FACES OF MASS SPECTROMETRY / Evgenia Shishkova

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Making Her Mark

When Evgenia Shishkova first began her time in graduate school at the University of Wisconsin–Madison, she knew right away that she felt at home—but mass spec studies weren't even on her radar. Still, within the first week, after attending a faculty event, she immediately became fascinated by everything that the mass spec program had to offer; the rest, as they say, is history!

Since finishing her PhD studies, Evgenia has made her mark in the mass spec field, especially when it comes to sample preparation and separation techniques. But early on, she noticed that the field was highly male-dominated, and she also made it her mission to make her mark as a female in the industry. Her push has, within a few short years, borne fruit. "Diversity-promoting" efforts are now at the forefront of Society's attention.

For others looking to make their own mark in the mass spec field, Evgenia's advice is simple: Start off by learning about a little bit of everything across the industry, and then narrow your focus to a particular area of expertise. A broad overall knowledge is essential to first getting your name out there—but at the end of the day, it's the specialized knowledge t hat really makes all of the difference!

How did you get your start in mass spec? Was it before or during the time you spent doing your PhD research??

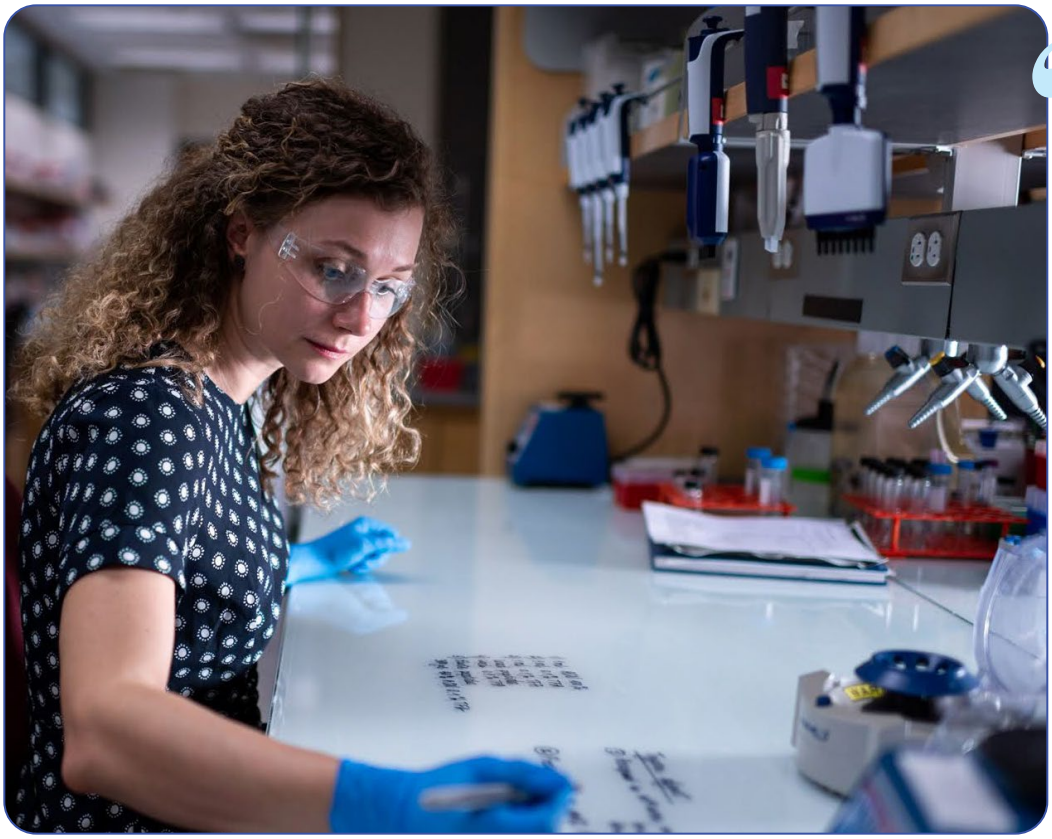
When I joined grad school at the University of Wisconsin–Madison, I went to an event they hold during the first week called "Faculty Parade." It's when all of the professors come out and present their research, trying to recruit students. It was during this event that I first met Josh Coon, my PhD advisor, and I was immediately fascinated by the technology's ability and the insight the mass spec data can provide. Up until that point, mass spectrometry and proteomics really were not on my radar at all, and that's what piqued my interest. I rotated in his lab, and the rest is history! So, it was a very unexpected thing that happened during that beginning portion of grad school.

What drew you to the University of Wisconsin–Madison to pursue your PhD?

I had several offers from different grad schools, and when I visited University of Wisconsin–Madison for the recruitment weekend, I quickly had a gut feeling that it felt like the right fit for me, personally and professionally. I really enjoyed my interactions with people at the school—everyone there seemed very nice, and the students seemed to have a lot of things that they did outside of the lab. They seemed to have a healthy life–work balance; they worked hard, and they were excited about their work, yet they managed to maintain other interests and hobbies, too. That's something that I really valued, and it just seemed like a very friendly, collaborative kind of environment.

What, exactly, did your PhD research focus on? Did it align with your current focus in the mass spec field?

My PhD research focused on developing novel technologies for proteomics research. Specifically, I was looking at sample preparation techniques and separations approaches. I also looked very closely at the interplay that occurs between the quality of chromatographic separations and the mass spec data acquisition rates, and how those two factors come together to influence the depth and quality of the data that you collect. I also worked a good amount with various biological collaborators, trying to adjust our technological developments to help them answer the questions that they have in their fields of more biology-focused research. What I'm doing today is very much a continuation of that (Figure 1). Every day, I'm building on the things that I learned during my PhD—I'm still working on developing proteomics technologies and also very much working with biological collaborators to generate the types of measurements that would be helpful and interpretable to them.



When you first start, you want to get your feet wet with every part of the process. Keep it broad at first, and then hone specific skills as you progress.

At her bench Evgenia outlines future experiments and lab work.

Tell us about your recent publication entitled, "Defining Mitochondrial Protein Functions Through Deep Multiomic Profiling."

This work was a massive collaborative effort. By the end of the project, it involved labs all over the world, and it actually was very long term, taking nearly seven years to complete. I worked a lot with various folks in our lab at the time, who all did a fantastic job with their parts. The goal was to try to generate a large data set that would characterize various knockout strains of human cell lines. Some of them lacked proteins of known functions—we already understand really well what they do in mitochondria. But some of the other proteins were poorly characterized; we know they exist, but we don't necessarily know what their functions are. So, the hope was to leverage the data set to make deductions about what the functions of these uncharacterized proteins might be, based on how the knockouts look in comparison to those of the proteins of known functions. This project had clear implications for human health as we were able to connect several previously poorly characterized proteins to manifestations of human diseases. It was just incredible to see how our mass spec measurements were validated by experiments that were done with actual human samples obtained from patients. It was a cool project to work on, for sure!

Why are you passionate about the specific area of mass spec that pertains to progress in sample preparation and separation techniques?

In science, there's a simple saying that summarizes my feelings about sample preparation: "Garbage in, garbage out." There is no amount of data acquisition or manipulation—or even the world's best mass spec—that's going to fix issues with sample preparation. If your sample is bad, it's just kind of over and done with. The sample is the cornerstone of any kind of good, high-quality reproducible measurements. Even though sample preparation is very critical in mass spec, it's relatively straightforward, but you just must get it right for everything downstream to work from that step. I really like separation work as well because it's a bit of an underdog that's often overlooked. But it's really that miracle of concentrating and separating the sample that enables everything that follows, especially in proteomics—it's such a key aspect. So, I really enjoy thinking about how it all plays in together.

How has being a female in the mass spec industry helped you to contribute to diversity within the field?

Like most technology fields, mass spec has been male-dominated, so when I first started attending ASMS meetings, it was very apparent to me that there were a lot of men there, and it really stood out to me right away. I started talking to people about this, including Josh Coon and our other collaborator, Professor Jessica Prenni. We quickly realized that at the time, ASMS was not tracking demographic data on the members. So, we requested some membership data from the society and used them to estimate the breakdown of males and females across different sub-areas of mass spec research. Because there were no demographic data, we had to use people's first names to deduce their genders. As you might imagine, that was not a perfect process, but it was a first attempt at estimating activities of various members in the field.

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Evgenia rests on the shore of Lake Superior after a hike at the Upper Peninsula of Michigan with hiking buddy, her dog Sallie!

We published our findings in JASMS, and since then, ASMS has actually begun to routinely collect demographic data on members and publish them every few years—it's accessible and you can actually look it up. It was our work that kind of started the conversation about diversity in the field, and once the conversation started, everyone realized that perhaps the society could use more diversity-promoting efforts to highlight not just the science, but also the people doing the science. It might be a little too soon to say exactly how much the numbers are improving as the result of these efforts, but it will be interesting to see whether there is a shift within, say, the next five-year time frame.

What are some of your interests outside of the lab?

I really love the outdoors—just spending time in nature biking, camping, gardening, or hiking. There isn't much I'd rather do than go for a hike with my dog, Sallie), who is a black lab pit bull mix. She's such a joy to be around because she's so inquisitive about the world and so excited by things outside—you can't help but enjoy yourself in that kind of company! In general, I'm a firm believer that when you work in the lab, you need to balance it by spending a lot of time outdoors. There's just something magic about doing physical activity and being in the sunshine. I also try to make frequent trips to explore U.S. national parks. With national parks, you have this fantastic nature that is so accessible by roads and trails. At least once a year, we try to go, for sure.

What advice would you give to those trying to enter the mass spec field?

When you first start, you really want to get your feet wet with every part of the process. You want to develop a reasonable understanding of how the sample preparation is done, how data acquisition is done, and how the different parts of this process talk to each other, meaning you have to develop a grasp of all parts of the process. But then, at some point, you want to pick one or two aspects and really focus on just those. You want to become an expert in those small, narrow areas, because ultimately, it's that specialized knowledge and expertise that's going to help you get a job—somebody is going to want to hire you to do those particular things. So, that's my main advice: Keep it broad at first, and then hone those specific skills as you progress throughout your time in the fieldl.