THE AUTHOR FILE

Emma Lundberg

A large-scale comparative study of techniques to localize proteins leads to paths through cells and forests

An image can seductively suggest a biological truth. But even the most convincing image does not mean you have "visualized the truth," says Emma Lundberg. She believes, however, that truth about the exact location of proteins in the cell moves a little closer into view when researchers complement results obtained using one method with evidence from another approach.

Emma Lundberg

Lundberg directs a part of the Human Protein Atlas, an international collaboration to comprehensively explore the human proteome. As part of this effort, she has viewed over 100,000 four-color fluorescence images. She never tires of their beauty and their potential to deliver discoveries but is also wary of their seductive charm.

In an effort called the Subcellular Protein Atlas, she and her team are localizing human proteins on a subcellular level and in a high-throughput mode using immunofluorescence and fluorescent-protein tagging.

Some scientists are skeptical about the specificity of antibody-based assays, and others doubt the practicalities of systematically using fluorescent-protein tagging. Lundberg sought to address the qualms with a large-scale comparative study of both techniques. "I wanted to emphasize that both immunofluorescence and protein-tagging are very good complementary methods, you just have to know when to use what and what to be extra cautious about," she says.

In 2007, she launched the project by first comparing the two methods on a small scale, for 100 proteins, and then she and her team ramped it up to over 500 proteins. "The difficult part has been to wrap our heads around how to actually do the comparison in a fair way," Lundberg says. The results show how well each method reveals where proteins do their job in the cell, which offers the community guidelines to help it study protein function and protein interaction in networks and signaling pathways.

Lundberg plans to continue validating localizations and also to discover more detail, possibly localizing proteins to specific domains of the nucleus or cytoskeleton regions. Such insights into the cell's molecular machinery can reveal a likely spatial organization all the way down to the molecular level, she says.

In addition to her Human Protein Atlas work, Lundberg directs a cell-profiling core facility, also at the Science for Life Laboratory (SciLifeLab), a research center devoted to high-throughput biology run jointly by the Karolinska Institute, the Royal Institute of Technology, Stockholm University and Uppsala University.

She landed her group leader post following her PhD at the Royal Institute of Technology in Stockholm. At first she studied chemical engineering but quickly switched to biology, which she found more interesting.

Lundberg balances her science with adventures outdoors: snowboarding, cross-country skiing, ice skating and kayaking. Born in the hamlet of Skellefteå in northern Sweden, she says she misses the long, white, cold northern winters now that she lives in Stockholm.

Her PhD student Frida Danielsson is choosing a research career because of Lundberg's idea-filled approach to science. Her supervisor's mix of energy, compassion and calm helps Danielsson make it through twists and turns. At a conference in northern Sweden, Danielsson was stumped about an aspect of a cancer research project and requested a chat with Lundberg while cross-country skiing in the woods. Her advisor obliged. "It was a beautiful sunny day, and we had a great discussion about how to move on to the next step in that cancer work," says Danielsson.

"The difficult part has been to wrap our heads around how to actually do the comparison in a fair way."

As the science hurdles eased, they suddenly realized they had lost their way in the high mountains amid reindeer staring at them with puzzled expressions, says Danielsson. Lundberg was slated to speak shortly at the conference. Her student feared the day might become an extended, cold stay in the woods.

Then, off in the distance, Lundberg detected a chalet. There, a map helped them point their skis back to the conference center and make it back in time. "Being an adventurer like this is just how Emma is at work, too; she is always willing to take risks, and she makes everything appear so easy, even though it is not," says Danielsson. "She is not only an expert in immunofluorescence technology and subcellular localization, she is an expert, too, in localizing this positive energy that would make you feel that anything is possible."

Vivien Marx

Stadler, C. *et al.* Immunofluorescence and fluorescent-protein tagging show high correlation for protein localization in mammalian cells. *Nat. Methods* **10**, 315–323 (2013).

© 2013 Nature America, Inc. All rights reserved.