

# FACES OF MASS SPECTROMETRY

## Christopher Pulliam



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### Being Resourceful

Christopher Pulliam is a skilled scientist with a passion for sharing the lessons he's learned with other professionals in his field. He earned his Ph.D. in Analytical Chemistry from Purdue University, where he studied in the lab of Dr. Graham Cooks. He also attended Purdue as an undergraduate and is now a member of the Chemistry Department's alumni board. Christopher is currently based in Los Angeles, where he works for Procter & Gamble as a Senior Analytical Data Scientist.

During his free time, one of Christopher's chief pursuits is the creation of online tutorial videos, which he posts to his YouTube channel. His video series is largely dedicated to teaching viewers how to apply generic data science tools and techniques in the context of mass spectrometry. He has now published over 200 videos, and his project has become a valuable resource for many students and professionals in the mass spec community.

Through these professional and educational experiences, Christopher has gained valuable insights on what it takes to be an effective mentor and teacher. He stresses the importance of cultivating confidence and encouraging others to trust their ability to rise to the challenges they face. He also emphasizes the various ways in which one's personal talents and passions can provide a creative edge that should not be ignored, regardless of one's chosen field.

### Did your interest in mass spec begin during or before your studies at Purdue?

My interest in mass spec actually began before I got to Purdue, when I was in high school. I was one of those students who got quickly enamored with the crime procedural TV shows and saw that they were using mass spec as part of their crime-fighting toolkit. While I didn't know exactly what it was, I knew I wanted to work on an instrument that was able to take an unknown material and identify it. As time went on, I learned that we were talking about a mass spectrometer, and that while it doesn't quite work that way, it was even more fascinating than I originally imagined!

### How did you first come to your position at the lab of Prof. Graham Cooks at Purdue?

As an undergraduate student, I wanted to join Graham's lab, because he was a world-renowned mass spec expert, and I knew by then that I wanted to pursue mass spec. Ironically, though, I couldn't join his lab then, because he had a rule that only one undergraduate researcher was allowed at a time. A year later, I found out that one undergraduate student would eventually become my girlfriend—and ultimately, we got married. Because of that, and because I didn't do undergraduate research with him, I was able to do graduate research with him. As an undergraduate student, I did do exciting mass spec research in the lab of Dr. Hilikka Kenttämä, but it was using mass spec in a very different way than in Graham's lab. Since then, I've graduated from Graham's lab with a Ph.D.—and in the process, I was able to meet my wife, too!

### What do you enjoy most about your current position with Procter & Gamble?

Because of Procter & Gamble's size, we're able to do a lot of different types of work. One day I might be working on some crisis involving the material we are using doing something weird—and then the next day, I'm working on a project on how we can incorporate novel ingredients to make our products better. So, I just really enjoy the scope of the work we can do, and the impact we can have. But I still have the ability to publish my research, go to conferences, and still make my mark in the academic world while simultaneously enjoying the industrial setting.

### What does your YouTube channel entail?

When I first started at Procter & Gamble as a postdoc, I was doing a lot of material comparison—how does material "A" compare to material "B"? Doing that, I was pretty quickly generating a lot of data. So, instead of using the traditional software tools that came from various vendors, I decided to go on an upscaling journey to learn how to use data science tools to get more understanding of—and deeper insights on—my data. Through that, I could move through the process much more quickly than with established software. So, I took several decades of courses



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Preparing experiment for Thermo IDX Orbitrap. (Photo courtesy of Christopher Pulliam.)

**How has social media generally helped you to connect with other members of the mass spec community and the broader science community?**

There are two main social media platforms that I use: LinkedIn and YouTube (Figure 2). LinkedIn is fantastic, because it has allowed me to connect with ACS and ASMS interest groups, along with other scientific communities—I’m able to build my own network. Actually, LinkedIn was critical in getting my position with Procter & Gamble. When I first moved to Cincinnati, I went to LinkedIn to figure out who in my Purdue alumni network worked, lived, or had any familiarity with the city. It turned out that there was another Purdue alum who was a hiring manager at Procter & Gamble in Cincinnati. Then, when I started shifting my focus more toward how to teach and help other folks, LinkedIn was helpful for that too—again, just through connecting with others in the ACS and mass spec communities and figuring out the opportunities there. I’ve used both the YouTube and LinkedIn platforms to grow those communities.

As a result of those efforts, I’ve had a number of professors tell me that my information is part of their onboarding! Interestingly, we were interviewing someone at Procter & Gamble, and the interviewee said, “I think I know you! Aren’t you that guy who publishes the YouTube videos?” That, for me, was just confirmation that I’m reaching scientific graduate students, early career professionals, and even some mid- to late career professionals who want to either understand how to use these tools or at least understand the capability of these tools as we all navigate this rapidly changing innovation landscape.

**How has serving as a mentor for graduate students helped to shape your own career and values as a scientist?**

Whenever I mentor folks, I automatically make it a reverse mentoring opportunity as well. I learn from anyone because hearing about diverse experiences gives me wisdom. It’s mind-blowing to hear what others have had to cope with or navigate. For instance, many of the students I’ve mentored have had an unconventional journey into grad school or into their careers, which is fascinating and helps me to learn about myself, too! For mentoring specifically, I also try to help my mentees realize that these programs are supposed to be hard, but that doesn’t mean they should be disqualified. A lot of the students who come to Purdue feel like they don’t really deserve to be there—it’s the hardest thing they’ve ever done (academically) to date, and they

learning how to work with data science, data visualization, and data storytelling.

In doing that, I had to take a jump from the generic data science lessons into the mass spec domain of the scientific realm. I then decided to become that same kind of resource for other people. The more I went on my learning journey, the more I heard the same sort of laments, such as: “How do I do this with chemistry? I understand how it works for the general data sets, but I’m a mass spectrometrists, so how does this connect?” I decided to become that bridge, and I was able to find open-source data sets to build YouTube tutorials. I go through a lot of that same pedagogy that I learned in the generic sense and apply it to the scientific domain. I have now published more than 200 videos to that point, and I’ve gained quite a following!

**Was there anything else that inspired you to begin creating the videos in that series?**

At one point in my career, I did consider becoming a professor. However, the biggest limitations for that became geography. By then, my wife and I had already gotten married, and she was in medical school. As part of the medical school journey, you have to match into a specific program, which essentially means shuffling around the country to find a good hospital for your specialization. This meant I wouldn’t be able to really establish a teaching career until much later. But I still have always had this passion of taking what I’ve learned and helping to democratize that for other people. So, when I noticed these tensions among internal folks that I mentioned before, I realized I could still teach—just in a very unconventional and more millennial kind of way! But it worked out well, because these digital and social media concepts are really shaping the future of how we do R&D everywhere.





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*Reviewing notes before recording a Python for Chemist tutorial. (Photo courtesy of Christopher Pulliam.)*

often get discouraged by that. They might not have a lot of other folks who look at them and say, “Hey, it is, in fact, possible!” For many of them, it’s just about buckling down and getting rid of the disbelief part. Self-doubt tends to be the one thing that stifles most academic or professional careers—getting that out of the way makes everything else easier. Yes, there are other things they have to learn or strategies they have to pick up in the process—but once they believe they can do it, that’s the most important thing in the path forward.

**Is there a particular role model or relationship that positively influenced your career?**

It’s hard to pick just one, but I’d say a particular person who influenced my career would be my seventh grade math teacher, Ms. Reel. By fourth grade, I knew I wanted to become a scientist, when someone came into the elementary school cafeteria and started doing scientific demonstrations. I said to myself, “I don’t know what kind of science that is, but I want to do that! I want to be that person!” So, in seventh grade, I was in math class and the semester had just started. A little less than halfway through the semester, I was getting a D in math. Ms. Reel pulled me aside and said, “It’s another bad grade, but at least you’re consistent.” I didn’t quite understand it at first, but I eventually realized that she meant it as an encouragement. That’s because she was saying, “You’re consistent because you’re making the same mistake over and over, which means we can start fixing that mistake.”

And by the time the semester ended, because of her words, I’d managed to raise that D to a B. So, my seventh grade math teacher really helped me understand the value of being a consistent person—you understand what’s working, and you can more easily address what’s not working to make improvements. That lesson applies whether you’re in the seventh grade, in undergraduate or graduate school, or even in a professional career!

**What are your interests outside the lab?**

Outside the lab, I have three main hobbies. Number one, I love to bike—it’s just a nice way to get out of the lab! When I was a little

younger, I got into road cycling, and in Lafayette, while I was at Purdue, it was pretty easy to go long distances because of the flat rural communities. My second big hobby right now is collecting vinyl records. There’s something about interacting with music that is a cool experience, because you never know what new sound or artist there will be to explore!

My third hobby would really have to be my whole project with YouTube. It takes up a lot of time, but it’s worth it, because I learn a lot in the process. When I first got into it, I really wanted to be more intentional about how I learned by teaching other people. So, when I’m not recording or editing a video, I’m probably learning something new to either demonstrate at work or demonstrate for a video. Many times, I’ll teach myself something just to publish, and then a year later, I’m watching myself back to learn how to implement it at work. So, in that way, it just helps me prepare for whatever comes in the future, and I can watch and teach myself later in real time!

**What is your advice to members of URM communities, and to students in general, looking to make their mark in mass spec and in science in general?**

Learning how to program is straight forward, with some well-defined rules, but the thing that makes you expertly and uniquely valuable is everything else you bring alongside that journey. To the URM students, I would say: science and mass spec have rules that you can learn, but it’s everything in your past that gives you the creative advantage. I’ve had a number of grad students who had passions that they initially thought were at conflict with their talents, but they turned out to be advantageous. For example, a student might have a passion for food and end up with a mass spec position at a food-based company or using their mass spec expertise to help growing conditions for plants. So, it’s about embracing all that living experience that really helps to paint you as a complete person—not just someone in a lab coat, but a full human being who can contribute to society in a number of different ways!