photovoltaic portable energy sources intended for implementation in rural Africa. Energy access in rural Africa is severely limited. Many villages in rural communities, like the Maasai, cook over open wood fires, where much of the heat dissipates into the environment. We can harvest the waste heat from the cooking fires to generate power from the thermoelectric modules, and combine it with renewable, photovoltaic cells. Thermoelectric devices supply high voltage, but low current, and solar panels supply a high current, but low voltage. Our hope is that combining these two energy sources will lead to an increase in harvested power, and that we may use this energy to solve various energy needs, such as access to safe drinking water. We have the pleasure of collaborating with the Nelson Mandela African Institution of Science and Technology (NM-AIST) in Arusha, Tanzania, where we can make and implement our devices with sustainability at the forefront of our concerns.

Epitaxial graphene grown on Silicon Carbide(SiC) encapsulated in highly ordered boron nitride(BN): production process and characterization methods

Fiza J. Shaikh & Zhihan Wei, Claire Berger, Grant Nunn

Epitaxial graphene(EG) is known for its unique structure which lends promising electrical properties for use in nanoelectronics. Methods to produce high-quality and scalable epitaxial graphene coupled with strategies to grow Van Der Waals semiconductors on top of such material are giving new insights into the capabilities of such material. In this study, Epitaxial Graphene produced on Silicon Carbide is encapsulated by hexagonal boron nitride(h-BN) whose structures suit that of EG making this ideal for usage in graphene-based microelectronics as will be observed in the production and characterization of samples.

Space, the Final Frontier… Advancing Parameter Estimation for LIGO's Fourth Observing Run

Nadia Qutob, Sylvia Biscoveanu, Salvatore Vitale

With LIGO's fourth observing run fast approaching, the new generation of interferometers will be capable of detecting gravitational wave sources with higher signal-to-noise ratios than ever before. In order to keep up, LIGO's post post processing algorithms will need to be upgraded to match this higher sensitivity level. But what if we could combine pre existing algorithms rather than creating new ones to yield the same results? This project aims to use the preexisting parameter estimation algorithms Bilby and BayesWave, which were successfully implemented in LIOG's third observing run, to minimize residuals in gravitational waveform approximants for the new era of binary merger detections.

Gravitational-Wave Emission from Binary Black Hole Hyperbolic Encounters

Heleen Amedi, Peter Lott, Dr. Laura Cadonati

In 2015, the Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO) recorded the first gravitational wave signal from binary black hole mergers. Since then, the detection of gravitational waves has significantly advanced with global collaborations. Our project aims to simulate and characterize gravitational waveforms for binary black hole (BBH) hyperbolic encounters. A hyperbolic encounter is an astrophysical event in which a black hole perturbs a less massive black hole's trajectory, resulting in the emission of gravitational waves which would emit in LIGO as a single-cycle transient. So far, LIGO has yet to detect any gravitational waves from hyperbolic encounters. Using BayesWave, a wavelet-based morphology-independent algorithm that characterizes waveforms, we can capture waveforms and determine a sum variable number of wavelets. We report on a study where we inject simulated signals into LIGO data to determine the best wavelets for detecting a hyperbolic encounter. Gravitational wave astrophysics has greatly impacted research for black holes, and our ongoing work on these detections can help us discover new phenomena and make more accurate conclusions.

Mixed Proportions of Paraloid B-72 and B-48N as Structural Adhesives in Art Conservation: Evaluations of Tensile Strength and Glass Transition

Sunmin Kim

With the aim to restore irreplaceable artifacts of cultural and historical significance, the art conservation field often employs adhesives formed by thermoplastic acrylic polymers. Modern conservation has utilized the stable and reversible bonds formed by manipulating a polymer's glass transition since Stephen Koob's 1986 publication detailing the preparation and evaluated strength of a 1:1 Paraloid B-72:acetone adhesive. Although B-72 is now one of the most popularly incorporated and relied upon conservation treatments, its relatively low glass transition temperature (Tg) leaves an adhesive joint susceptible to deformation or failure at hotter temperatures. As these conditions are often present when an object is being stored, transported, or displayed outdoors, conservators have begun to incorporate B-48N into B-72 solutions in efforts to raise an adhesive's Tg and resistance to temperature fluctuations. Previous works that have tested the stability and strengths of 3:1 and 1:3 B-72:B-48N blends suggest that the adhesives' strengths are controlled by the resin in greatest concentration. However, the extent to which the addition of B-48N affects the performance of an adhesive remains ill-understood. We fill this gap by using ellipsometry to measure the glass transitions of different blends of B-72 and B-48N solutions. Further, we evaluate each adhesive's tensile fracture strength using the Conservation Adhesive-to-Shear (CATS) tester. These results provide detailed profiles of adhesives that a conservator may refer to when determining an adhesive most suitable for a restored artifact's expected stresses and location of display.

Investigating Electronic Properties of 2D Materials

A. Evans, K. Lasek, S. Khatun , M. Batzill, P. M. Coelho

Here, we work with two types of characterization techniques, Scanning Tunneling Microscopy (STM) and X-Ray Photoelectron Spectroscopy (XPS), to investigate the properties of 2D materials. Transition Metal Dichalcogenides (TMDCs) are a class of 2D materials which have the chemical formula MX2, where M is a transition metal atom and X is a chalcogen atom. We can use STM to explore the electronic properties of our material, as well as achieve atomic resolution images to help us understand the structure of our material. XPS tells us about the chemical composition and how these elements are bonded in the material. We can use these techniques together to understand the overall lattice structure of our material. In a previous project, we used these characterization techniques to explore phase changes in TMDCs when exposed to excess metal. The use of STM with XPS can help us determine where the excess M positions itself in the lattice. In our next project we will be working with doping and magnetic characterization of TMDCs.

Systematic Distribution Sampling of IceCube Neutrinos for use in a Multi-Messenger Search for Gravitational Waves and Compact Binary Coalescences

Shamita Hanumasagar, Hannah Griggs, Viviana Cáceres Barbosa, Laura Cadonati

In addition to gravitational waves, compact binary coalescence (CBC) events produce neutrinos. In accordance with IceCube and LIGO data, neutrino sky locations and energies upon arrival at Earth follow common distribution laws. We created a Monte Carlo sampler to emulate IceCube data and produce a randomized representation of neutrinos in a selected area to eventually apply to a large-scale gravitational-wave and neutrino pipeline. To do so, we seek to create a mutable and automated sampler to predict neutrino energies along a declination range at a user-specified bin value, which may be used to detect CBC events and verify the validity of our collection and testing methods. We completed the automated code in Python using IceCube's past ten years of data and information from LIGO's second observing run, utilizing a declination choice from -5 to 90 and a bin size of 10, which resulted in varying distribution evaluations. Further modifications will include implementation of machine-learning to mitigate compilation and run times in addition to including information about right ascension and GPS times to simulate events with augmented information.

Search for VLQ Wq+X

Yarelis D. Acevedo Rios, Joe Haley, Evan Vandewal

The analysis on VLQ Wq + X is searching for pair production of a new heavy quark that decays into a W boson and a light quark in the final state where one W boson decays leptonically (to an electron or muon plus a neutrino) and the other W boson decays hadronically. Using data collected by ATLAS detector we are looking for new Heavy Quarks that couple to light SM quarks and W-bosons. In order to analyze the collected data the team generated ROOT files from Ntuples containing kinematic variables of particles. The variables of interest are Jet pT, Lepton pT, MET, $\Delta\phi$(Q, Q),ΔR(lep, v), and ST. On the analysis, we have a selection criteria to selected events. Cutting for events to maximize the signal efficiency. Reducing the cut will result in more signal, but also more background. The main goal is the determination of what cut values use to maximize the sensitivity, and keep as much signal as possible.

Optical Imaging & Raman Spectroscopy of Responsive Polymers

MariaEllice Antonio, Alec Neith, Dharani Mullapudi, Christian Rodriguez, & Dr. Alfons Schulte

Responsive polymers undergo significant changes in their physical properties (e.g. a reversible demixing transition) in response to external stimuli such as temperature and pressure. Poly-N-isopropylacrylamide (PNIPAm) in solution transitions from a coil to globule conformation which, accompanied by heat-induced hydration, results in the formation of distinct mesoglobules. This smart polymer is water-soluble near physiological temperatures when situated in aqueous solutions. However, as the temperature is increased, it reaches insolubility and the solution becomes cloudy. This is a characteristic of the lower critical solution temperature (LCST) phase transition. When the solution is at the transition, the polymers chains collapse and form large aggregates or mesoglobules. Our objective is to study the temperature-dependent phase attributes and self-assembly behavior in aqueous solution of the thermoresponsive polymer, PNIPAm. The produced mesoglobules will be studied using optical imaging at varying temperatures and pressures. Experiments will be conducted at these variables under a microscope providing view of size distribution and spatial organization of the mesoglobules. This will contribute to an optical understanding of phase separation in responsive polymers which is relevant for the design of functional materials such as biosensors and drug delivery systems. These mechanisms of phase separation are of vast current interest for the understanding of liquid-liquid phase separation and non-membranous compartmentalization within cells. During our investigation, PNIPAm was dissolved in an aqueous solution and was studied after infusion into a sealed microcapillary cell. We explored what conditions mesoglobules form in and their resultant spatial arrangement.

Projections for Rubin Observatory Legacy Survey of Space and Time (LSST) Telescope's Detection of New Milky Way Satellite Dwarf Galaxies

Rebecca Robinson Rey

The annihilation of weakly interacting particles (WIMPs) produces energetic particles including gamma rays. Dwarf galaxies are a great target for indirect dark matter detection since they have high concentrations of dark matter and low astrophysical background. In this project we will predict the amount of satellite dwarf galaxies in our Milky Way that the Rubin Observatory Legacy Survey of Space and Time (LSST) telescope might detect for indirect dark matter detection. This will be achieved by modeling the telescope's survey using a Monte Carlo. To perform an accurate modeling, we will first simulate the discoveries made by the Sloan Digital Sky Survey (SDSS), Dark Energy Survey (DES) and Pan-STARRS1 (PS1).

IceCube-Gen2 Environmental Impact: Utilization of Solar Panels at the IceCube detector site

Alanis K. Rodriguez Diaz

The discovery of high-energy astrophysical neutrinos with IceCube has opened this new window to the Universe. IceCube has been successful in finding first evidence for cosmic particle acceleration in the jet of an active galactic nucleus. Yet, IceCube's sensitivity would only allow for the detection of a very limited sample of bright neutrino sources, or to detect populations of less luminous sources. Therefore, a next-generation instrument, IceCube-Gen2 is needed to sharpen our understanding of the Universe at the highest energies. IceCube is currently the largest neutrino telescope that successfully uses the Antarctic ice as a detector medium. The South Pole environment holds challenges for neutrino detector operations, in particular through the availability of electrical power. Renewables might be able to help augment power production for future neutrino detectors at the South Pole. In this project we investigated the use of solar power at pole to reduce the environmental footprint of IceCube-Gen2. We have created a test setup at the University of Utah consisting of a 24-volt battery, a maximum power point tracker (MPPT) charge controller and a bifacial solar panel. The setup was used to test the power generation efficiencies for the detector site at the South Pole. The test was conducted at the Bonneville Salt Flats in Utah to simulate the South Pole's conditions, such as a highly reflective environment. The collected data from this test is integrated into two python programs that predict the power output of the bifacial solar panel based on the temperature, Julian date, azimuth and zenith angles between the panel and Sun.

Thank you to the UCF CUWiP Local Organizing Committee for all their hard work!

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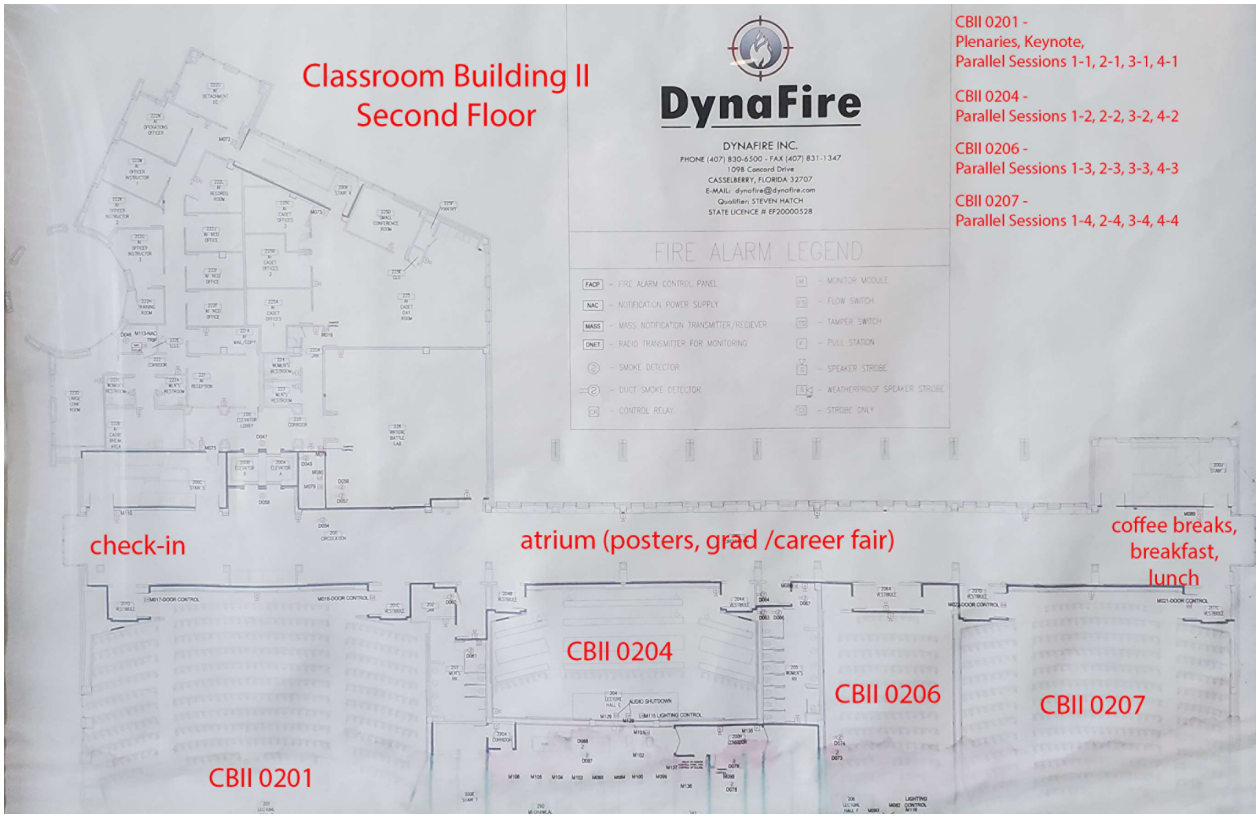
Thanks to all of our volunteers, Physics department staff, speakers, and members of the UCF Women in Physics Society for making this conference a reality!

Finally, thank YOU for attending!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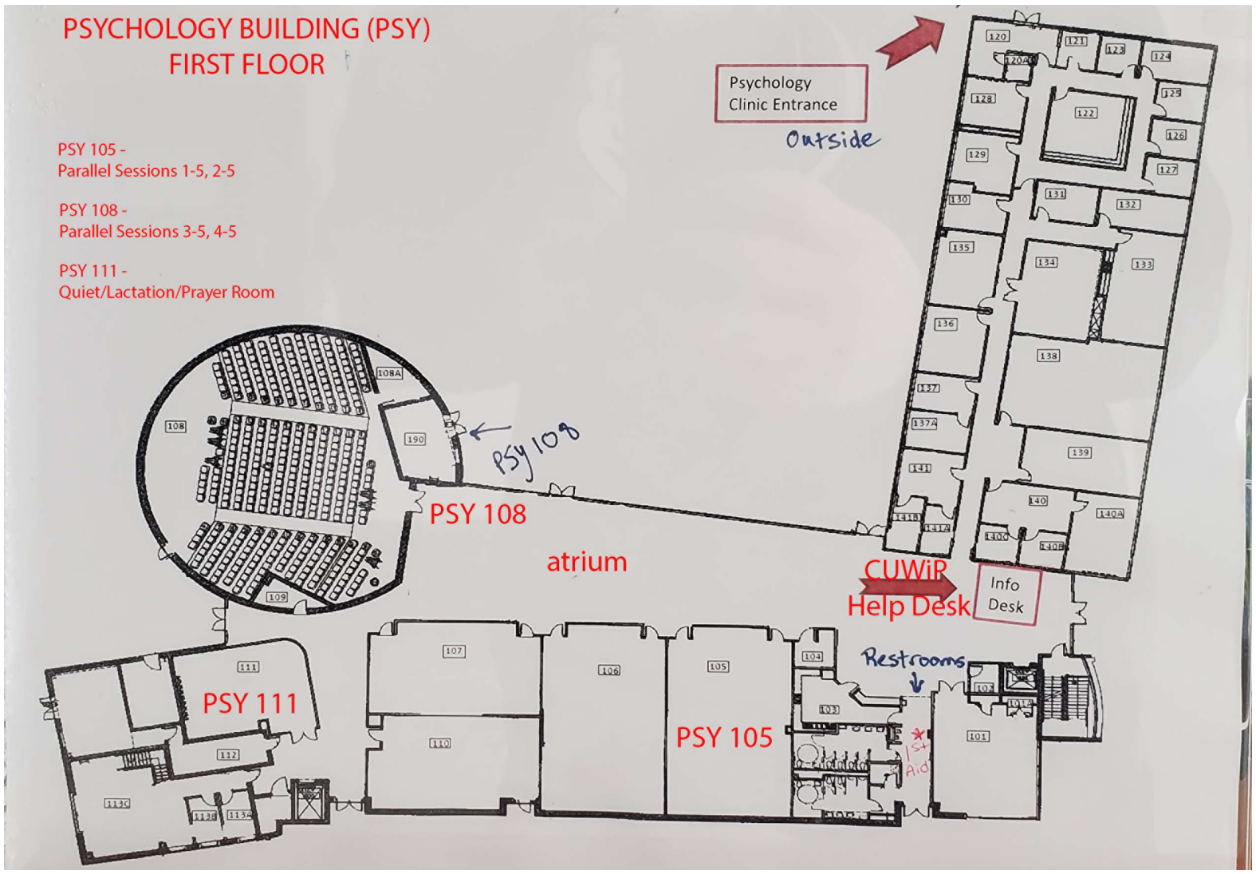
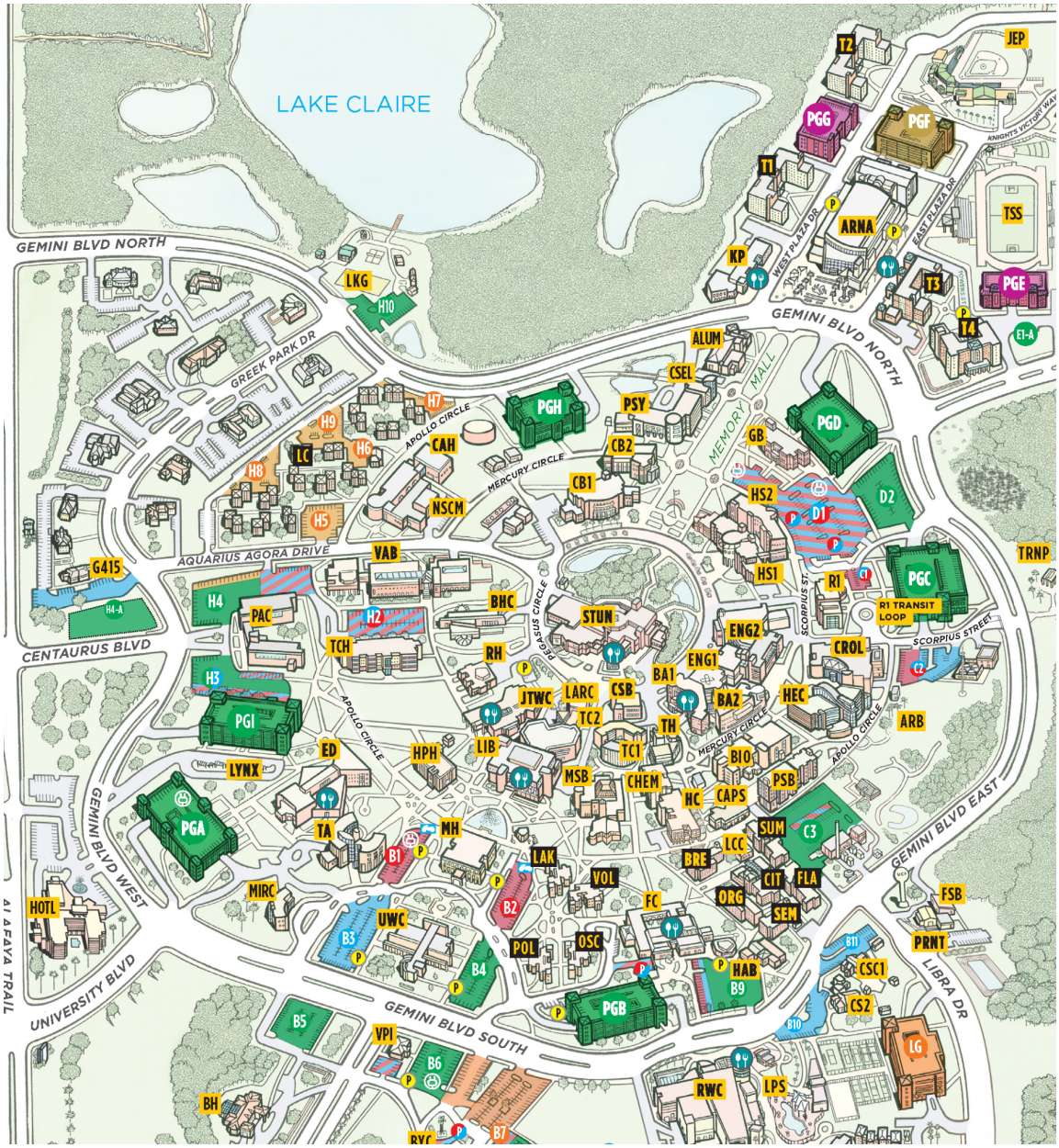
DUCT SMOKE DETECTOR
CONTROL RELAY
MONITOR MODULE
FLOW SWITCH
TAMPER SWITCH
PULL STATION
SPEAKER STROBE
WEATHERPROOF SPEAKER STROBE
STROBE ONLY
CBII 0201 -
Plenaries, Keynote,
Parallel Sessions 1-1, 2-1, 3-1, 4-1
CBII 0204 -
Parallel Sessions 1-2, 2-2, 3-2, 4-2
CBII 0206 -
Parallel Sessions 1-3, 2-3, 3-3, 4-3
CBII 0207 -
Parallel Sessions 1-4, 2-4, 3-4, 4-4
check-in
atrium (posters, grad /career fair)
coffee breaks, breakfast, lunch
CBII 0204
CBII 0206
CBII 0207
CBII 0201


PSYCHOLOGY BUILDING (PSY)
FIRST FLOOR
PSY 105 -
Parallel Sessions 1-5, 2-5
PSY 108 -
Parallel Sessions 3-5, 4-5
PSY 111 -
Quiet/Lactation/Prayer Room
Psychology Clinic Entrance
Outside
PSY 108
atrium
CUWiP Help Desk
Info Desk
Restrooms
PSY 111
PSY 105
First Aid



Abbreviation	Description
HOTL	CELESTE Hotel (Check-In, Accommodations)
PGA/PGH	Parking Garage A (Closest to CELESTE) and Parking Garage H (Closest to Conference Events)
PSB	Physical Sciences Building (Lab Tours)
CB2	Classroom Building II (Plenaries, Parallel Sessions, Meals, Poster Session, Grad/Career Fair)
PSY	Psychology Building (Parallel Sessions, CUWiP Help Desk, Quiet/Lactation/Prayer Room)
ALUM	Fairwinds Alumni Center (Dinners, Panel Discussions, Check-In)
KP	Knights Plaza (Coffee, Food, Convenience Store, Hangouts)

NOTES