

# Spotlight on Hidden Physicists



**Frances D. Carter**  
Catonsville, MD

“What? You like physics?” is a question people have asked since 1994 when my love for physics began as a

student at the Mississippi School for Mathematics and Science (MSMS, a public, residential high school for academically gifted students). I am forever grateful to MSMS for introducing me to physics. Currently, I am a public policy PhD candidate at the University of Maryland, Baltimore County (UMBC) in an evaluation and analytical methods track. My research focuses on research-based evaluations of science, technology, engineering, and mathematics (STEM) educational programs and policies that affect underrepresented minorities. However, before I became a physicist hidden in the field of public policy, I completed dual bachelor of science degrees in physics (Spelman College) and mechanical engineering (Georgia Institute of Technology), worked as an optical fiber engineer for two years, and completed master of science degrees in physics (Mississippi State University) and applied physics (UMBC). While at Spelman College I was a leader in the Society of Physics Students and was inducted into Sigma Pi Sigma.

While in the masters program at MS State, I reflected on personal characteristics and experiences that fueled my success in physics. I realized that my love for physics was supported by a connection I made in high school between physics and cheerleading. As a senior in high school I began to participate in two-person partner stunting while simultaneously taking physics and considered the required lift-and-

catch sequence as an example of free-fall motion. I believe this application of physics to an area of success in my personal life was motivation to pursue physics-related degrees and careers. This reflection helped me identify a connection between my encouraging spirit, my high school and college cheerleading experiences, and my purpose to become a lifelong proponent of students in science and engineering. Realizing this connection guided me to succeed in both physics and cheerleading and to use the leadership skills I developed to motivate others. Writing about my research interest as well as my application of physics and cheerleading resulted in my being awarded a National Science Foundation Graduate Research Fellowship in 2004, which led to my masters in applied physics (UMBC) and subsequently, my PhD in public policy.

As I approach completing my PhD in public policy, the questions I get now are, “You switched from physics to public policy? Aren’t those two totally different fields? How did you do that; better yet, why did you do that?” My answers explain how my previous academic and professional experiences in science and engineering prepared me for a career researching STEM educational programs and policies. As an African American female researcher whose life experiences illustrate that participation in science and engineering can be approached from a variety of different perspectives, I will continue to encourage all types of people to relate their own personal stories to physics. I know from experience that relating personal challenges and triumphs to science supplies the passion and resilience needed to continue to love, work in, and influence the success of physics and its ever-changing community.



**Kohl S. Gill**  
Sunnyvale, CA

As early as my sophomore year in college I knew I loved physics, but I didn’t want to do physics forever;

I was at least as excited about student government! I found out about a science policy fellowship program which introduces scientists to government work but required a PhD. Since I still enjoyed physics, I decided to go to grad school with the eventual goal of applying my skills to broader issues. I even put that in my grad school applications! Surprisingly, I was still admitted and completed my PhD in 2005.

*I’m currently in the San Francisco Bay Area, working independently on an initiative to fight human trafficking by providing mobile technology services to migrant workers.*

I wanted to do a year of service after grad school, so I went to India and lived in the slum areas of Delhi, working as a volunteer paralegal for an anti-corruption project. That project turned me on to transparency, which is a big passion of mine to this day. You can think of transparency as a way of analyzing the flow of information as a key to good governance, good markets, and a more “physics-y” approach to society. I got into the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellowship program and worked for the Department of Energy’s (DOE) Office of Science for about 2 years, and then the State Department’s Office of International Labor and Corporate

Social Responsibility for one year. At the DOE, the most interesting work I did was research on federal innovation policy. As it turns out, despite our dependence on innovation as a society, nobody really knows how it happens, and how the government, universities, and the private sector can best stimulate it. Here, again, the models for behavior of so many individuals can get a little physics-y. At the State Department I covered labor rights issues for South Asia and the Middle East. I was most concerned with how the Department tracks human rights abuses and how it creates and shares that information, despite chronic staff turnover and shifting political priorities. I helped push the agenda of evidence-based decision-making, a science-y concept that tends to get lost there.

I'm currently in the San Francisco Bay Area, working independently on an initiative to fight human trafficking by providing mobile technology services to migrant workers. You could call me a social entrepreneur. The idea is to use the vast collective experience of the world's 80 million migrant workers to help potential migrants avoid the most abusive situations. Those abuses cost workers \$20 billion a year; we might be able to provide a useful service while making a modest profit at the same time! I'm hoping to pilot this project in India within the year.



**Kathleen A. Kramer**  
San Diego, CA

I am the head of engineering and a professor of electrical engineering at the University of San Diego. In my work as a professor, I do research in data fusion, trying to fuse data and measurements from a variety of different types of sources into the dots we can connect to form a

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picture and interpret meaning. This has applications anywhere there are large quantities of data that require intelligent interpretation. For instance, in health-care, illnesses could be detected more quickly and efficiently. In security, data fusion can be used to ensure that we assess risk and deploy resources where they are needed.

One recent project of mine applies this work to sustainable manufacturing, where there are some complex trade-offs and many different kinds of data involved in making decisions.

I actually became an engineer without knowing what it was. "If you are good at physics, you should major in engineering," is what I was told. I did love physics and, although I majored in electrical engineering, I also took on a second major in physics at Loyola Marymount University and was inducted into Sigma Pi Sigma in 1986. I really enjoyed the physics and remember some very fun activities in the Society of Physics Students. There were five of us physics majors that graduated that year—the largest class they ever had.



**Beverly M. Rogers**  
Finleyville, PA

A physicist with over two years of professional scientific experience with research and development in advanced weapons systems and stealth technology for defense

applications, I have worked at August Research Systems since I graduated from Bucknell University in 2008 with a bachelor's degree in physics. South of Pittsburgh, the small town of Bethel Park, PA, harbors a facility concealed within a group of medical offices. At 24 years old, the main scope of my work is to provide scientific and technical support to consulting companies through research, problem-solving, and modeling. I research electric and optical properties of materials to mitigate radar by selective absorption to achieve a budget-level criterion for performance in multiple spectra. I design articles for radar cross section (RCS) analysis on ships and vehicles, ensuring proper material interfaces in accordance with desired optical interactions. I set up runs for the articles to test a virtual environment that simulates the threat zones of radar detectors. I compose programs in a radar analysis suite that define azimuth, elevation, and frequency swaths and use physical optics, the physical theory of diffraction, method of moments, and shooting and bouncing rays for the characterization of scattering mechanisms. Data is processed and calculated to obtain statistics, which are presented to the customer in graphical form and interpreted accordingly.

My largest project entails the formation of a nonrepetitive, texture-matched camouflage pattern. Most people are unaware of the physics behind such designs, but pattern generation involves expanding the pattern through Fourier analysis and random phase changes to preserve texture, in addition to factors such as illumination, background reflectance, resolution, and color. I operate devices such as spectrophotometers and radar detectors to evaluate the performance of enhanced materials in specific threat bands, and I collaborate on data presentation and justification of results for appearance-sensitive coatings, contributions which are well-researched in

color and appearance. Post-processing of data and interpretation based on results and statistics are key components of my repertoire, whereby I explain to our customers the physics and evidence behind their systems and performance. In essence, I have to model a problem, test it by experiment, compare results to predictions, and relay this information to the customer in a way that is easy to understand.

Problem-solving, research, programming, and data processing are carried out at my office; however, when an article requires laboratory testing, travel is necessary. I enjoy being able to change the pace a little and work in the lab environment during test periods. I have often traveled to Huntsville, Alabama, to aid with the trouble-shooting of system components for paint application and to help characterize the properties of camouflage paints. My job is rewarding because the problems I solve by theory and prediction are translated into actual environments. Interpreting how well actual measurements conform to expectation and prediction allows me to suggest modifications that tune the results to meet specific requirements. Understanding the physics behind the results is the foundation for forming new models and adjusting properties for improvement. Knowing why things work has always intrigued me, so this career path suits me perfectly!



**Dr. Gary H. Lunsford**  
Senior Process Improvement Consultant  
Charleston, SC

In the late 1950s, my high school principal told me that I had an obligation to help the United States win the space race. Since I enjoyed science and math classes, his encouragement fueled my technical interests. I majored

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in physics, earning a BS degree from Duke University, an MS from the University of Illinois, and a PhD from Georgia Tech. I joined Sigma Pi Sigma and Phi Beta Kappa while at Duke. As my physics studies progressed, I began using the emerging power of the computer as a primary investigative tool.

At the University of Illinois I held a graduate research assistantship with Dr. John R. Pasta, Director of the Digital Computer Laboratory. Dr. Pasta pioneered the use of computer simulations to solve physics problems ranging from reconstructing bubble chamber particle tracks to investigating solid-state physics lattices. His seminal physics research using computer simulations inspired me. Following my studies at Illinois, I worked with IBM on the Apollo project where I programmed the trajectory equations that generated guidance commands for the Saturn vehicle. I then took an educational leave from IBM and completed my PhD in physics under the direction of Dr. Joseph Ford at Georgia Tech; we investigated the breakdown of equilibrium in physical systems using computer simulations.

After graduate school, I returned to IBM where I developed and taught a forty-hour course in celestial mechanics and conducted studies in battlespace management in ballistic missile defense scenarios. Later, I programmed the reentry guidance equations for the Space Shuttle vehicle. I particularly

enjoyed working as a rocket scientist and interacting with the astronaut corps at the Johnson Space Center in Houston. I then transitioned to Department of Defense contract defense work with Georgia Tech Research Institute where I directed projects involving air defense systems.

For several years I had experienced a growing awareness that technical personnel, management teams, and customers often did not speak the same language and that projects were often characterized by inadequate planning and a lack of usable documentation and repeatable processes. These observations sparked my interest in pursuing process improvement in the technical arena. I started taking classes at the Software Engineering Institute (SEI) at Carnegie Mellon University and eventually became a certified instructor and lead appraiser in their Capability Maturity Model Integration (CMMI) process improvement program.

In my current consulting activities in process improvement as an employee of ARINC Engineering Services, LLC, an SEI partner, I am able to help management and technical personnel in both government and industry work together more effectively and to see technical organizations improve their processes. As a founding member of the Charleston-wide Joint Industrial Advisory Board, which is co-sponsored by The Citadel and the College of Charleston, I have still another avenue to help academia, government, and industry work together in planning curricula and providing employment opportunities for students in science and engineering. I find this gratifying, and, like many other hidden physicists, I have enjoyed seeing the twists and turns my career has taken.

# Get Involved

## Reaching the Community: A Choose Your Own Adventure

From hosting trebuchet competitions to visiting classrooms, groups across the country with physics outreach programs are entertaining and engaging their communities, increasing science literacy, and encouraging young students to explore science careers. In partnership with SPS, the student section of the physics and astronomy digital library, The Nucleus, has launched a new science outreach resource for teachers and leaders of community groups that want to bring science to their constituents.

- If you are a teacher or leader of a community group, continue on to #1.
- If you are part of a team that conducts physics outreach events for outside groups, skip to #2.
- If neither of these apply to you, enjoy the pictures and pass this article on to someone in such a position.

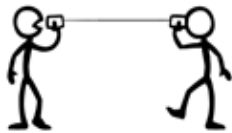


1.

If you are a leader in a scout troop, 4H club, science café, summer camp, classroom, or other interest group, this resource is for you! The new Outreach Groups section on The Nucleus features groups across the United States who engage in physics and astronomy outreach efforts.

If you want to find a group near you, skip to #3.

If not, pass this article on to someone that does!



2.

If you conduct physics outreach events, there are two great ways to use this site—networking with similar groups and advertising to potential audiences.

If you would like to network with other outreach groups, go to #3.

If you would like to advertise your group to potential audiences, go to #4.



3.

If you want to find groups of interest:

- Go to [www.the-nucleus.org/](http://www.the-nucleus.org/) outreach.
- Put in your search parameters: location, audience, and topic.
- Hit the “Search” button and browse the results.
- Click on a group name to see details and contact information.

If you would like to see more groups, repeat #3.

If you would like to add a group to the listing, go to #4.

If the first two options don't sound appealing, skip to #5.



4.

If you want to create an entry:

- Log in to The Nucleus at [www.the-nucleus.org](http://www.the-nucleus.org/). If you are not a member of The Nucleus, follow the “Not a Member?” link to create a login. You must be logged in to create an entry.
- Go to the Outreach Groups section and click on the link, “Submit your group now.”
- Enter your information, click “Submit,” and you are done!

If you want to see what other groups are in the database, go to #3.

If not, go to #5.

5. Thanks for participating, and good luck on your future outreach adventures!