THE AUTHOR FILE

Erin Margaret Schuman

Birth-dating proteins and shaping an institute from the first building block.

Gilles Laurent

Erin Margaret Schuman

A news feed on the cell's proteins could tell scientists when a protein of interest was synthesized, which may have been 30 seconds or an hour ago, and where the protein is. In a neuron, for example, there is always uncertainty about where something was made and where it ends up, says neurobiologist Erin

Schuman, who is managing director at the Max Planck Institute for Brain Research in Frankfurt, Germany.

Schuman and her team, along with a colleague at California Institute of Technology (Caltech), can now deliver this news by visualizing newly synthesized proteins. Using their approach, the researchers showed that neurons respond to a silencing cue—the neurotoxin tetrodotoxin—by making more receptors for the neurotransmitter glutamate. She hopes the technique will help many researchers find their newly synthesized proteins of interest, and not just in neurons.

Schuman credits Susanne tom Dieck, a staff scientist in her group, for having the idea for the approach to 'birth-date' as well as label a protein. "Anything that is labeled can be retrospectively identified as having been synthesized during the labeling period," says Schuman.

For the labeling, the team applied the proximity ligation assay (PLA), an *in situ* technique that uses antibodies labeled with oligonucleotides to find a target. In PLA, the targets might be on separate proteins or on different parts of the same protein; they must be in close proximity to one another for the assay to work.

The metabolic label for the protein has two parts: an artificial amino acid that is incorporated into the protein and an element added onto the amino acid via a technique called click chemistry. "This 'clicked' element can then be recognized by an antibody that serves as one arm of the coincidence detection by PLA," says Schuman. Alternatively, the proteins can be metabolically labeled with puromycin, a molecule that latches onto the growing peptide chain and ends protein synthesis. The team then used PLA like a coincidence detector, generating signals only when the 'recently

synthesized tag' and the 'protein-of-interest tag' were in the same spot.

"We are obsessed, fascinated and in awe of the machine that is the synapse," says Schuman. Synapses, along with the rest of the neuron, store our life histories and help us interact with the environment, and do so with proteins that have a defined lifetime. "It's a bit like trying to write a memoir with disappearing ink," she says. Scientists trying to understand such synaptic feats will benefit from having more quantitative information, such as about how and where proteins at synapses are made, where they go, and many other aspects regulated by neuronal activity.

Schuman received her PhD from Princeton University, was a postdoctoral fellow at Stanford University and then joined the faculty at Caltech as a Howard Hughes Medical Investigator. She was recruited to build the Max Planck's new brain research institute. "The opportunity to shape a place from the first building block, to think about how the space influences people, their science and their lives, was irresistible," she says. "I study plasticity, and believe it is a good thing to challenge oneself with a new environment and culture."

Making the move was not an easy decision for this fourth-generation Californian, but she and her French husband, who was also recruited to the institute as a director, enjoy that their three daughters speak multiple languages and feel that the world is their space in which to move around, she says.

Every day, Schuman says she feels lucky to have the amount of independence the Max Planck Society (MPS) position affords her as director of the Department of Synaptic Plasticity. She and other directors run the institute without much hierarchy.

At MPS, she and colleagues launched an initiative to raise the percentage of female Max Planck directors to 20%. It is now 13.7% and was 11% when she arrived in 2009. She also set up the institute's new childcare facility that tends to babies as young as three months and stays open until 6:30 p.m. And, she says, "we also have a kids' room in the Institute for school-age kids to come after school."

When she finds the time, she cooks for family and friends, hosts dinner parties, reads, gardens and sews. She has also made "TFFs"—tennis friends forever. Besides playing twice a week, the group makes a yearly pilgrimage to Rome to watch the Italian Open.

Vivien Marx

tom Dieck, S. *et al.* Direct visualization of newly synthesized target proteins *in situ*. *Nat. Methods* **12**, 411–414 (2015).

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