

SHAPE 2021
Symposium on Horizons in
Astronomy and Physics Education

Department of Physics and Astronomy
University of North Carolina at Chapel Hill
20 March 2021

SYMPOSIUM SCHEDULE

9:30-10:40 Presentations

9:30 - 9:40 Prof. Laurie McNeil (UNC-CH), *Welcome and Logistics*

9:40 - 10:10 Prof. Julieta Gruszko (UNC-CH), *Neutrinos: Rescuing Conservation Laws Since 1930*

10:10 – 10:40 Ms. Bailey Canter (Raytheon), *You Can Do Anything with a Physics Degree!*

10:40 - 11:00 Break (optional breakout rooms)

11:00 - 12:00 Presentations

11:00 - 11:30 Mr. Josh Reding (UNC-CH), *The Menagerie of “Failed” Ia Supernovae*

11:30 - 12:00 Ms. Susan Miller-Hendrix (Public Schools of Robeson County), *Women in Physics: Crucial Conversations*

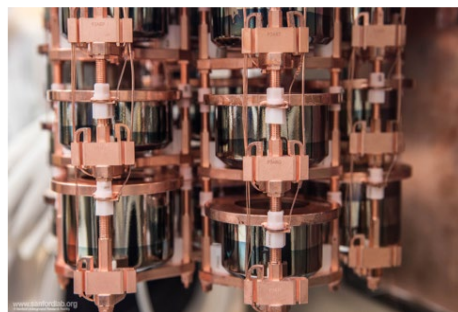
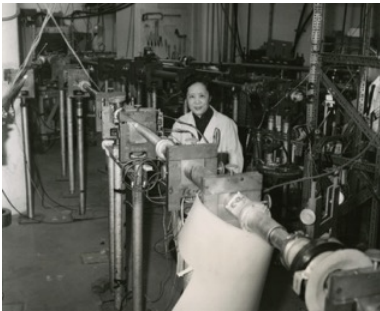
12:00 - 1:30 Lunch (optional breakout rooms)

1:30 - 4:00 Workshop: Prof. Colleen Countryman (Ithaca College), *Going the Distance: Remote Labs for Introductory Physics*

Neutrinos: Rescuing Conservation Laws Since 1930

Prof. Julieta Gruszko (UNC-CH)

From the moment of their discovery, neutrinos have confounded and surprised us. These tiny “ghost particles” have served to rescue our understanding of energy and momentum conservation, forced us to re-evaluate how we think about symmetry in the fundamental forces, and provided an unexpected solution to a conundrum about our own sun. Now, neutrinos might save our understanding of the laws governing the universe yet again, by offering a solution to the mysterious imbalance of matter and anti-matter in the world around us. To discover whether neutrinos could answer the question of “why there is something and not nothing,” we must search for neutrinoless double-beta decay, an ultra-rare process that could occur in some nuclei. I’ll tell you a bit about the lengths (and depths!) we go to in order to search for this decay, and the exciting future of neutrino physics.

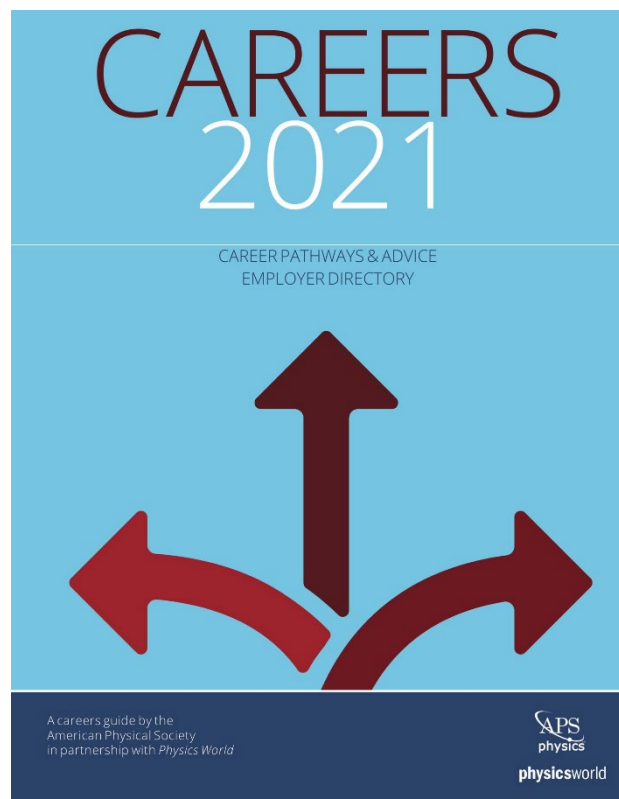


Julieta Gruszko started her “physics life” by forcing her parents to sit through planetarium shows every chance she got and reading Carl Sagan’s “Cosmos.” Though she originally planned to be an astrophysicist and a theorist, she discovered the joy of tinkering in lab and the exciting world of particle physics while an undergraduate at University of Rochester, setting her on her current path. She did her PhD at University of Washington, where she took advantage of the great Seattle music scene to see live performances as often as possible, took a lot of weekend hiking trips in the mountains, and worked on the MAJORANA DEMONSTRATOR, a neutrino physics experiment. Following that, she was a Pappalardo Fellow at Massachusetts Institute of Technology, where she (belatedly) started rock climbing and got to work with an inspiring group of female faculty. Starting in 2020, she became an Assistant Professor of Physics at UNC Chapel Hill, where she works on neutrino physics with NuDot, LEGEND, and the MAJORANA DEMONSTRATOR. She is highly involved in diversity and culture-building efforts in the department, and spends much of her spare time cooking overly-elaborate meals.

You Can Do Anything with a Physics Degree!

Ms. Bailey Canter (Raytheon)

There are a multitude of opportunities available for physics majors. The skills acquired while obtaining a physics degree open many doors in various career fields. Oftentimes, students studying physics are faced with the ubiquitous phrase “You can do anything with a physics degree!”. In general, this is a good thing; however, the multitude of options can also make it difficult to align one’s interests with a definitive career path. An early understanding of what opportunities are available to students studying physics can aid them in navigating their studies and help them to better predict a fulfilling career path after college. In this presentation, I will describe my experience in physics and suggest various career paths, as well as ways to best prepare students for a career in physics.



Hi, my name is Bailey Canter and I am currently a Systems Engineer at Raytheon Technologies and working in Boston, MA. I joined Raytheon after I graduated from UNC-Chapel Hill in 2019 with a Bachelor’s degree in Physics. I participated in extensive research in optics with Professor McNeil and also TA’d. My experience as a TA and participation in undergrad research helped prepare me for work in the defense industry. Alongside my work as a Systems Engineer, I am also a Hiring Manager for the Radar Systems department at Raytheon Technologies. When I am not working, I enjoy reading, hiking and playing with my cat, Fig. A fun fact about me is that I am an identical twin!

The Menagerie of “Failed” Ia Supernovae

Mr. Josh Reding (UNC-CH)

Type Ia supernovae are among the most scientifically valuable objects in modern astronomy because they hold applications for many different fields of astronomical inquiry, including as distance calibrators in cosmology and as nuclear factories producing most iron-group elements. However, the nature of their progenitors remains a mystery; they arise either from a single white dwarf star gradually accreting mass from a companion, or from the merger of two white dwarfs. Additionally, should these merging systems lack the conditions necessary for supernova detonation, they may instead produce a variety of merger products such as strongly magnetic, massive, and fast-rotating white dwarfs. These remnants often exhibit unexpected and interesting physics. My research investigates these unusual white dwarf merger remnants, and carries implications for white dwarfs as a stellar population by placing constraints on type-Ia supernova progenitor systems.



I am a fifth-year graduate student at UNC Chapel Hill working under Dr. Chris Clemens. Aside from my research work, I am passionate about astronomy outreach and education and have worked to further these causes in the Triangle across my graduate career. I organized and hosted Astronomy on Tap in the Triangle, our local branch of the worldwide event series which brings current astronomical research to the public through accessible talks, following the departure of our founder Dr. JJ Hermes. I also am a member of the SciREN Triangle team, an organization that connects local STEM researchers with K-12 educators to bring current scientific research into the classroom. I have helped to run a number of smaller outreach events, including the UNC Physics and Astronomy Department's representation at the annual NC Museum of Natural Science event Astronomy Days, the undergraduate research experience Educational Research in Radio Astronomy (ERIRA) in Green Bank, WV, and I wrote an Astronomy 101 curriculum and taught it to local senior citizens through the continuing education program Peer Learning of Chapel Hill. I have made the recent decision to explore science policy and advocacy as a career path in order to use these skills to make a difference for science and education across the country. I live in Chapel Hill with my wife Olivia and two cats Ghillie and Hobbes, where I can often be found cooking something delicious in the antique cast iron cookware I find and restore. I am also a devoted follower of Celtic Football Club -- mon the Hoops!

Women in Physics: Crucial Conversations

Ms. Susan Miller-Hendrix (Public Schools of Robeson County)

I will present a lesson on the underrepresentation of women in physics and the role of implicit bias and cultural stereotypes. This lesson helps students examine the conditions for women in physics and discuss gender issues with respect to famous physicists, gendered professions, and personal experience to neutralize the effect of stereotypes and bias. In the lesson, students participate in an interactive presentation by the teacher in which data about women in physics around the world are discussed. The role of culture and society are considered.



I have taught all high school sciences in both face-to-face and virtual settings. Currently, I am the Science Supervisor for the Public Schools of Robeson County and a STEP Up Ambassador. My focus is on STEM and making sure that women everywhere are represented and encouraged in this domain. I have been married for 22 years to someone who actually grew up less than a mile from me where we attended church, school, and even each other's birthday parties together, but never thought about dating until I turned 30. We have three daughters, the oldest is a Junior at the University of North Carolina-Pembroke where she is majoring in Elementary Education, and then I have twin daughters who are freshmen. One is at the University of North Carolina at Wilmington where she is majoring in Business and the other is at the University of North Carolina Chapel Hill where she is majoring in Biology. Two out of the three are taking after their mama as I attended UNC-Chapel Hill where I earned my degree in Biology (Worked 14 years in the medical field with HIV testing and case management) but then obtained my teaching certification to teach in secondary science education from UNC-Pembroke. I couldn't do Wilmington or I would have never gone to class but would like to retire within the next 8 years and move to the beach.

Going the Distance: Remote Labs for Introductory Physics

Prof. Colleen Countryman (Ithaca College)

In this workshop, we will be discussing ways to address some of the challenges brought about by remote learning environments. The workshop will include discussion of evidence-based resources that keep students engaged, and how we might perform labs using some common equipment from home (both with and without smart devices). Finally, we will discuss how smartphones collect sensor data like acceleration, and how we might be able to best utilize them in our own labs. The workshop will be active, with several opportunities to share resources with others and work together to create labs that fit your class' learning objectives.

We will be using the "NCSU MyTech" app in this workshop. You may consider downloading it for free in advance from your app store.



Colleen Countryman is an Assistant Professor in Physics at Ithaca College. She graduated with her Ph.D. in Physics, specializing in Physics Education Research, from North Carolina State University in 2015. She has also obtained a Masters in Applied Mathematics from Virginia Polytechnic Institute (2010) as well as a B.A. in Mathematics and a B.S. in Physics (2008) from Canisius College in Buffalo, NY. Colleen is interested in educational technologies, and her dissertation project involved the development, implementation and assessment of an app that utilizes smartphones' internal sensors in introductory physics labs. When Colleen is not teaching, she can be found running and hiking the hilly terrain of Ithaca, NY with her two-year-old hound, Watson. She also plays in a couple of bands (funk, soul, and "psychedelic folk!"), and will be in the studio again in a few weeks! She looks forward to a time where she can share her music at live venues in central NY.