

'A Pathway to Independence'

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By Matthew Dublin

With more than 30 years of experience running her own lab in the trenches of biology and genetics, Mary Lidstrom has had ample time to make mentoring up-and-coming investigators into a fine art. Lidstrom, who obtained her PhD in bacteriology from the University of Wisconsin in 1977, has for most of her career made the University of Washington in Seattle her primary base of operations, where she currently holds down several positions.

In addition to being a professor of microbiology, Lidstrom is the Frank Jungers Chair of Engineering in the department of chemical engineering and the vice provost of research for the University of Washington tasked with helping to support the entire university research community and foster a healthy environment for discovery. Lidstrom is also co-director of the Microscale Life Sciences Center, an NIH Center of Excellence in Genomic Sciences. So far, she has helped to kick-start an initiative at the center to recruit engineering students in research careers at the intersection of engineering and biology.

Between balancing her multi-faceted responsibilities, Lidstrom somehow finds time to focus on developing alternative, environmentally-sound chemical production and effective cleanup strategies. To do this, she is concentrating her efforts on the molecular and metabolic manipulations of methylotrophic bacteria, which are capable of growing on methane, methanol, and methylated amines. Recently her lab discovered that the bacteria contain a pathway previously thought to be found only in methanogenic archaea. This discovery sparked a whole new research area that aims to use genomics, proteomics, and expression microarrays to elucidate the evolution of C1 metabolic pathways across the bacterial and archaeal boundaries.

Mentor at work

When she's not focused on directing the efforts of her lab to further research, Lidstrom is a passionate and dedicated mentor. Since 2000 alone, she has

ushered roughly 25 PhD students and two master's students to the finish lines. This dedication was recognized by her peers back in 2006, when she was presented with the American Society of Microbiology Graduate Teaching Award for her long track record of mentoring both graduate students and postdocs. Lidstrom makes a point of always being available to her lab members with an open-door policy and the discipline to make sure everyone gets her undivided attention when they ask for it. At the same time, getting these young investigators out of the nest as soon as possible is the name of the game. "I like to build independence in my students, so I don't hover in the lab over them, but I meet with them a lot. I like to challenge them and when they're new in the lab I give them guidance, but as they develop maturity I want to see them take charge of their project themselves," Lidstrom says. "So it's a kind of a pathway to independence and as they get more senior, I give them more evaluative tasks. I give them chances to help me review papers and proposals and we discuss those kinds of things, so that's really where I am — more hands-on early on but moving people forward to independence."

Lidstrom says that what is often the most difficult thing is not to let her mothering or micromanaging instincts kick in when she sees a research project start to slide off-kilter toward a possible train wreck. "One of them is to allow people to make their own mistakes. I think that's probably the biggest challenge for me because I have a tendency to want to step in and fix everything," says Lidstrom. "So giving advice and being the coach without micromanaging, I think that's probably the biggest challenge for me." In addition, parsing out the diversity of individual strengths and weaknesses of each postdoc or graduate student in her lab and helping eventually sharpen all the skill sets in their tool belts is something she really enjoys. "Everybody brings some strengths and some weaknesses to the table ... and being able to help people balance those strengths and weaknesses is a real challenge," she says. "This is something I really enjoy — it really is one of the big passions of my career."

Once it's time for her students to leave and go on to their first professional appointment or postdoc, Lidstrom hopes that they have been fully inculcated with the value she places on teamwork and an appreciation for the different cultures in the lab. "I want them to be grounded in team and collaborative approach; it's fine to be competitive but I want them to value what other people have to bring to

the intellectual environment. I want them to value diversity of background, thought, and opinion," she says. "I also want them to have basic skills, good communication, good writing skills, and again, critical thinking." Beyond the requisite lab skills, Lidstrom wants them to be critical thinkers and not drink the Kool-Aid when it comes to current paradigms. "I want them to not buy into dogmas, because dogmas keep falling, they should always be skeptical," she says.

And while no longer directly involved in genomics research, Kelly Fitzgerald, technology manager in the tech transfer office at the University of Washington, says that Lidstrom had a profound effect on her development both as a scientist and as a person during her graduate years. Fitzgerald remembers Lidstrom's calm demeanor in the lab when dealing with students and the many demands on her time. "I always felt that if I had time scheduled with her, she was focused on helping me with the issue I brought to her," she says. "And I always felt empowered by the fact that such an accomplished woman in such high demand would take the time to listen to my tedious troubles in the lab."

Fitzgerald also remembers that the biggest challenge a young postdoc or graduate student would face in Lidstrom's lab was being pushed toward excellence and stretching beyond one's comfort zone. "During the time I worked in her lab, I grew from a timid engineer with no biology background into a biological researcher confident in my ability to do good science and to communicate well," she says. "Mary was instrumental in that change, but it wasn't due to one particular experience — it was every day, every week, spending time with me and the other students and showing us how it should be done."

Naming Names The names below represent just a drop in the bucket of the many investigators to have passed through the Lidstrom lab over the years.

Tom DeChristina. This former Lidstrom postdoc is now a professor in the department of environmental sciences and technology at Georgia Tech. DeChristina focuses on the molecular biology and biogeochemistry of anaerobic bacteria in marine and freshwater environments.

Kelly Fitzgerald. Fitzgerald cut her teeth over-expressing foreign genes in *Methylobacterium extorquens* AM1 in the Lidstrom lab. Staying close to her advisor for her postdoc, Fitzgerald moved on to the Microscale Life Science Center to develop new methods for studying single cells.

Marina Kalyuzhnaya. Kalyuzhnaya is currently a research assistant professor in the department of microbiology at the University of Washington, where she works on microbial ecology and environmental metagenomics.

Chris Marx. While in Lidstrom's lab, Marx completed his PhD on formaldehyde metabolism in *Methylobacterium extorquens*. He is currently an assistant professor of biology at Harvard University, where he uses experimental evolution to study the selective pressures and outcomes of adaptation of microbial populations.

Julia Vorholt. Formerly a postdoc in the Lidstrom lab, Vorholt worked on the metabolism of methylotrophic bacteria as a postdoc and then later at the Max-Planck Institute in Marburg. She is currently a group leader at the Swiss Federal Institute of Technology in Zurich.

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