FACES OF MASS SPECTROMETRY / Amanda Hummon

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Creating Supportive Environments

Amanda Hummon earned her PhD in analytical chemistry at the University of Illinois at Urbana-Champaign, where she was a member of Dr. Jonathan Sweedler's lab group. Reflecting on this experience, Amanda recalls being immediately drawn to his team's passion for mass spectrometry research. While pursuing her PhD, Amanda experienced the loss of a close family member who passed away from cancer. Amanda then devoted her career to investigating topics at the interface of mass spec and cancer research. After completing her PhD and working as a post-doctoral researcher at the National Cancer Institute, Amanda started her independent lab at the University of Notre Dame. There, she began to explore these intersectional areas of interest. After working at Notre Dame for eight years, Amanda moved her lab to The Ohio State University in 2018, where she works today.

Alongside her personal connection with her work, Amanda is firmly committed to encouraging the next generation of scientists to get involved in chemistry. For example, Amanda has led community outreach events with local girl scout troops, which include activities such as liquid chromatography experiments and a Muppet-themed science exercise. Amanda also participates in science outreach events at nearby elementary schools. At The Ohio State University, Amanda volunteers to teach the general chemistry class for chemistry majors, which she describes as one of the highlights of her job. In 2021, she won The Alumni Award for Distinguished Teaching, Ohio State's top teaching award, for her stellar teaching of this course.

Did your interest in mass spec begin before or after your undergraduate studies at Cornell?

My interest in mass spec started after my time at Cornell as an undergrad. At Cornell, I was studying synthetic chemistry. When I applied to graduate school, I was interested in both inorganic chemistry and analytical chemistry. It was during that time, while visiting graduate schools, that I met the students in the research group that I eventually joined at the University of Illinois at Urbana-Champaign, in the lab of Jonathan Sweedler. They were just so enthusiastic about mass spec, and that is what really got me into it. There, I was very lucky to get to work with Lingjun Li. She was a 5th year graduate student, and I was fortunate to be paired with her as I started in the Sweedler group. She was very generous with her time and advice.

What brought you to your current position at The Ohio State University?

Arriving at The Ohio State University was a long evolution. While I was in grad school at the University of Illinois at Urbana-Champaign, I had a real advantage of learning mass spec, being mentored by Jonathan Sweedler. During grad school, I had an immediate family member pass away from cancer. At that point, I decided I wanted to focus on cancer research. Specifically, I wanted to blend mass spectrometry and cancer research. I pursued a postdoc at the National Cancer Institute, yet during the four years I was there, I never touched a mass spectrometer, because we simply didn't have access to one. In 2002 there was not a lot of work being done at the interface of cancer research and mass spec. Cancer research was mostly focused on genome sequencing. When I started my independent laboratory, my plan was to merge cancer biology and mass spec. I got lucky because around that time, the University of Notre Dame wanted to establish a program in analytical chemistry, and they were starting a cancer center: the Harper Cancer Research Institute. They hired me and stayed on for eight years. It was a great place to get started and had many opportunities tailored to my interests. In 2017, Ohio State contacted me. They have a strong analytical chemistry program, a huge cancer center, a lot of mass spectrometry resources, and the students there are excellent. It seemed like a great next step, especially because I am originally from Pittsburgh and Columbus is a short three-hour drive from my family. In 2018, I moved my lab here to Ohio State.

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Teaching General Chemistry is a great way to recruit students into chemistry research. It also allows me to talk about two of my great loves: chemistry and the Muppets. I teach a "Muppet of the Day" at the beginning of each lecture; the last day of the semester, we discuss Bunsen & Beaker, the two scientist Muppets (Photo courtesy of Amanda Hummon.)

When did you first decide to focus on proteomics research?

My entire graduate work focused on proteomics. The project I worked on in 2000 was using individual neurons and looking at them with mass spec to identify different protein processing patterns. At that point, I was shocked at how little had been looked at in terms of proteomics and cancer biology, so it seemed like my background would be a good match. In the Sweedler lab, we were the first group to do single cell mass spectrometry. As I mentioned, mass spectrometry was not as heavily utilized in cancer research, and I thought I could contribute.

In your two plus decades as a member of ASMS, how has your involvement helped you to grow as a scientist?

Being involved with ASMS, you meet so many people, and it is such a vibrant environment! I enjoy getting to see the inner workings of ASMS, along with the diversity of the different sessions at the conferences. Every year, there is the temptation to go only to the sessions that are about your specialty. I always try to expose myself to something new by going to a couple sessions that are outside of my area of expertise. What I love about ASMS is that it is a supportive community where people help each other. It is so beneficial. About 20 years ago at the yearly ASMS conference, a group of women scientists started getting together for an annual lunch. It has has become a great tradition which we have kept going throughout the years. Now, we invite younger women to join us, and we have found that learning from them is very insightful!

What have been some of your other initiatives in encouraging female scientists and children to get involved in chemistry?

One initiative we worked on was setting up lactation rooms at Notre Dame. When I first started as a faculty member at Notre Dame, around 15 years ago, there weren't many lactation rooms for breastfeeding women. I am a mother of two children, and when I was interviewing for jobs at that time, I was in a position where I had to email chairs of departments, explaining that I would need a lactation room. I was shocked by the number of people who emailed me back saying, "Sorry, we don't have that. We've never had a woman who has had a baby." Or, if they did, those women were breastfeeding somewhere out of sight, like a bathroom or a closet. At Notre Dame, they did have lactation rooms, but quite frankly, they needed more. That was one initiative we worked on, and my department was very supportive of us setting up more of these rooms. I had my second baby as an assistant professor, and I was very aware of the need for private, clean spaces for mothers. Since moving to Ohio State, I have done educational outreach at local elementary schools, as well as volunteering at the university each year to teach CHEM 1610: General Chemistry for Majors.

Helping graduate student Arbil Lopez set up a dosing experiment for her three-dimensional cell cultures. The cultures will be harvested, and Arbil will examine them by mass spec to determine how the drug regime affected the cells. (Photo courtesy of Amanda Hummon.)

"It's very rewarding to see my students' progression from working on something I've developed for them to independently working on their own intellectual property."

It's for 200 students who are planning to major in chemistry and biochemistry, including many premed students. It is my favorite teaching assignment. I put a lot of time and energy into talking to my students about pursuing research and trying to make it as accessible as possible to them. We do a lot of fun activities, such as lessons focusing on the Muppets (Figure 1). I have a mini course on the Muppets that I mix into chemistry lessons, with every single lecture opening with a "Muppet of the Day." As a child of the 1980s, the Muppets are kind of a running theme in my life!

Describe a moment of surprise or discovery that you experienced as a researcher.

There have been several surprises over the years, but not a particular "eureka" moment. There have been a series of moments. In grad school, for example, I remember very vividly the time I finally found the protein I'd been looking for. It was midnight, and I remember dancing up and down the hallway in the empty building; then worrying that I'd forgotten my key and been locked out of the lab! Luckily, I was okay. I also vividly remember the first time my grad student showed me that we had different patterns in our three-dimensional cell cultures. My group does a lot of work with tumor models, so we develop mass spec protocols for them. As I mentioned, as a postdoc, I never had access to a mass spec. My hypothesis, when I started my own lab, was that we should be able to detect different protein distributions in these three-dimensional cell cultures (Figure 2). But I really didn't have a way to validate that until I had my own lab with my own grad students. I still very much remember that moment in my first year when my student came running into my office and said, "We have the different protein gradients. We can see them." And then he and I danced around with that data. It's fun doing experiments on your own, but in many ways, it's even better when your students get the data, they are proud of themselves, and you get to celebrate with them!

How do you demonstrate your commitment to personal growth and development for the members of your lab?

My main role is to guide them as they transition from graduate school, and being a student, to being a fully developed scientist. By the time they leave my lab, they have much more expertise than they realize. When they first join the group, I give them a project, which is obviously in line with the group's mission. But then, after their first two years, we do the candidacy exam—and at that point, we start adding other projects that they have designed themselves. As they move through grad school, they become increasingly independent—and by the time they are in their fifth year, they are hopefully writing and developing most of their projects on their own. It's very rewarding to see my students' progression from working on something I've developed for them to independently working on their own intellectual property.

What is a research question you hope to pursue in the future?

I am very excited right now about work that I'm doing with Heather Desaire. Heather is a professor at Kansas and a good friend of mine. She and I have been working together for the last several years. Heather is also a mass spectrometrist, but over the past 10 years or so, she's gotten involved in programming and machine learning as well. Our groups have collaborated using imaging mass spec data that my group is developing. We have a few different projects that we have started, along with a bunch of proposals using the combination of imaging mass spectrometry and machine learning. We hope these efforts will help improve disease diagnostics in the future and anticipate them being used in hospital settings.

What are some of your other interests outside the lab?

One unique hobby of mine is making stained glass windows. It was something I started after finishing up graduate work as a treat to myself. Over the years, I've kept it up, taking classes on how to manipulate glass. Mostly I make windows, but sometimes I'll do lamps, too. I also enjoy reading, doing yoga, and spending time with my family. My sons are teenagers now, and traveling with them is great, because they thankfully still tolerate their mother!