

FACES OF MASS SPECTROMETRY

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March 2026



Being Open to New Paths

Bini Ramachandran feels right at home in the world of proteomics and mass spectrometry. Although becoming a scientist was not a priority when she began her studies, Bini always enjoyed subjects with practical applications.

She also drew inspiration from her peers and their passion for science. Now, proteomics and mass spec research are what Bini lives and breathes!

Bini was first introduced to mass spectrometry while working in the lab of her PhD professor, using proteomics to perform a strain development study. She was particularly fascinated by the technological aspects of the project and the challenge of finding ways to better resolve proteins.

After a wide-ranging career journey—spanning the realms of academia and industry and traversing multiple continents—Bini now works at King's College in London as Proteomics Core Facility Manager. She was drawn to this job, in part, because King's College is a large academic institution with many facility users and a vast network that provides access to numerous mass spectrometers. The role is satisfying for Bini because it involves contributing toward a wide array of proteomics applications for students and researchers, as well as the engaging responsibility of staying abreast of technological and methodological advancements in a rapidly evolving field.

Bini is a firm believer in the power and importance of networking. Although she does not consider herself an extrovert, Bini has found that tapping into her passion for science and technology has helped her more easily engage with the mass spec community. Doing so, Bini notes, is important because it helps foster collaboration so that people with different specialties can find common ground and work together to solve problems more efficiently.

Did your interest in mass spec begin before, during, or after your master's education?

It was definitely afterward. Mass spec wasn't even on my horizon until very late into my studies, when I began my PhD. Prior to that, I was not what most people would consider a "studious" student, because I didn't enjoy subjects that required intense reading or memorizing large numbers of terms. So, my interests were much more focused on subjects that required practical application—such as physics, chemistry, and mathematics—as opposed to subjects heavily focusing on memorization and reading. Mass spec was never something that I intentionally fell into. It was, instead, an identification that came with getting exposed to it.

We understand you initially had interests in infectious disease immunology. When did you decide to switch your focus to mass spec instead?

After completing my master's, my next step was to identify a research lab. At that time, I was only looking into immunology labs. In one of those labs, they were looking into studying HIV immunology. But that didn't work out, which made me sad, because it was really exciting immunology work. I then met with my PhD professor at Madurai Kamaraj University in India, whose lab was studying mycobacterium leprae infections with clinical samples. He asked me to get involved with a bacterial strain development project before starting with my research topic, which used proteomics. At that time, I had no idea what proteomics was, but I figured it was worth trying out. We had a mass spectrometer in our lab, but in those days, they weren't nearly as sensitive or efficient as they are now. We still needed to come up with better ways for resolving the proteins using gel-based approaches. I am still very proud of how my 2D-gels resolved those complex protein mixtures to be identified by mass spectrometry. For me, that was the defining moment, because it was when I got to dive into mass spec technology. Ever since, mass spec has been my subject of choice; I have never looked back!

How did you come to your current position at King's College in London?

One of the main reasons I joined there was getting access to mass specs. Early in my mass spec journey, I started thinking of mass specs as "toys"—so, this position gave me access to lots of toys



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School students’ visit to the Proteomics Core Facility at King’s College London. Sophie Anderson, the mass spectrometry analyst at the facility, and I are engaging with the students and explaining to them how proteins are identified, quantified, and characterized using mass spectrometry. Picture taken at King’s College London. (Photo courtesy of Bini Ramachandran.)

to play around with! Also, this job gave me the opportunity to see how many different types of applications the mass spec can do, along with all of the different areas of proteomics to which it can be applied. King’s College is a very big institution—we have hundreds of in-house facility users who routinely work with us for the proteomics projects. We also have a vast network of people we work with outside of the institution, and we even get samples from outside of the United Kingdom. So, I was attracted to this position because it allows me to work with a wide variety of proteomics applications, both at present and for a new generation!

As a follow-up, what is something you find most exciting about this role?

Working in this kind of position, there’s always room for new evolution. You always get to see different advancements, and it’s never monotonous. It’s not like you can say, “I did my studies a long time ago, so now I can just continue on what I learned back then.” That’s just not how it works. You always have to learn, read, and be on top of the technology. That’s something this type of job offers you, especially during work in the service lab. Another aspect of my position that I love is getting to introduce new workflows, services, and offers. Through this, I feel like I am making real personal contributions to the path for the facility to move forward! Moreover, I love working with students, and I believe in inspiring the next generation of mass spectrometrists.

Tell us about the specific mass spec work you have done with toxicology and food allergies.

My first proteomics core lab job was in the Toxicology Unit at University of Cambridge. The work involved a lot of method development in a toxicology lab setting. My boss and I were not

toxicologists, but there is a great deal of overlap with proteomics. Mass spec can answer those questions on drug/toxin interactions with proteins and downstream effects. The area of food allergies is another field of research I accidentally fell into as a mass spectrometrists during my postdoctoral research at University of Nebraska-Lincoln. There, I developed targeted mass spectrometry methods for detection of trace amounts of milk proteins allergens in large quantities of cooked foods. It was like solving a puzzle that unfolded across several difficulty levels. For me, the “eureka” moment isn’t the solved puzzle. Instead, it’s the path that you take to solve that puzzle.

How has the value of networking helped your work in mass spec?

The kind of people you find around you is crucial as a mass spectrometrists. All too often, people stop themselves from networking, because they say to themselves, “I don’t have anything to talk about, so why bother?” But networking matters, not only in the mass spec field, but in every field. In the mass spec realm, it might start out virtual and then lead somewhere like the ASMS conferences, where you get to put faces with names. Personally, I’m not very good at small talk or casual conversation—but when it comes to mass spec, I can talk on the topic all day long! I will also point out that networking with scientists in fields other than mass spec can be very helpful for collaborative purposes. For example, although some of my past studies did involve biology, I don’t define myself as a biologist anymore. But even so, a collaboration between a mass spectrometrists and a biologist might still lead to a mass spec workflow. While we might speak different “languages,” we can still try to understand each other in a way that provides a solution to a major question or problem.



“ At the end of the day, good networking just means finding and engaging with like-minded people with whom you can discuss common interests—the technology, the science, and the passion of it all. ”

I like to travel around and take photographs when I am not “nerding” out on mass spectrometry. Mass spectrometry conferences and meetings have been one of the few opportunities to pursue both passions. Picture taken at Monterey beach, California while attending the ASMS Asilomar Conference. (Photo courtesy of Bini Ramachandran.)

Can you tell us about a technological advancement in mass spectrometry that has had a major impact on your career, or that you believe will push the boundaries of understanding in coming years?

At the way technology is now advancing, you’re getting literally thousands of proteins identified in a matter of minutes! I can remember jumping up and down because I got perhaps a hundred proteins identified during a six-month time period during my PhD. We always joke about how this technology is improving much more quickly than Smartphone technology advances on a yearly basis. It also keeps you focused on what you, as an individual, can do to help build on those technological improvements through your own work. Seeing that time scale is fascinating, because you’re able to compare what it has been in the past with what it is now—and it makes you think about what it could become tomorrow!

When you aren’t working and are outside of the lab, are you ever able to travel to other countries in Europe, or to the United States?

Apart from mass spec, my other passion is traveling. That’s actually one of the great advantages of being in the mass spec field: You get to have conferences in a lot of great places! I especially love

taking pictures during my travels. One highlight from a few years ago was seeing the northernmost part of Alaska: Utqiagvik. It was during a time of the year when there is all-day darkness. It was very rewarding as a solo traveler to just be in the wilderness on my own!

Can you share some advice for early-career scientists who might be wondering what opportunities mass spectrometry can offer them?

First, I would say that sometimes the steps you end up taking are not exactly the steps that you first wanted to pursue. As I mentioned before, mass spec wasn’t originally even on my radar—but now, it’s what I know I want to do for the rest of my life. So, it’s all about being open to paths other than the ones you first thought you’d go down. But also, going back to networking: You don’t necessarily have to be an extrovert to effectively network. I always have considered myself an introvert, but effective networking doesn’t mean always going out and literally seeing people. At the end of the day, good networking just means finding and engaging with like-minded people with whom you can discuss common interests—the technology, the science, and the passion of it all.