2014

International Microscopy Congress
September 7–12, 2014
Prague, Czech Republic
www.imc2014.com

EMAS 2014 Regional Workshop
September 21–24, 2014
Leoben, Austria
www.emas-web.net

MS&T 2014
October 12–16, 2014
Pittsburgh, PA
www.matscitech.org

X-ray Microscopy 2014
October 26–31, 2014
Melbourne, Australia
www.xrm2014.com

Neuroscience 2014
November 15–19, 2014
Washington, DC
www.sfn.org

MRS Fall Meeting
November 30–December 5, 2014
Boston, MA
www.mrs.org/fall2014

ASCB Annual Meeting
December 6–10, 2014
Philadelphia, PA
http://am.ascb.org/meetings

2015

Microscopy & Microanalysis 2015
August 2–6, 2015
Portland, OR
www.microscopy.org

2016

Microscopy & Microanalysis 2016
July 24–28, 2016
Columbus, OH
www.microscopy.org

2017

Microscopy & Microanalysis 2017
July 23–27, 2017
St. Louis, MO
www.microscopy.org

2018

Microscopy & Microanalysis 2018
August 5–9, 2018
Baltimore, MD
www.microscopy.org

2019

Microscopy & Microanalysis 2019
August 4–8, 2019
Portland, OR
www.microscopy.org

More Meetings and Courses
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Carmichael's Concise Review

Myelin May Be Playing a Larger Role in Neural Transmission

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Generally we classify neuronal processes, in this case axons, as being either myelinated or unmyelinated. In the brain, myelinated axons are wrapped with several layers of plasma membranes of oligodendrocytes with layers of the lipid-rich myelin in between the membranes. Unmyelinated axons are wrapped with a few layers of cell membranes with little or no myelin in between. Physiologically myelinated processes are characterized by rapid conduction of neural impulses (information), whereas slower conduction is a property of unmyelinated processes. The reason that conduction is faster in myelinated processes is that there are gaps (called nodes of Ranvier) in the myelinated covering, and the impulses "leapfrog" from node to node much faster than a wave of depolarization moves along an unmyelinated process. It has been assumed that the interval between nodes is regular, at least for a given process. In an elegant study, Giulio Srubek Tomassy, Daniel Berger, Hsu-Hsin Chen, Narayanan Kasthuri, Kenneth Hayworth, Alessandro Vercelli, Sebastian Seung, Jeff Lichtman, and Paolo Arlotta have shown that this assumption is wrong [1]. This will change our thinking concerning the role of myelin in neural transmission.

Tomassy et al. first assessed the distribution of myelin within the somatosensory cortex of the adult mouse, a prominent model of neuronal diversity. Immunohistochemistry for myelin basic protein showed the lowest levels of myelin in the most superficial layers, an intermediate amount of myelin in the middle layer, and the most myelin in the deepest layers. Using a different stain they also found that the distance between the axon hillock and the beginning of the myelin (termed the premyelin axonal segment or PMAS) was progressively shorter in the deeper layers.

In order to directly view myelinated segments and nodes of Ranvier, studies at the ultrastructural level were required. Tracing long, winding axons through the complex milieu of the brain required the reconstruction of serial sections of transmission electron micrographs. Tomassy et al. used high-throughput electron microscopy to build high-resolution maps of myelination. Techniques

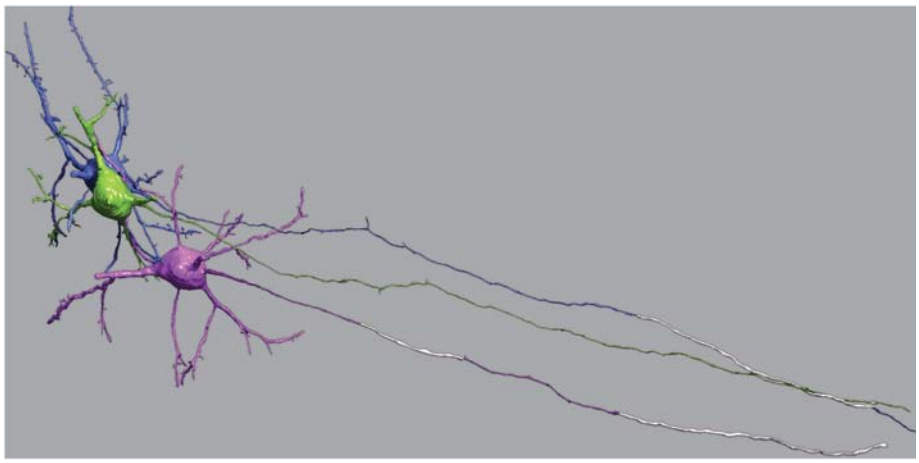

Figure 1: High-resolution rendering of three representative neurons displaying different myelination modes. The myelinated portions of the axons are white.

doi:10.1017/S1551929514000972 www.microscopy-today.com • 2014 September

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to accomplish this have only recently become available. They first found that the PMASs were longer in the more superficial layers. Additionally they found that many neurons in the superficial layers had myelinated segments interspersed with long unmyelinated segments (Figure 1), a profile never described before in the central nervous system.

These studies demonstrate for the first time that the longitudinal distribution of myelin varies among neurons, at least in the cerebral cortex. This myelination difference could well enable different arrays of communication mechanisms that in turn allow highly complex neuronal behaviors to emerge. This exciting discovery will surely lead to new concepts about how information is transmitted and integrated in the brain!

References

[1] GS Tomassy et al., *Science* 344 (2014) 319–24. Also see RD Fields, *Science* 344 (2014) 264–66.

[2] The author gratefully acknowledges Drs. Paola Arlotta and Giulio Srubek Tomassy for reviewing this article.

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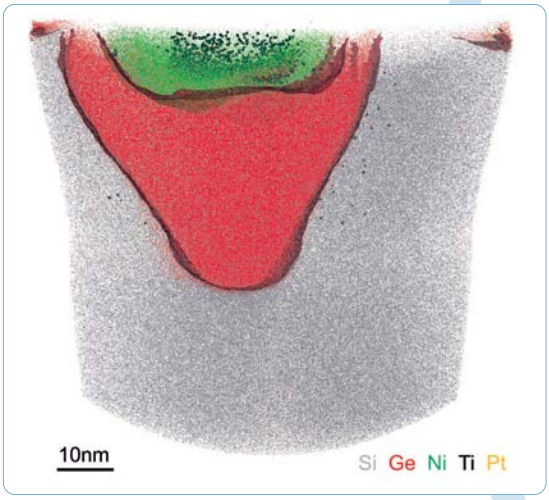
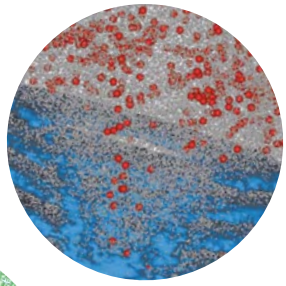
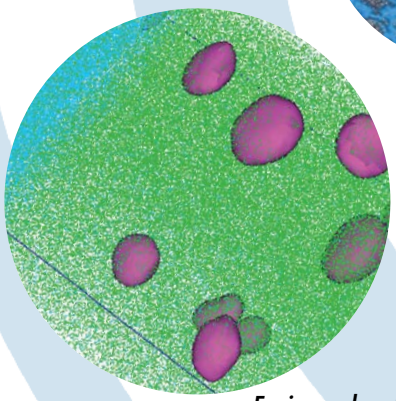


3D analysis of the source-drain region of a 28nm transistor revealing titanium and platinum doping in the nickel silicide to SiGe contact.

Amorphous materials



InGaN LED structures



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