

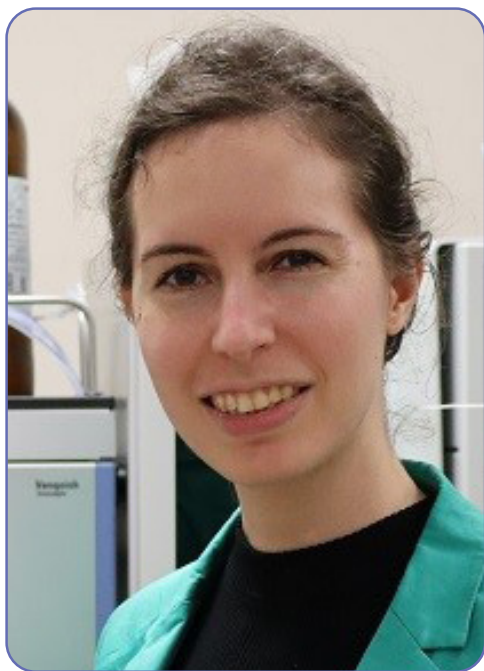
FACES OF MASS SPECTROMETRY

Laura-Isobel McCall



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Location, Location, Location

Laura-Isobel McCall is an associate professor of bioanalytical chemistry at San Diego State University. Her research combines mass spectrometry metabolomics with 3D modeling, a method she refers to as “chemical cartography.” Through this unique approach, Laura-Isobel’s work shows how understanding the spatial distribution of small molecules can help characterize the progression of certain diseases and inform drug development efforts. Much of her research focuses on parasitic diseases that disproportionately affect vulnerable populations in developing countries. One disease she has studied very closely is Chagas disease, caused by the parasite *Trypanosoma cruzi*.

Laura-Isobel began her position at San Diego State University in 2023. She previously worked as an associate professor at the University of Oklahoma. Although moving is always difficult, and she will miss her former colleagues, she is also very excited about the new role. As she notes, many students in her field are interested in industry careers, and being in San Diego provides a wealth of new opportunities for collaboration in this respect.

Both in the lab and as a mentor, Laura-Isobel believes it is important to cultivate a sense of belonging and show everyone

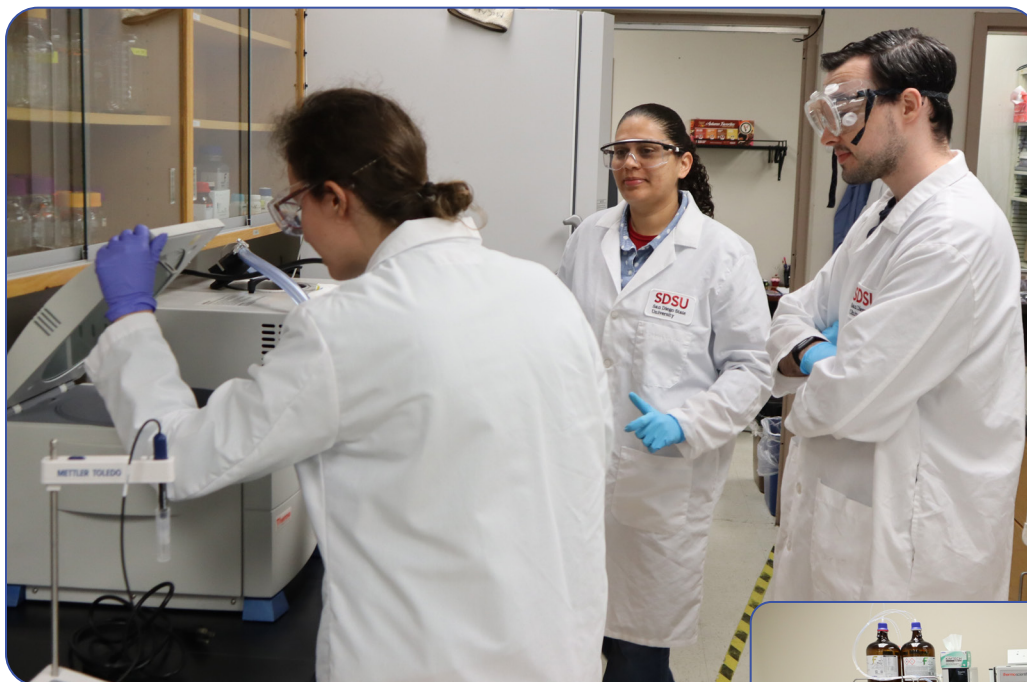
that their ideas matter. She learned to appreciate this value in part through the example set by her grandfather, who was a linguistics professor. As she explains, her own career has been tremendously influenced by mentors and colleagues who kept an open door and were generous with their time. In fact, she was introduced to mass spectrometry and discovered her interest in small molecules thanks to one such relationship!

How did you first become interested in mass spectrometry and then come to your most recent past position at University of Oklahoma?

I think it’s a good story, because it’s a story about luck and the role that it can play in a person’s scientific journey! I was in the process of completing my PhD in microbiology with Greg Matlashewski, with a focus on a single specific protein (A2). But I was always interested in big data research, so I did some proteomics on the data analysis side right after I finished my PhD. I then joined Jim McKerrow’s lab at UC San Francisco to learn high throughput screening drug development for parasitic diseases. I didn’t know anyone there doing mass spectrometry, but then Jim moved the lab to UC San Diego—and there, Pieter Dorrestein happened to be two floors above us. Pieter was the one who told me, “Don’t do proteins. You should instead do small molecules.” So, he invited me to his lab to focus on that. And that’s really how I got to do mass spec—just by chance, because the lab happened to move to UCSD. I was working in Jim’s lab primarily, but also learning mass spectrometry metabolomics with Pieter, applying those tools to the parasitic diseases that I was working on in Jim’s group. When I applied for the faculty position at the University of Oklahoma, they were looking for someone with expertise in metabolomics and an interest in the microbiome, broadly defined. And all of my work with parasites fit into what they were looking for.

What made you decide to transition to San Diego State University?

I started at SDSU in August of last year. The transition for the lab overall was more progressive, but now almost everyone from my lab in Oklahoma has arrived in San Diego. Last semester was mostly a transition semester. There’s a lot of growth happening here, so it’s a thrill to be a part of that. Many of the students and postdocs who come to my lab want an industry career. Being in San Diego brings a lot of opportunity to engage with industry. Those opportunities weren’t really available in Oklahoma, but now I can start building back those connections. I also think SDSU really cares about creating opportunities for people through research and teaching, changing peoples’ lives through both the research and the teaching aspects of the university. That being said, I definitely do miss my colleagues in Oklahoma. But we have kept in touch and still have a lot of collaborations.



Troubleshooting the speedvac. Left to right: Laura-Isobel McCall, Joseane Godinho, and Jarrod Roach. (Photo courtesy of Bryana Quintana.)

“ I try to set the tone about expectations, professionalism, and listening to people—your day-to-day interactions with your coworkers play a huge role. ”

Belos: McCall lab members in front of our new instrument. Left to right: Jarrod Roach, Monica Ness, Laura-Isobel McCall, Giovana Macedo, and Joseane Godinho. (Photo courtesy of Bryana Quintana.)



Tell us about the phrase “diseases of poverty” in relationship to your work?

The phrase “diseases of poverty” has two parts to its meaning. Number one, they are diseases that tend to develop in areas with fewer resources—they show up in people who don’t have access, for instance, to good health care, good plumbing, or good building materials. This tends to create the types of conditions where these diseases easily spread. For example, you have the parasite *Trypanosoma cruzi*, which my lab works on a lot. The insects transmitting *Trypanosoma cruzi* are more likely to get into your house or apartment if it has a lot of cracks in the building. Number two “diseases of poverty” means they are diseases where you can’t make a lot of money producing drugs for them, because patients often don’t have health insurance or much financial resources. They are also often in very isolated communities, where there’s not much financial incentive to developing treatments. This, in turn, means that we just don’t know as much about them as we know about other conditions, and the treatments that are available are often very out of date and have bad side effects. But there’s also a lot of opportunity there for academic research, because I’m not competing with the major pharmaceutical companies. I can do research that will have a real-world impact, because the bar is just set so low. It gives us a chance to really make a difference for over a billion people worldwide who have one of these diseases.

How do ideas related to spatial perspectives and cartography inform your research?

In a way, that’s the common thread throughout my research program. I have always been interested in why and where things

happen, whether it’s in the body or on a geographic or planet-wide scale. Chemical cartography really helps us explain all of that—why, for example, do you get symptoms in a specific body part? Sometimes, the solution is easy, such as saying, “You have the influenza virus, and it’s in your lungs, which is why you’re coughing and having difficulty breathing.” But other times, it’s not as straightforward—there are many scenarios where you have an infection with a parasite or bacteria in one body part, but your symptoms are in a different body part. Looking at the issue from a spatial perspective helps you understand why those symptoms happen where they do. It is also often why different patients have different experiences with the same disease, and the prognosis or treatments might therefore also be very different. It might depend on, say, whether the patient also has heart damage, large intestine damage, or skin lesions. If we understand location, it just really shapes everything overall that we know about the disease.

We understand that you serve as a mentor for younger scientists. How has your own career path influenced your approach to these relationships?

My grandfather was a professor in linguistics. Even as a small child, when I hung around with him and his colleagues, it made an impression on me, because at the young age of six or seven, they made a space for me. Although I didn’t understand much, it



“Whether you’re a high schooler or the most senior postdoc, your ideas matter.”

Laura-Isobel at a Highland Dancing competition. (Photo courtesy of Sophie-Dorothée Clas.)

still created that sense of belonging. Then, when I started my first lab job, people took chances on me. Even though I had very little experience everyone—the grad students, the lab manager, and the postdocs—all took the time to show me how to do things. I think it’s really important to bring that same kind of safe space for the people in my lab. Sure, experiments sometimes fail, and hypotheses aren’t always right, but it’s not because you don’t belong. When I was first starting out, all of my ideas were valued, and that kind of mentality is something that I try to bring to those on my team. Whether you’re a high schooler or the most senior postdoc, your ideas matter.

Tell us about some of your efforts to create a positive, diverse, and rich lab environment?

As I mentioned, a lot of it is about the idea of belonging as a child, hanging out with my grandfather and his colleagues. For me, it really created the belief that as long as you’re interested, you belong. And I’ve had the luck to work with absolutely fabulous people who also believe in creating a good lab environment. I try to set the tone about expectations, professionalism, and listening to people—your day-to-day interactions with your coworkers play a huge role. The other thing I try to do is create time for every single person in my lab, giving them all the same space and time—I want to make myself available to listen to them and hear about their experiments and ideas.

Do your interests outside the lab include any kinds of hobbies?

One hobby that I have, which might perhaps be considered unusual, is Highland dancing, which is a traditional Scottish form of dancing—think kilts, bagpipes, and swords! I haven’t had much of a chance to do that since I moved, but I’m hoping to restart it soon. I also like cooking, and I mainly serve homecooked meals for lunches and suppers; I’m quite a foodie!

Can you describe a relationship or major piece of advice that has had an impact on your career?

A lot of success really just depends on random chance and luck. In a way, moving specifically to UC San Diego was what really put me on this path. Relationships which I formed along the way, all mattered. Working with Pieter made a huge difference, because I was interested before that in omics, but I didn’t know I wanted to study small molecules until I met him. And that’s shaped everything from there—I’ve done metabolomics since then, and I’ve never looked back. So that’s really what I’d say: It’s all about great mentorship, and sometimes just a stroke of good luck.