

RESEARCH ARTICLE | NOVEMBER 17 2023

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AIP Conf. Proc. 3040, 050042 (2023)

<https://doi.org/10.1063/5.0175795>



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Citation

Celebrating the Successes of Women Physicists over the Past 50 Years in the United States

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Abstract. The past few years have brought a reckoning to the United States, as awareness of our country's injustices dramatically increased, elevating international movements for equity. Although the road to equity remains long, the United States delegation was inspired to highlight a few women's stories showcasing their success in physics as well as their struggles. We aim to elevate their accomplishments, knowing we cannot possibly highlight all the amazing stories, to further validate and support women's importance in physics. Physicists are presented in three main categories: (1) Legacy: Women in physics who have made their mark (no longer active, retired, or deceased); (2) Active: Women who are making their mark now (already established in the field, mid-career to senior); and (3) Emerging: Women who are primed to make their mark in the future (current students and postdocs or early career).

INTRODUCTION

In the United States, women remain underrepresented in physics, earning approximately 20% of all physics degrees [1, 2]. With these numbers, many women have experienced being the “first” or “only” woman at some point in their career, which is an important part of the story of women in physics. To help reduce the stereotype that physics is for men, we have compiled a list of exemplary women in physics, sharing their stories and their successes.

Legacy

Fay Ajzenberg-Selove (1926–2012) was an experimental nuclear physicist who was awarded the 2007 National Medal of Science by President George Bush. Over the years, Ajzenberg-Selove analyzed thousands of papers and published 26 reviews, most of them written alone. She also conducted nuclear spectroscopy experiments and experienced a radiation accident that rendered her sterile. She was a strong advocate for women's rights through her

work with the APS. She was a tenured faculty member at Haverford College and the University of Pennsylvania. She published an autobiography in 1994 entitled *A Matter of Choice*, and she states, “Science is not a dead cathedral. It is live and it is fun.”

Willie Hobbs Moore (1934–1994) was the first African American woman to earn a physics PhD, which was awarded in 1972 from the University of Michigan. Since both her BS and MS degrees were in electrical engineering, it was assumed for some time that her PhD was also in electrical engineering. Her PhD thesis was entitled “A Vibrational Analysis of Secondary Chlorides.” She published more than 30 papers with her advisor Samuel Krimm. Most of her professional career was spent at Ford Motor Company, and in 1991, she was named by *Ebony Magazine* as one of “100 Most Promising Black Women in Corporate America.” Her first rule of survival was “you’ve got to be excellent.”

Active

Geraldine Cochran is an assistant professor of professional practice in the School of Arts and Sciences and the Department of Physics and Astronomy at Rutgers University. Cochran teaches introductory physics courses for engineering majors, develops curricular materials for the high school physics classroom and introductory collegiate-level physics courses, and engages in equity- and justice-oriented research on teaching, learning, participation, and experiences in physics. Cochran earned her PhD in curriculum and instruction with a cognate in physics from Florida International University.

Kate Daniels is an assistant professor of physics at Bryn Mawr University and holds a joint position as a visiting research scientist at John Hopkins University. She is one of very few Indigenous people in physics/astronomy spaces and identifies as Comanche and Chickasaw. She is a cofounder of the newly formed Society of Indigenous Physicists. She was instrumental in bringing issues impacting Indigenous communities to the National Academy of Sciences decadal survey on astronomy and astrophysics (Astro2020): *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*.

Melina Avila is an assistant physicist in the Physics Division at Argonne National Laboratory (ANL). She earned a bachelor’s degree in physics in 2007 from the Universidad Autónoma de Nuevo León. In 2009 she received a master’s degree and in 2013 a PhD in physics from Florida State University. In 2021 Avila received an Early Career Research Program award by the DOE’s Office of Nuclear Physics that will support her research in measuring key nuclear reactions for the astrophysical process known as the weak r-process.

Jami Valentine is the first African-American woman to earn a PhD in physics from Johns Hopkins University. She 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. Jami founded a website dedicated to African American women in physics, AAWiP.com, to honor the women who paved the way, to inspire future physicists, and to connect with all people interested in promoting diversity in physics and other STEM fields. Jami earned a master’s at Brown University and then went to Johns Hopkins University. In 2006 she joined the US Patent and Trademark Office. She examines patent applications for a wide variety of semiconductor devices. She is a wife and mother. In her spare time, she is a licensed Zumba instructor. She also enjoys traveling and sampling new cuisines.

A theoretical physicist, Shirley Jackson has had a distinguished career that includes senior leadership positions in academia, government, industry, and research. She holds an SB in physics, and a PhD in theoretical elementary particle physics, both from MIT. She is the first African American woman to receive a doctorate from MIT—in any field—and has been a trailblazer throughout her career, including being the first African American woman to lead a top-ranked research university. In 2016, US President Barack Obama awarded Jackson the National Medal of Science, the nation’s highest honor for contributions in science and engineering.

Luz Martinez-Miranda is a professor in the Department of Material Science and Engineering at the University of Maryland–College Park. Her area of research is rooted in liquid crystals for biological studies and general engineering applications (e.g., displays), as well as X-ray scattering techniques using liquid crystals and other materials. She is a fellow of the American Ceramic Society (1994), the American Association for the Advancement of Science (2004), and the American Physical Society (2007). She has been the only female president for the National Society of Hispanic Physicists and has devoted much of her career to supporting underrepresented populations in the physical sciences. Martinez-Miranda received her BS in physics and piano performance from the University of Puerto Rico, her Master’s in physics from the University of Puerto Rico, and her PhD in Physics from Massachusetts Institute of Technology.

Emerging

Wei Jia Ong is currently a Lawrence Post-Doctoral Fellow at Lawrence Livermore National Laboratory studying nuclear astrophysics. She received her BA in physics in 2013 from Washington University and her PhD in physics in 2018 from Michigan State University, for which she was awarded the Sherwood K. Haynes Outstanding Doctoral Dissertation award from MSU. While at MSU she served on the executive committee of the MSU Women and Minorities in the Physical Sciences organization and was the graduate student representative to the diversity committee for the multi-institute NSF-funded “Joint Institute for Nuclear Astrophysics” physics frontier center.

Molly McDonough received her BS in physics in 2021 from Suffolk University. She was awarded the Department of Defense SMART scholarship and is now an associate research physicist with the Air Force Research Lab. She will begin her graduate studies in 2022 at Penn State University. Molly served on the Executive Committee of the Society of Physics Students (SPS), chairing the Inclusion Committee and the International Association of Physics Students. She will cochair the 2025 SPS Physics Congress Planning Committee.

Wichahpi King would consider themselves an unexpected physicist. It’s not often that we find an Oglala Lakota, non-binary, queer, first-generation student coming from an adverse childhood in the fields of physics and astronomy. Their intersectionality has allowed them to find joy and fulfillment in the intersections of their research, outreach, and DEI work. They enjoy splitting their research interests between cosmology and education research that focuses on the needs of minoritized students. They love finding ways to bring physics and astronomy into the public community and facilitating positive changes in the fields through DEI efforts.

Meg Anderson received her BS in physics and philosophy in 2019 from William Jewell College and spent one year at Oxford University. She is currently a graduate student at George Washington University. Anderson served on the Executive Committee of the Society of Physics Students (SPS), chairing the Outreach Committee, and she represented the US at the 2019 International Conference of Physics Students. She serves on the 2022 SPS Physics Congress Student Engagement Committee.

CONCLUSION

By highlighting these women, we are showing that there are numerous women of color and women of LGBTQ+ identities in physics, doing exemplary work. These physicists can serve as role models for younger women and younger BIPOC people interested in physics.

ACKNOWLEDGMENTS

The authors thank the physicists who agreed to be highlighted in this paper. This material is based upon work supported by the National Science Foundation under Grant PHY-1938815.

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