

November 2025

What Can Physicists Do?

Interviews offer a glimpse of how physicists get into—and thrive in—myriad nonacademic careers.

Toni Feder

Feature

Feature Article

Featured



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Toni Feder is a senior editor at PHYSICS TODAY.

Physics students are told their degree is a ticket to, well, anything. But elaboration is rarely forthcoming. Part of the problem is that physics professors are often ill-prepared to help: They simply don't know—and don't have time to find out—about options for their students. Despite departmental efforts such as hosting alumni to give talks about their work, the message to US physics graduate students tends to be that anything other than following in the footsteps of one's adviser would be a failure.

Even if everyone who earned a PhD in physics wanted to be a professor, job seekers vastly outnumber tenure-track job openings. Of an estimated 43 050 working-age, US-trained physics PhD recipients across the nation in 2023, about one-third (14 500) worked in educational institutions, according to the National Center for Science and Engineering Statistics; the rest were in business or industry (24 450) and the government (4100). Typically, about half of bachelor's recipients pursue graduate studies in physics or other fields; many of the others enter the private sector, according to the American Institute of Physics' (publisher of PHYSICS TODAY) statistical research team.

So where do physicists end up? Surprise: Physicists can do—and actually do—(almost) anything. They join startup companies, do research in the private sector and at national labs, and work in finance, data science, policy, museums, and the film industry. They are teachers, lawyers, science writers, and much more.

In a new interview series, PHYSICS TODAY is profiling physicists who opted for careers outside of academia. They discuss what motivated their decisions, how they got into their fields, how their physics backgrounds come into play, what skills they need, and how they like their jobs. What follows are eight interviews selected from this series. Going forward, look for more profiles to be published online and in these pages.

To suggest a physicist (bachelor's degree or higher) for PHYSICS TODAY to highlight in this series, please email pteditors@aip.org.

Jovana Andrejević Kim

minimizes fabric waste

Research scientist, CLO Virtual Fashion

BS, engineering physics, Cornell University, 2016

PhD, applied physics, Harvard University, 2022



(Photo courtesy of Jovana Andrejevic Kim.) (Image courtesy of CLO Virtual Fashion.)

What was your research focus?

Modeling how paper crumples. It was a fun mathematical problem, and our explanation tied into other fragmentation-inspired models, such as how rocks fragment and how glass shatters.

What were you looking for in a job?

One thing that was lacking in academia was being able to see an immediate impact of my work. During my postdoc, I decided it might be good to give industry a try. I did not know what was out there for physicists.

I was open-minded, but I had always loved the intersection of art and science. It turned out that the computer graphics industry has what I was looking for.

How did you get your job?

My husband had seen a video about CLO Virtual Fashion on YouTube. Later, when I was looking for a job, I saw on LinkedIn that CLO was hiring. I applied. I started in 2023.

How do you spend your time?

My day-to-day looks like academic research: reading papers and programming—developing and improving software. But the projects are driven by user needs.

One project involved figuring out how to cut pattern pieces with a goal of minimizing fabric waste. You have to contain the pieces within boundaries, allow for seams, and account for the grain line of the fabric. Recently, the project extended to include respecting print placement.

How does your work transfer to actual fashion?

Brands, fashion houses, and vendors use the software CLO creates to help design garments. They can visualize in 3D how a garment will fit and how it will look as the wearer moves—all before moving into production

What do you like about your job?

The same things I loved about research: the creative aspects and trying to solve challenging problems.

How do you use your physics in your job?

My physics background was a way in. And there are similarities between how paper and fabric sheets behave. My background influences my approach to problem-solving, even if the problem is not inherently a physics one.

What new skills have you learned?

I've learned about the fashion design and production process and how to discuss my technical research in that context. I've also gained skills in collaborative software development.

Josiah Schwab

evaluates self-driving cars

Software engineer, Waymo

BS, physics, MIT, 2009

PhD, physics, University of California, Berkeley, 2016





(Photo by Annelise Beck.)

What was your research focus?

Astrophysics. I did computational work on stellar evolution and the mergers of white dwarf stars.

How did you make the switch into the private sector?

I had thought I would go into academia. But during my postdoc, my intent changed as I realized the constraints, such as not having much choice about where I'd live. My first step was talking to other people who had left academia. It was helpful hearing what people did and didn't like about their jobs. Some of the conversations crystallized for me that I wanted to try software engineering.

It can be tricky as a physicist with no job experience to put together a résumé that makes clear what your transferable skills are. I got much higher uptake when someone referred me for a position. I joined Waymo in 2021.

How do you spend your time?

I'm on a team that evaluates the performance of new software releases for Waymo's self-driving cars. We figure out how to process both real and simulated driving data to measure the rate of safety-relevant events like collisions

driving data to measure the rate of safety-relevant events like collisions.

What do you like about your job?

I get to scratch my problem-solving itch every day. I work 40 to 45 hours a week, less than when I was in academia. I also get paid more. And I have more mobility—there are lots of companies I could work at.

How does your physics background come into your work?

The quantitative and analytical aspects of working with data and reasoning about complex systems feel familiar from physics. In modeling collisions, I've used kinematics and rigid-body dynamics.

What new skills did you need?

A lot of the growth for me was working in a different-paced environment. Projects are faster moving and smaller scope. And writing software with 1000 engineers requires different kinds of coordination than in the small collaborations I had experienced in academia.

Is there anything you'd like to add?

The transition is not easy. If I were doing it again, I would look outside academia earlier in my career. It's good to have awareness of options and what is required to pursue them. I'm happy I made the career change.

Katrina Miller

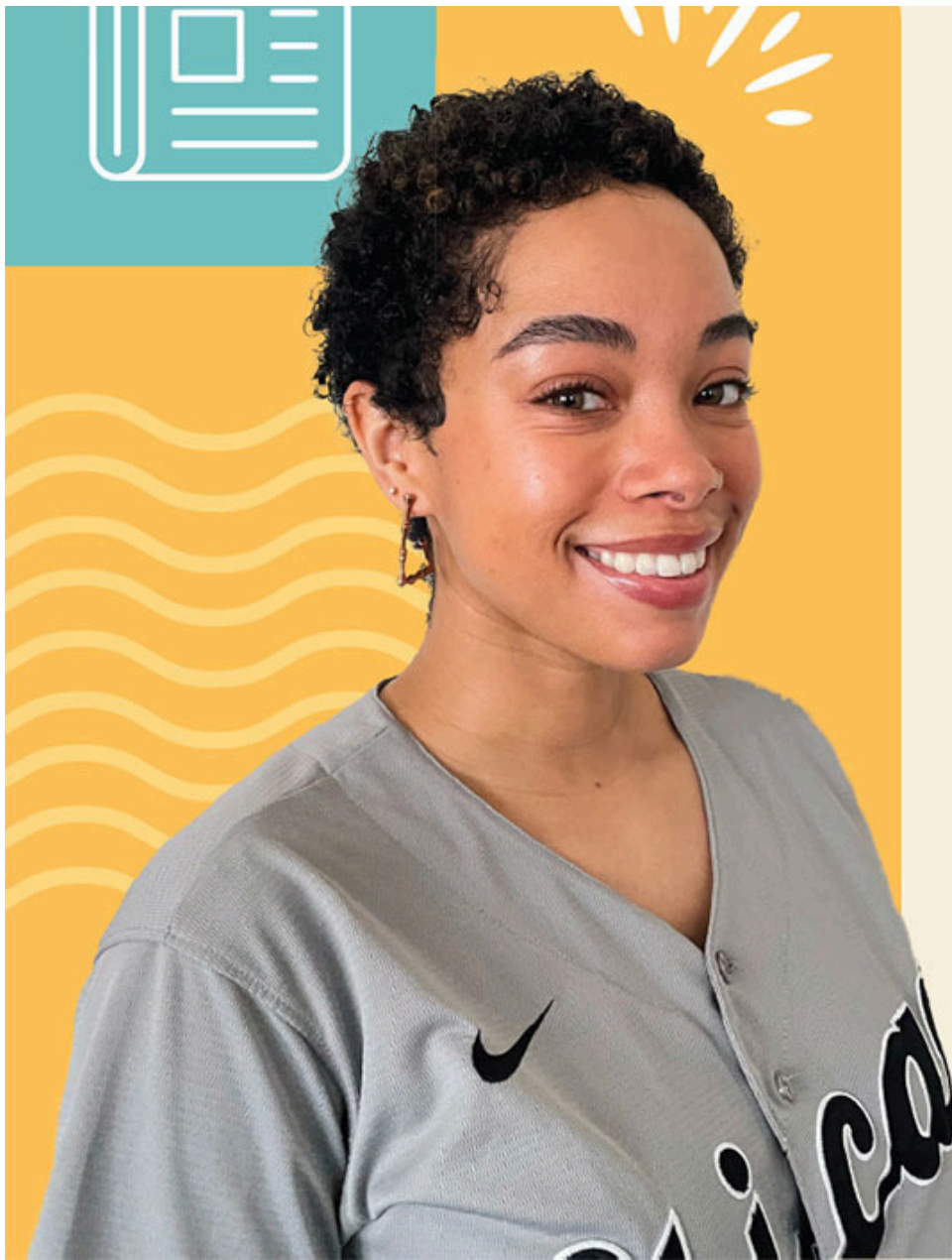
explores and explains science news

Science writer, *New York Times*

BS, physics, Duke University, 2016

PhD, physics, University of Chicago, 2023





(Photo by David Dowd.)

What was your PhD research focus?

I worked on the MicroBooNE experiment at Fermilab, measuring neutrino cross sections in liquid argon.

What were you looking for in a job?

In the day-to-day work of my PhD, I felt like a software developer. And I didn't like the structure of particle-physics research, which, because of the nature of the experiments, has huge collaborations. I realized I liked learning about science more than I liked doing it. I was looking for something more connected to society,

something where I could use my expertise for the good of people.

How did you get into science writing?

As a graduate student, I did an internship with the University of Chicago's news office. I have always liked writing, but that's where I started learning the tricks of the trade of journalism—how to write a lede, how to conduct interviews. Then I got an AAAS [American Association for the Advancement of Science] mass media fellowship, and I worked for a summer at *Wired* magazine. I wrote freelance up until I finished my PhD. I applied for a *New York Times* fellowship and got it. That was for a year, and then they hired me.

What do you like about science writing?

I love that I am immersed in science, and I get to talk to scientists about the cool work they do. And I get to bridge the gap between scientists and the public.

How do you use your physics in your job?

My technical expertise comes into play with translating for the public what scientists say. It guides my choices of articles to pitch to my editor and the angle I approach a story from. And it comes in handy in building trust, in both directions: with scientists and with readers.

Is there anything you'd like to add?

Recently, I served on a career panel and was asked whether I have any regrets about leaving academia. So far, no.

Phil Broughton

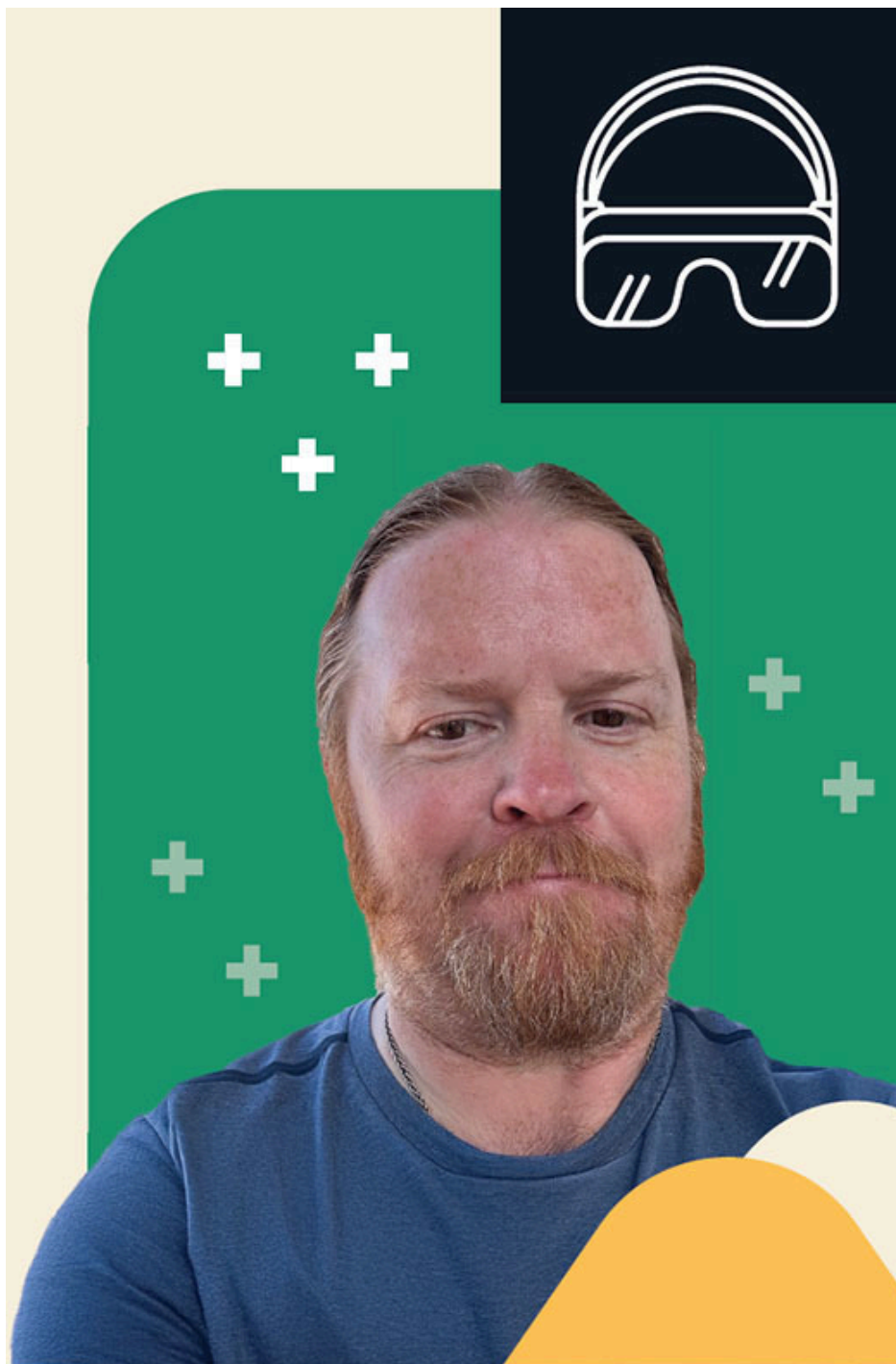
keeps laboratories safe

Laser safety officer, University of California, Berkeley

BS, physics, University of California, Santa Cruz, 1998

MS, health physics, Oregon State University, 2008





(Photo by Gabriel Mosher.)

What was your research focus for your master's degree?

Radioecology: how radioactive materials propagate through the environment via food chains, groundwater, and soil.

What were you looking for in a job?

I got into lab safety because I was terrible at programming. I originally fell into it

as an undergraduate working in an isotope geochemistry lab. After graduation, I was hired as a laser tech and then service engineer. I picked up safety roles until they became my entire job. But I wanted to learn at the ground level. I wanted to learn history and industrial knowledge, not just the ropes of how to do things.

Then, as a health and safety technician at Lawrence Livermore National Laboratory, I saw that to advance, I needed to get a higher degree. I wanted to work with ionizing radiation. I got my master's in health physics very intentionally, while working full time. After four years at Livermore, and after I finished my degree, I moved to UC Berkeley in 2008.

What does your job involve?

I inspect labs. I look for radioactive contamination and make sure shielding is appropriate and that people have not altered setups. I check laser safety. I calibrate instruments. I spend a lot of time reviewing proposals and procedures for experimental design. I document problems and make sure researchers know where things go wrong—so it won't happen again.

What do you like about your job?

It's fun working with students. And I never know what I will do on any day. I love that.

How do you use your physics in your job?

In radiation safety and control, we have a good understanding of how ionizing radiation interacts with materials, biology, and the environment. That takes advantage of the breadth and flexibility that a physics degree fosters. And I use physical intuition for how things work and for doing the math and then checking if the answer makes sense.

Is there anything you'd like to add?

Among research physicists, there is some prejudice against safety roles: It's not seen as real physics. But I like that as a physicist in a safety role, I am helping people make sure that their research succeeds and can continue.

Liting Xiao

searches for patterns in financial markets

Quant researcher, Graham Capital Management

BA, astronomy-physics; BA, math; University of Virginia, 2015

PhD, physics, California Institute of Technology, 2022



(Photo by Xinghui Yan.)

What was your PhD research focus?

Designing and improving statistical and computational methods for detecting and characterizing gravitational wave signals from the LIGO–Virgo network. [LIGO is the US-based Laser Interferometer Gravitational-Wave Observatory; Virgo, its counterpart in Italy.]

What were you looking for in a job?

I was looking for a transition out of academia, something that would allow me to stay close to rigorous analytical work but with more tangible, real-world impact.

How did you make the switch?

I branded myself with a personal website and built out my LinkedIn profile. Recruiters reached out, and I applied to both big tech and financial firms. Within a month of intense interviewing, I landed a job. I chose GCM because I connected with my interviewers and with the company's datadriven research culture.

What do you like about your job?

What I enjoy most is the continuous learning: It keeps me intellectually engaged and connected to real-world events. I train myself to think critically about how global developments, like tariffs or geopolitical tensions, might ripple through inflation, commodity prices, and broader markets. I also really value the collaborative, intellectually curious culture.

How do you use your physics in your job?

It was not a huge leap. Instead of searching noisy data for black holes, I'm searching for patterns in markets to help decide when to buy or sell assets. The work is fast paced. We formulate ideas, validate them empirically, and subject them to internal peer review before iterating or discarding.

My PhD training gave me the mindset of an independent researcher and the tenacity to push through ambiguity. Both are essential for quant research. I had done a lot of signal processing, which translates well.

Have you needed new skills?

I've picked up, almost from zero, mathematical optimization skills. I also needed to build a foundation in finance, which I mostly taught myself. It took a few months to get fluent in the language of markets, and there's an expectation to ramp up quickly.

One major shift was the importance of networking. In industry, relationships and communication matter a lot. You need to put yourself out there and be visible. It's about building a network, exchanging ideas, and staying connected to the broader research community.

Roohi Dalal

advocates on Capitol Hill for the astronomy community

Deputy director of public policy, American Astronomical Society (AAS)

BS, astrophysics and history, California Institute of Technology, 2018

PhD, astrophysics, Princeton University, 2024





(Photo by Tori Repp/Fotobuddy Photography.)

What was your research focus?

To understand the distribution of dark matter in the universe, I looked at how gravitational lensing distorts the shapes of galaxies. I also earned a certificate in science, technology, and environmental policy.

What were you looking for in a job?

I knew that I wanted to do policy, but I didn't know if I wanted to be in an academic setting or in something where I would interact directly with policymakers.

How did you make the transition to policy?

As a postdoc, I realized I wanted to do something that was government facing. When this opportunity at the American Astronomical Society came up, I thought I was not qualified because the job ad asked for five years of experience. I applied anyway. I left my postdoc early to start here in October 2024.

How do you spend your time?

I work on legislative and regulatory aspects in three areas related to astronomy: funding, workforce, and access to the night sky.

I am on the Hill every week or two talking to committee staff and congressional members about our priorities and how we can help. On the regulatory side, I

members about our priorities and how we can help. On the regulatory side, I submit comments—to the FCC [Federal Communications Commission] on satellite regulations, for example, or to the Department of Homeland Security to oppose a proposal to limit the duration of student visas to four years.

I go to receptions and happy hours. Networking is important.

What do you like about your job?

I feel that I have agency—that there is something I can do about the times we are in.

How do you use physics in your job?

I work with volunteer committees made up of professional astronomers. A lot of it is talking and distilling what they say so that it's understandable to people in the government.

What new skills did you need to learn?

I'm still developing my communication skills. In legislative offices, the staffers have 100 things going on; how do you grab their attention? I am also learning to multitask, prioritize, and triage.

Anything else?

When I was hired, the salary range was posted as \$118 000–\$130 000. Also, all PhDs at the AAS can choose to do research 20% of the time.

Jack Lambert

teaches high school physics

High school physics teacher, Utah

BS, physics, Washington State University, 2019

MA, teaching, Westminster University, 2021





(Photo courtesy of Jack Lambert.)

Why did you go into teaching?

I intended to get a PhD and stay in research. But while I was getting my bachelor's degree, I got involved in outreach through the physics and astronomy club. I found value in thinking of ways to share the physics I love. By the end of college, I realized that I could continue to do that if I went into education. And I realized I was good at it.

How did you move into teaching?

I found an accelerated master's program in education, three semesters long.

I was lucky: One of the places I did observations and student teaching was at Utah's top public high school. The school's initial response to the program's inquiry about taking on a student teacher in physics was, "No, but can we hire him?" I did end up student teaching there and then got hired.

What do you like about teaching?

I teach AP physics. I also teach IB [International Baccalaureate] physics, where I cover things in a different way. I love that.

It's rewarding to see it click with people that math can be used to explore the universe, and how beautiful and incredible that is.

The less fun parts are the grading, parents, emails, and students' stress about exam scores.

How do you use physics in your job?

Most high school physics teachers have backgrounds in math, chemistry, or geology, not physics. I'm not sure I would have the same enthusiasm if I hadn't studied physics. And I think that helps kids, who often have the perception that physics is difficult and scary.

What new skills did you need?

I had to learn classroom management and how to have the right presence. I also had to rethink how to present material. My master's helped with that. So did conversations with the high school's instructional coach.

Do you earn a living wage?

It's been pretty good for me. I make about \$70 000 a year, plus \$5000 from Utah's Teacher Salary Supplement Program. And there are opportunities through the school to earn more. Last year, I swapped a prep period to take on an extra class. That gave me a 12% bump.

Eric Frederick

programs motion-tracking software

Director of technology, Xcitex

BA, physics and mathematics, Clark University, 2003

PhD, physics, University of Massachusetts Lowell, 2011



(Photo courtesy of Eric Frederick.)

What was your research focus?

Hyperpolarized gases for MRI. I used hyperpolarized xenon to get a ventilation map of the lungs. And from the fraction that enters the bloodstream, you can estimate the surface-to-volume ratio of the lungs.

What were you looking for in a job?

Physicists know that we can do a lot, but we don't know how to market ourselves. Originally, I hoped to get a job in medical physics. But my program didn't have the necessary accreditation or residency program. In 2012, I went to Bruker to remain in research and provide support to the research community. The company specializes in test equipment for materials advancement and drug discovery. I worked mostly with preclinical animal MRI, CT, x-ray scanners, and optical methods and later worked with the sales team.

How did you find your job at Bruker and then at Xcitex?

Someone I knew at Bruker told me about the opening. I was there from 2012 to 2017. For my job at Xcitex, I was poached.

Describe your work.

At Xcitex, we have a software suite that can track motion and synchronize data from accelerometers and other sensors with videos. There's a lot of ballistics tracking and testing of showerheads and of how paint gets sprayed out of cans to get a better coating. The software can track points, edges, and contours and perform more complex tasks like particle tracking and particle-image velocimetry.

I mostly update legacy code. I also do training and interact with customers.

What do you like about your work?

I work with computers and get a broad exposure—we work with biomedical companies, defense companies, and more. What I like most is consulting with customers.

How do you use your physics?

How do you use your physics?

We take real-world observables—speed, position, et cetera—and give them to clients so they can create models. We need to be aware of optics to advise customers on proper lighting—a good-looking video is not always the same as one that will work well for tracking.

What new skills did you need to pick up?

Physics and other skills I picked up along the way prepared me for industry jobs. For me, it's more about trying to be a good person in industry. People want to take shortcuts and do quick fixes. Having a backbone and doing what is right—and not what's easy—is important and sometimes challenging.