Revealing the structure of axons

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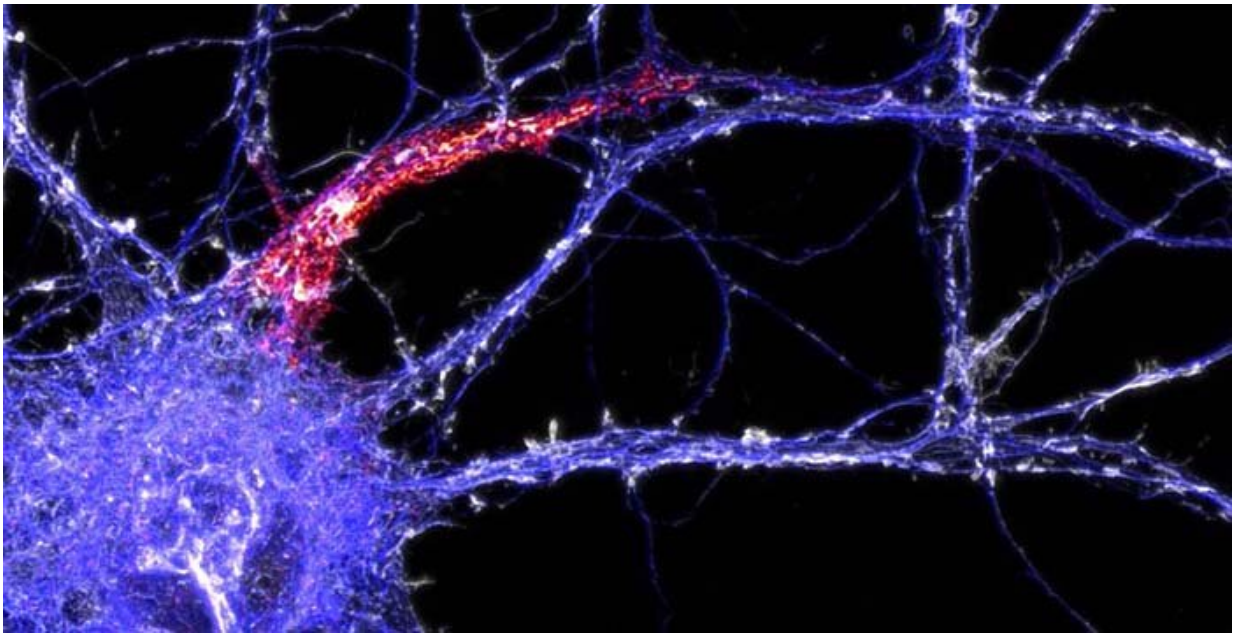

The axon of a neuron has rings of actin spaced every 190 nm by spectrins (A). Ultrasonic unroofing (B) makes the axon accessible using platinum-replica electron microscopy (PREM). This allows to visualize rings formed of two long actin filaments (magenta and arrow points, C). Using stochastic optical reconstruction microscopy (STORM) and electron microscopy (D) we can identify the actin rings (orange and arrow points) within the spectrin network. Credit: Christophe Leterrier & Stéphane Vassilopoulos/CC

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rings. By combining two microscopy techniques, optical and electronic, French researchers have now managed to observe these rings at the molecular scale. They are formed of long braided actin filaments, braided like a Christmas wreath.

Axons, the threadlike part of a nerve cell that conducts impulses, are both flexible and strong, which makes them a mystery in the eyes of biologists. Recent studies have shown that under the axonal membrane, rings composed of actin filaments give the structure its flexibility. But those studies had not been able to define the precise architecture of these rings.

By combining two microscopy techniques, optical and electronic, researchers at the Institut de Neurophysiopathologie (CNRS/Aix-Marseille Université) and the Institut de Myologie (INSERM/Sorbonne Université) have now managed to observe these rings at the molecular scale. They are formed of long braided actin filaments, braided like a Christmas wreath.

This work, which brings key new insights into our understanding of axonal architecture, was published on 20 December 2019 in *Nature Communications*.

More information: Ultrastructure of the axonal periodic scaffold reveals a braid-like organization of actin rings. Stéphane Vassilopoulos, Solène Gibaud, Angélique Jimenez, Ghislaine Caillol et Christophe Leterrier. *Nature Communications*, Dec 20, 2019. DOI: 10.1038/s41467-019-13835-6

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