TOWARD NANOWARE DEVICES

--utilizing nanofibers--

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PREAMBLE

Adjustment and control of nanofiber diameter.

A powerful way to see atoms inside segments of polymer molecules.

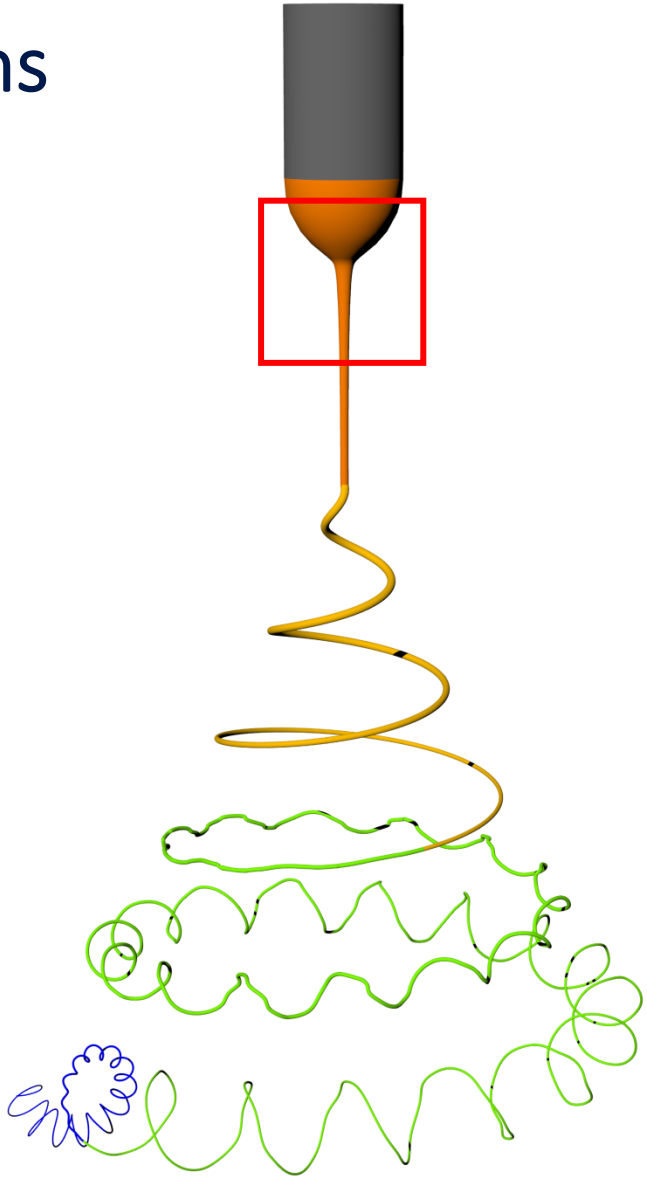
Polymer molecules that are fundamental to biology and life.

What evolved protein molecules can do with electric forces.

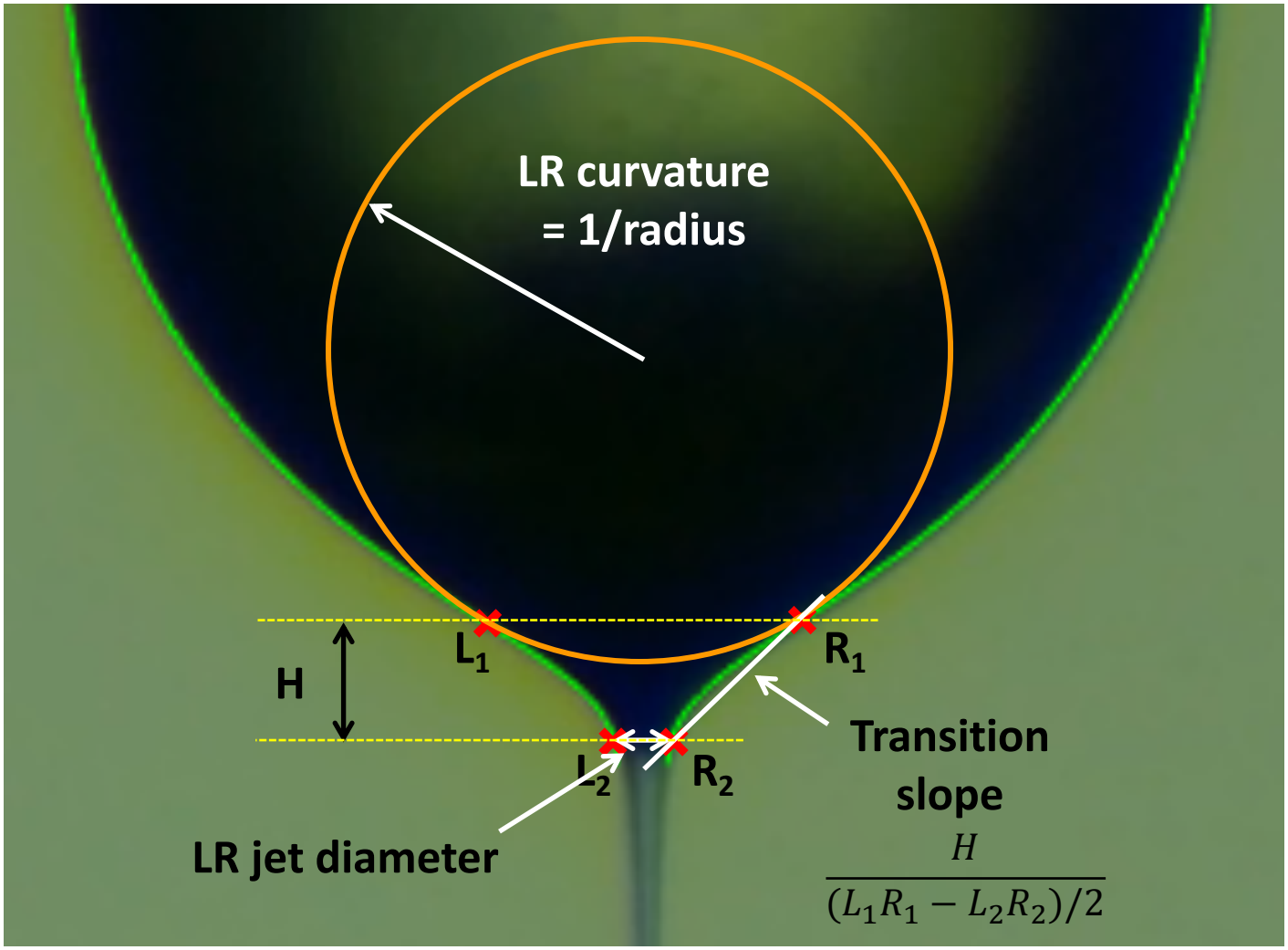
Leading to scaffolds and devices for biological applications.

Adjustable Control of Nanofiber Diameter

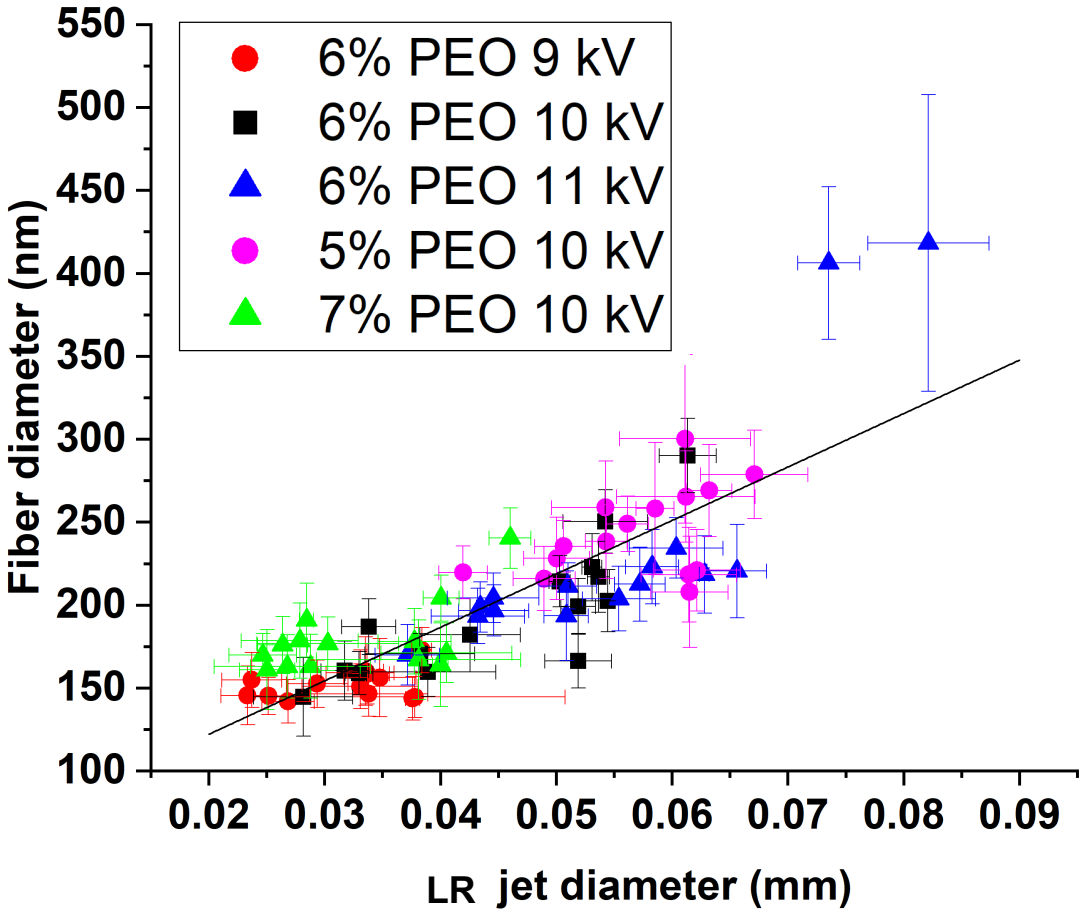
Transformations



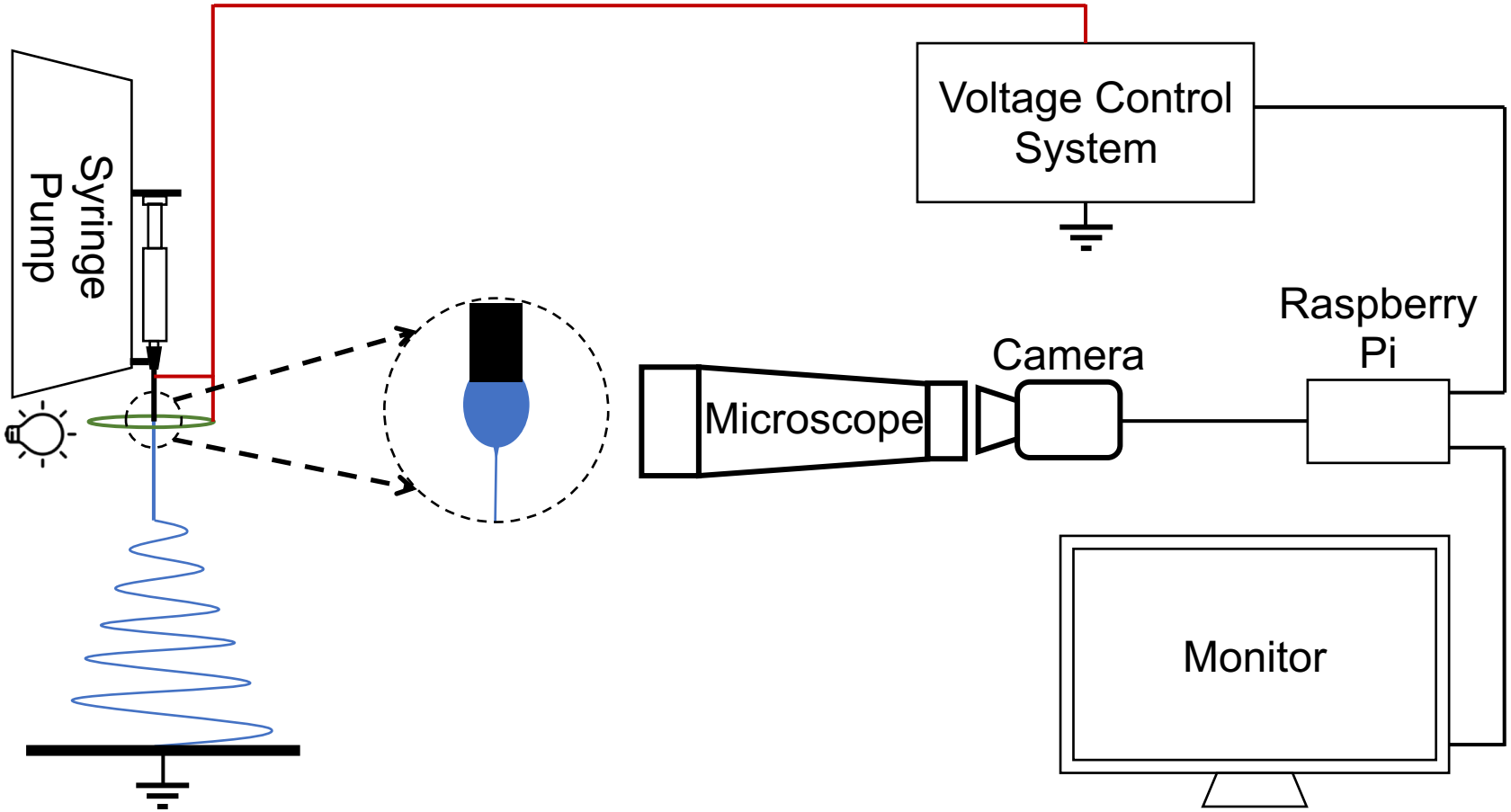
Definition of three shape parameters



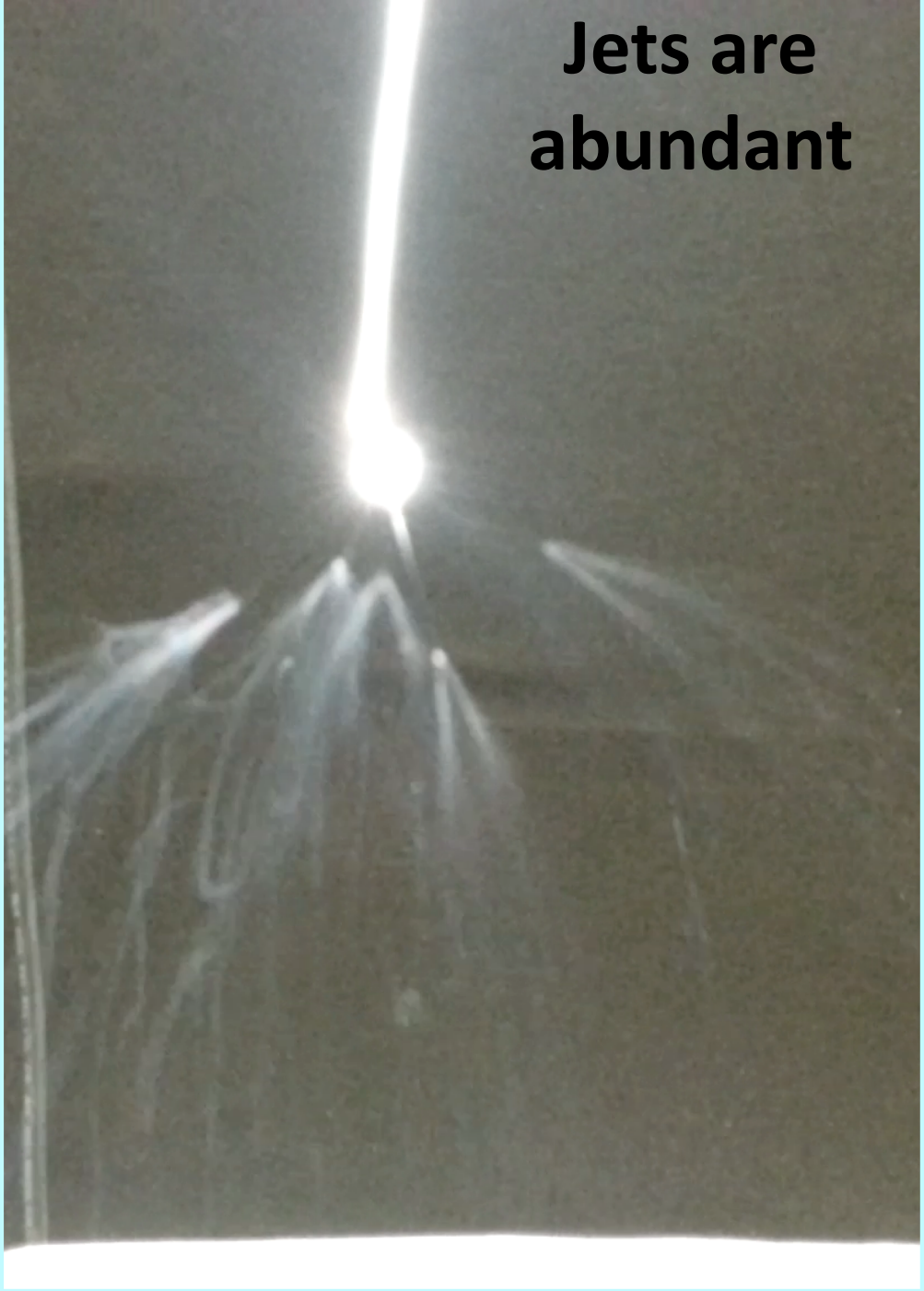
Correlation between fiber diameter and initial jet diameter is not affected by the variation in voltage or in the concentration of polymer solution



Online controlled electrospinning



Inside nanofibers


Jets are
abundant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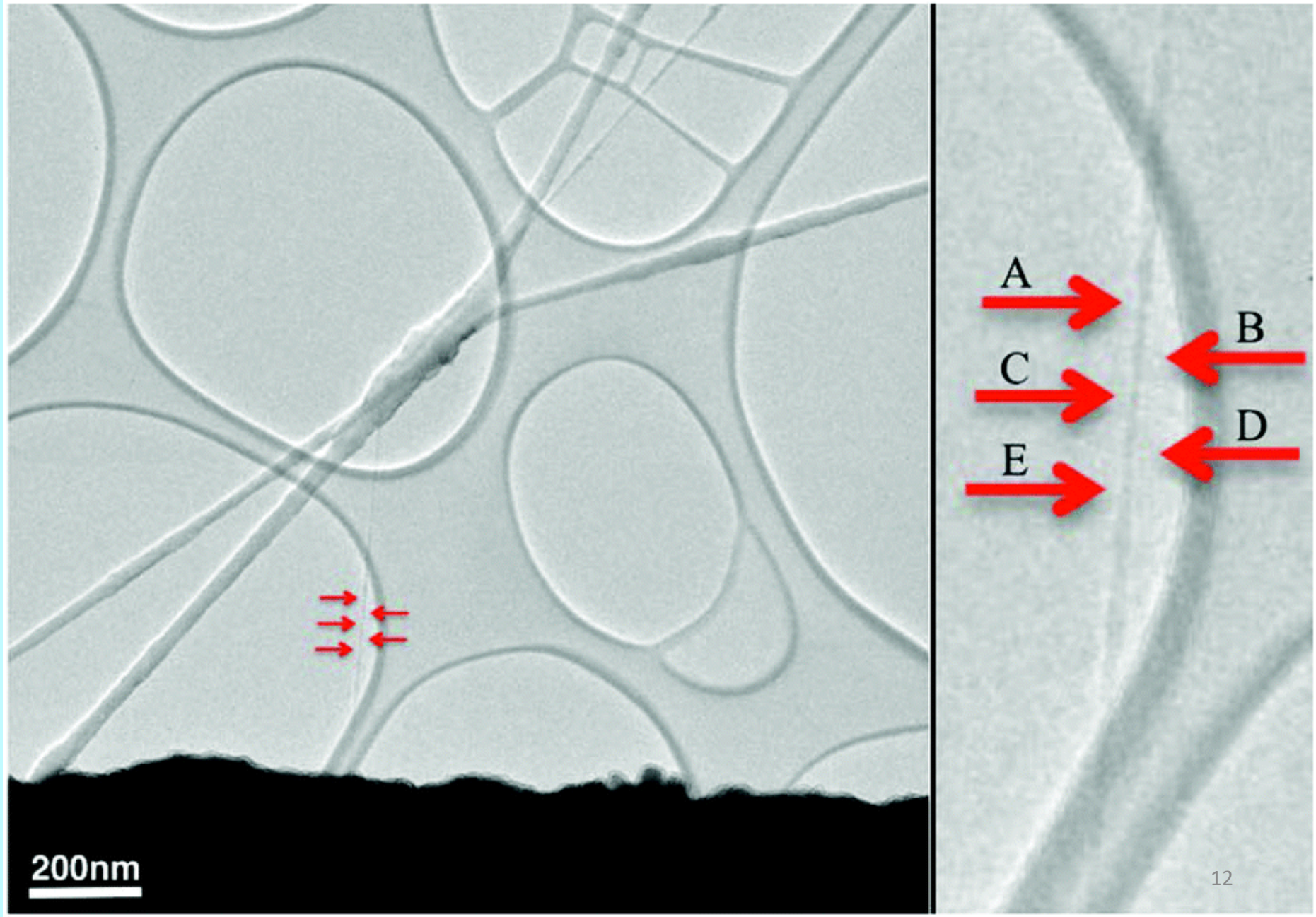
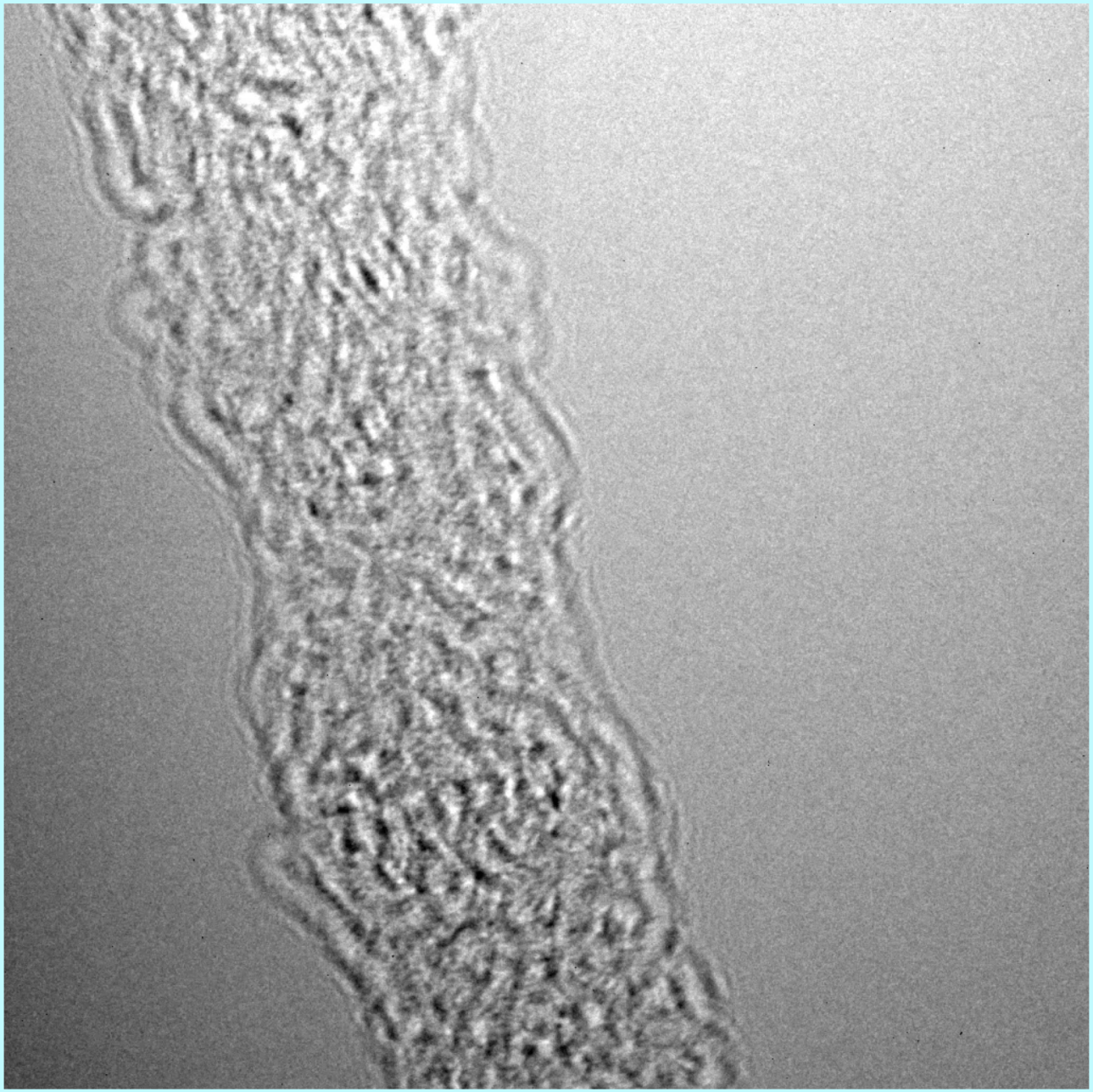
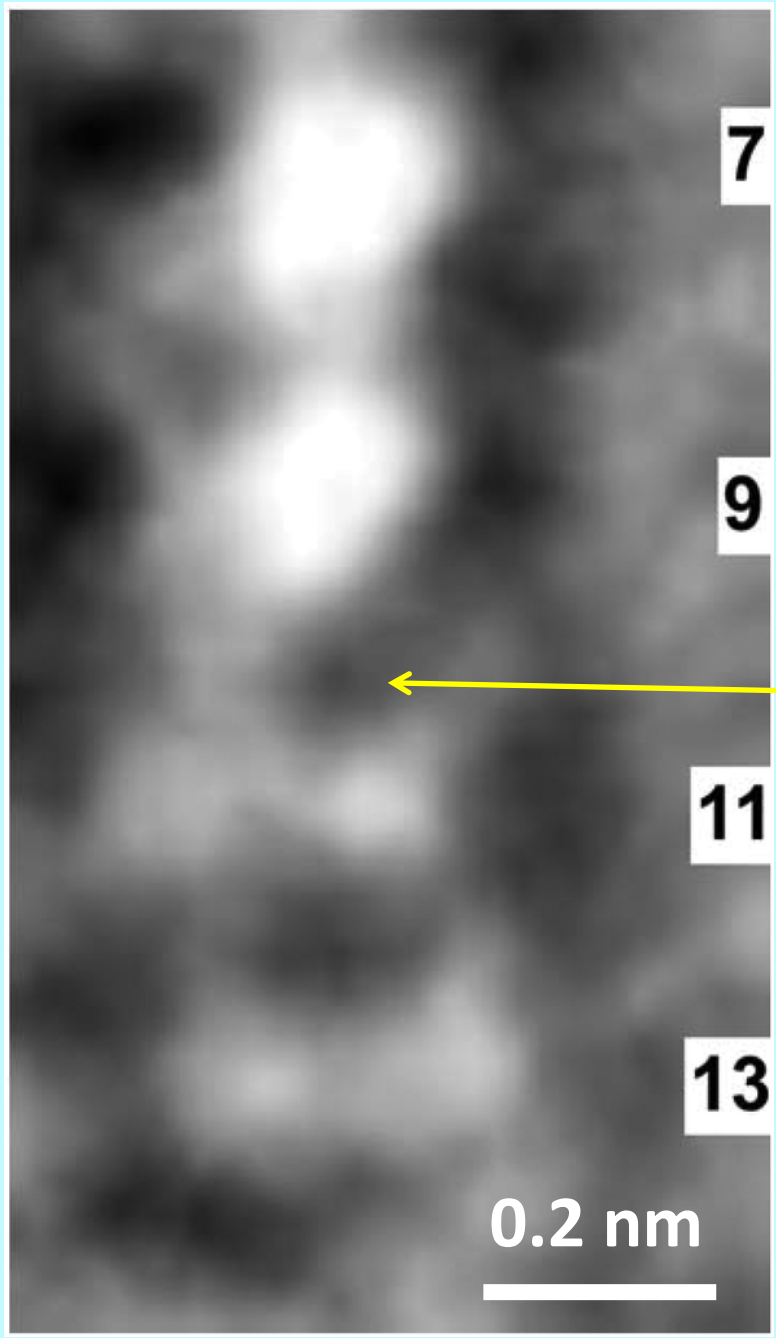
Grid, lacey film, nanofibers, thinner nanofibers



Movie (through focus)



Twisted and bent PVDF molecule



7 and 9 each show two superimposed fluorine atoms.

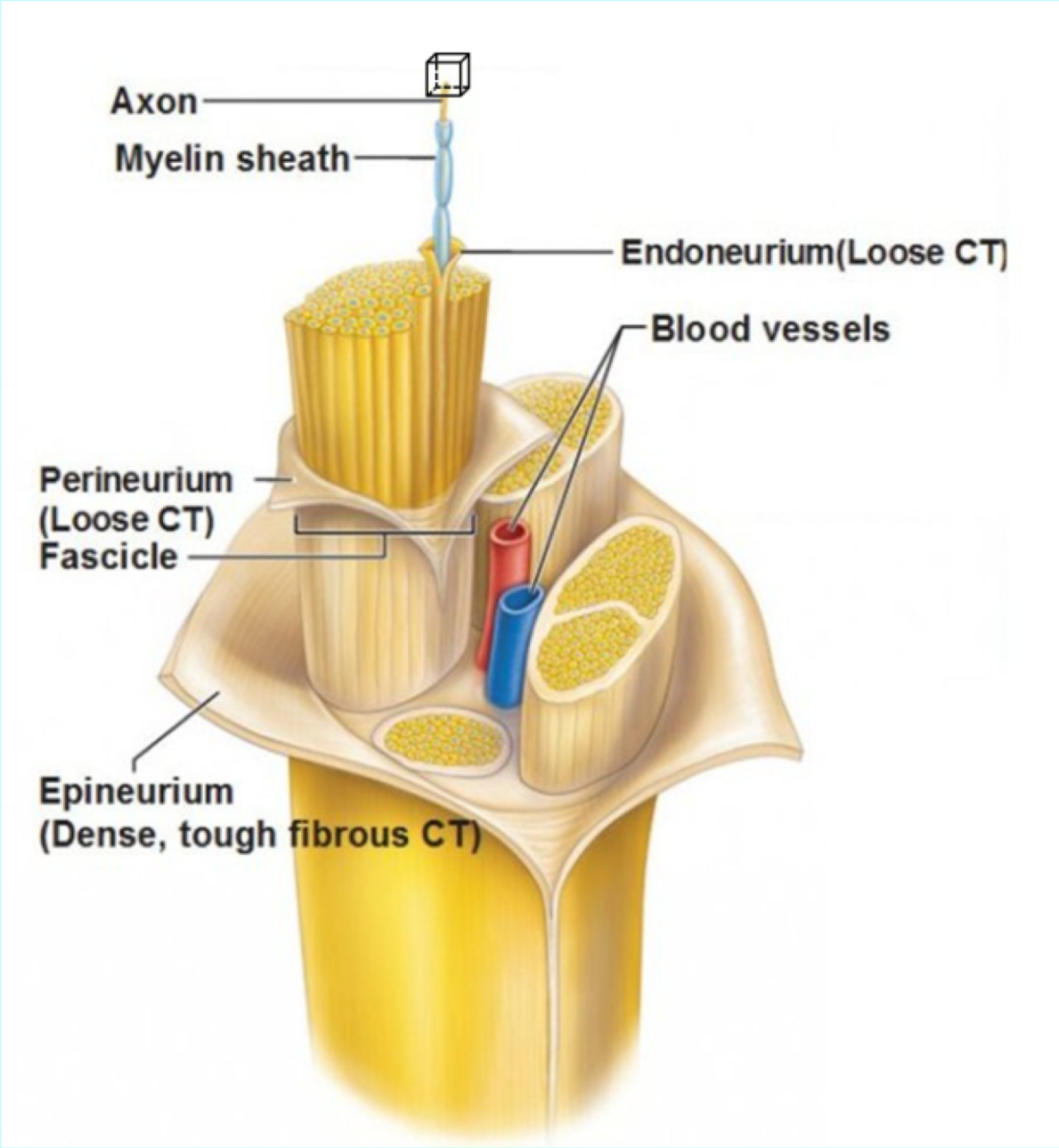
Twist

The four dimmer dots at 11 and at 13 are fluorine atoms separated by a center-to-center horizontal distance of 0.2 nm (2 angstroms).

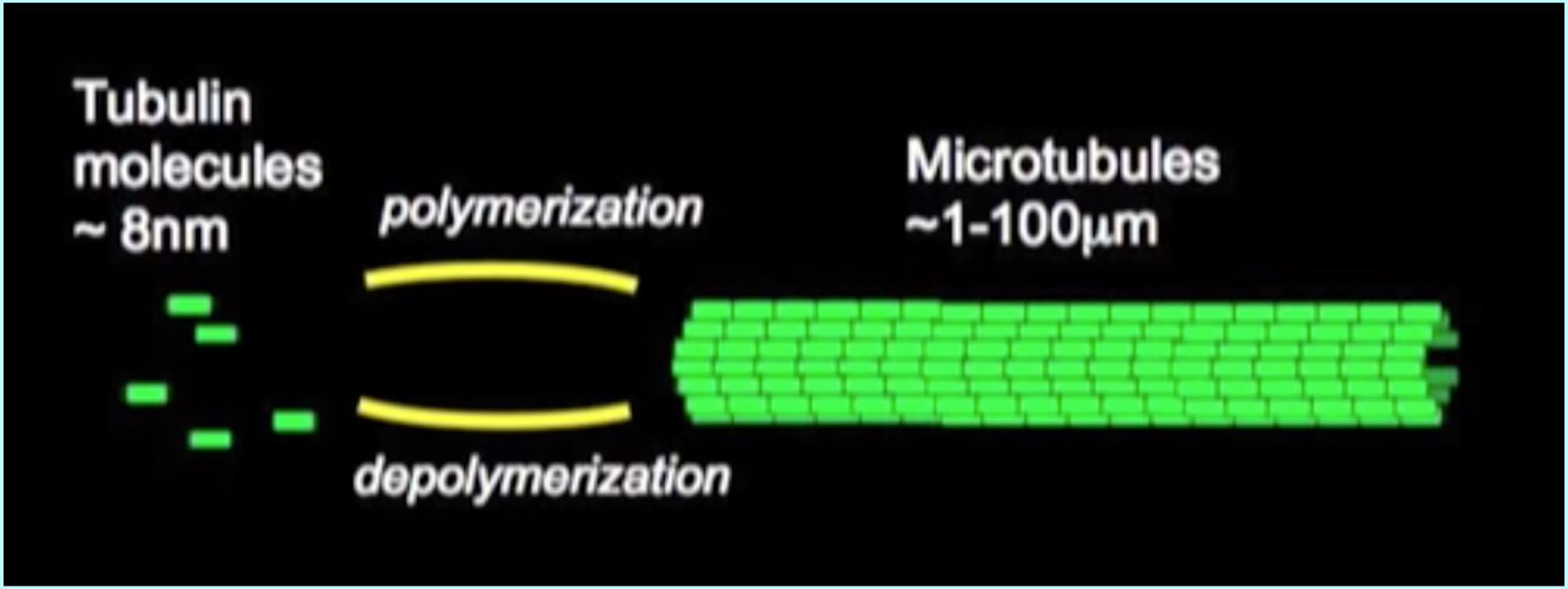
Nanoware

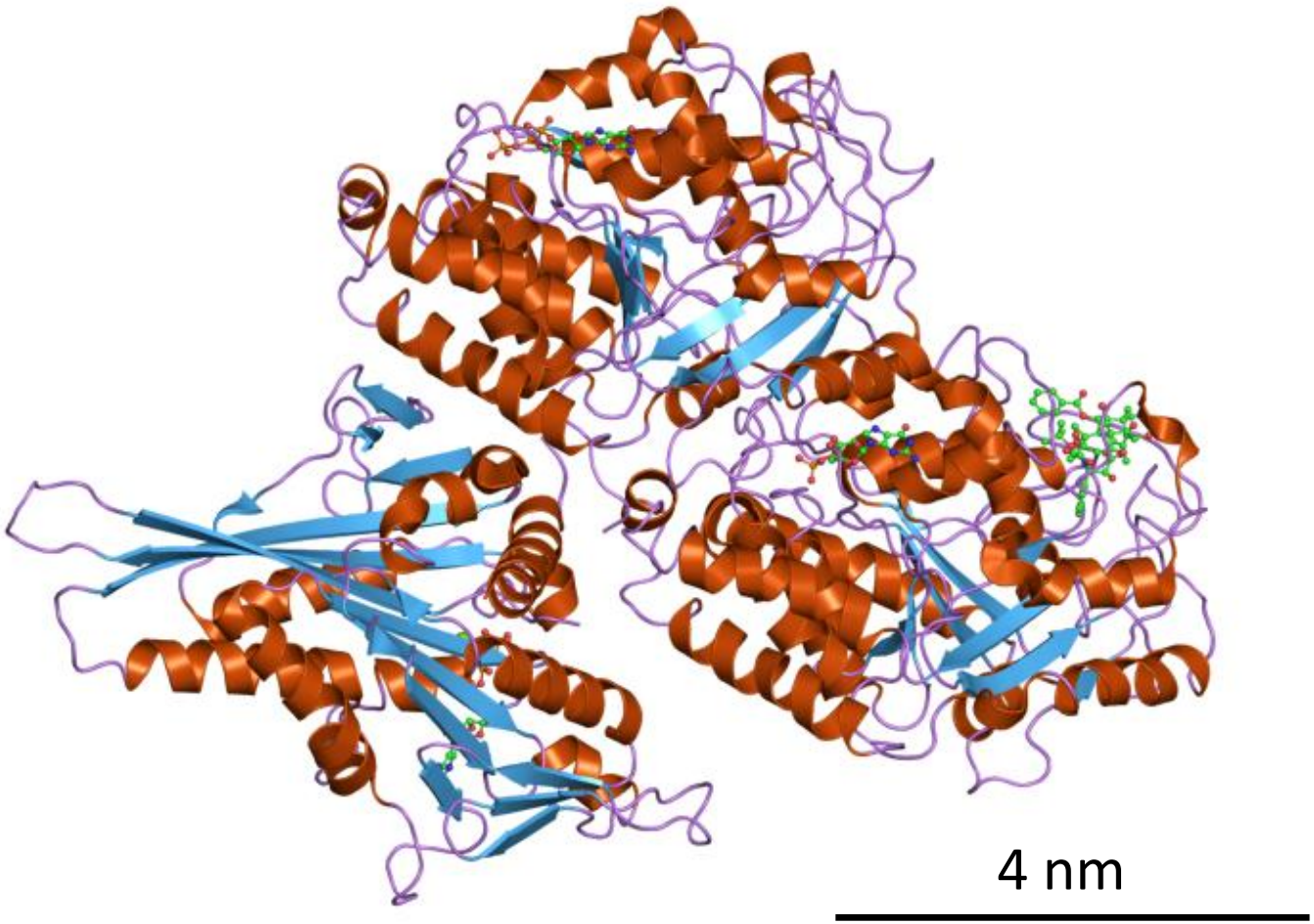
such as **conducting nanofibers** which function like evolved protein in eels and nerves

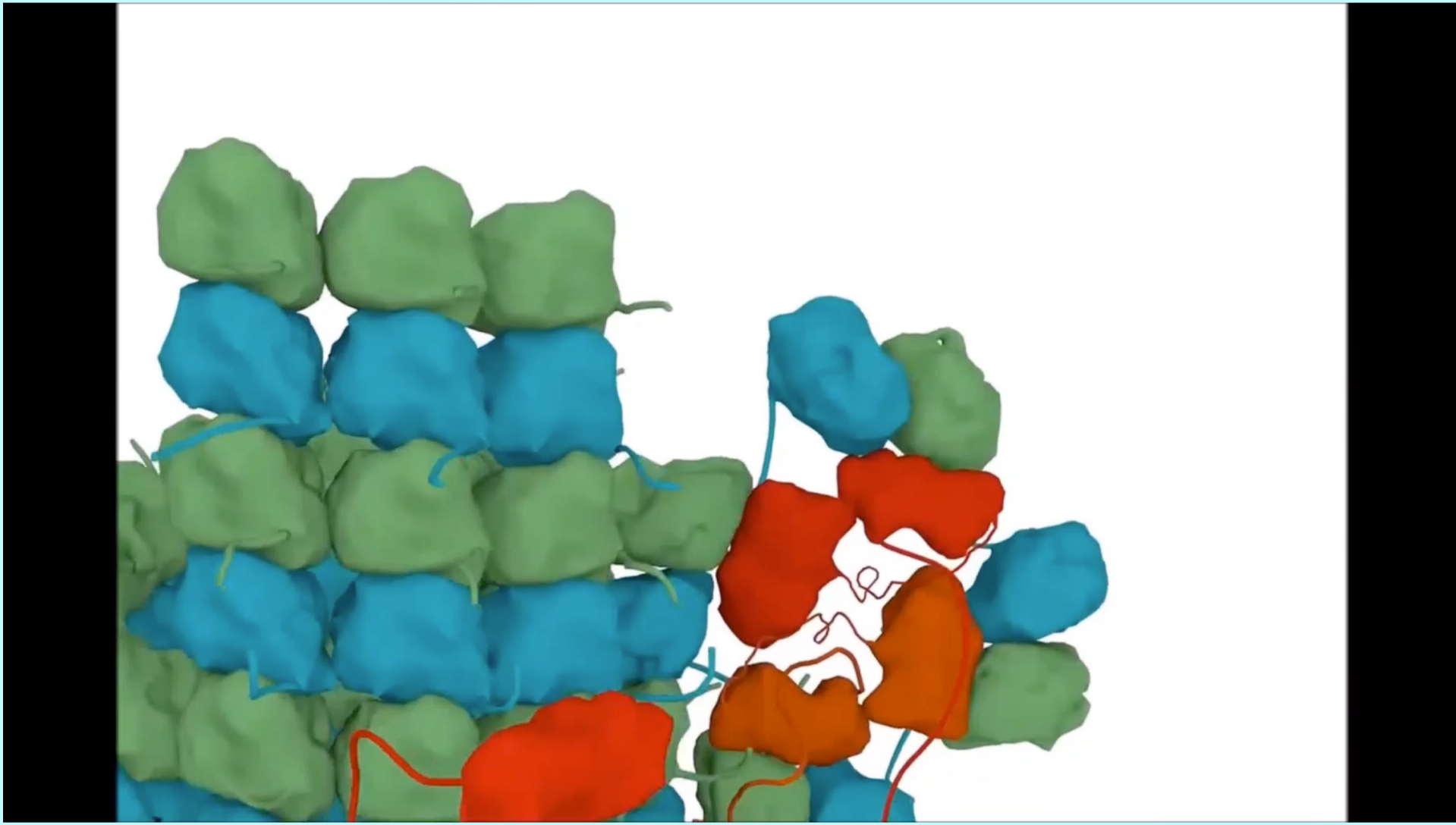
Catania, Kenneth. "The shocking predatory strike of the electric eel." *Science* 346, no. 6214 (2014): 1231-1234.



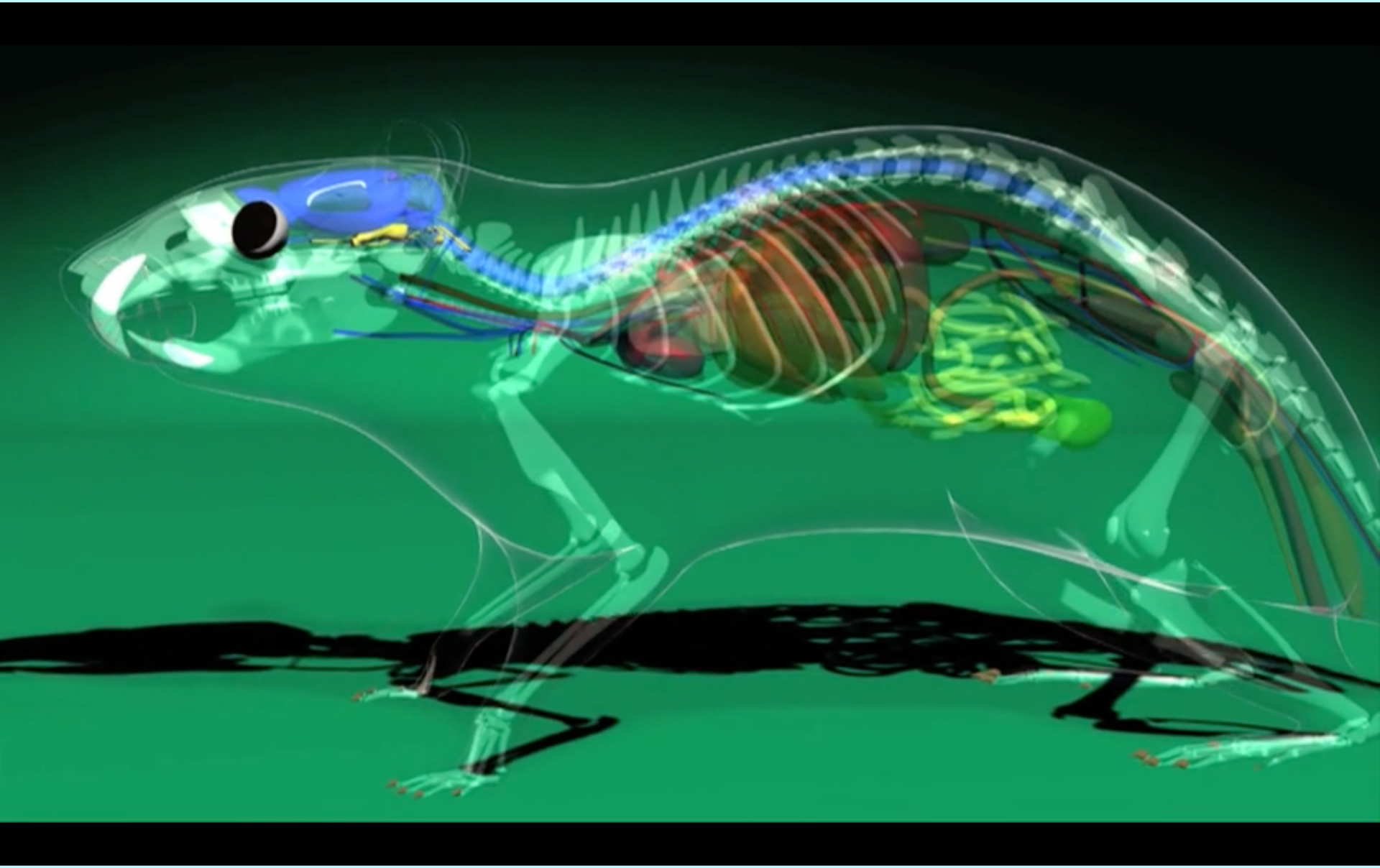
Fundamentals of the Nervous System and Nervous Tissue. https://antranik.org/fundamentals-of-the-nervous-system-and-nervous-tissue/ (accessed Nov 1, 2019)

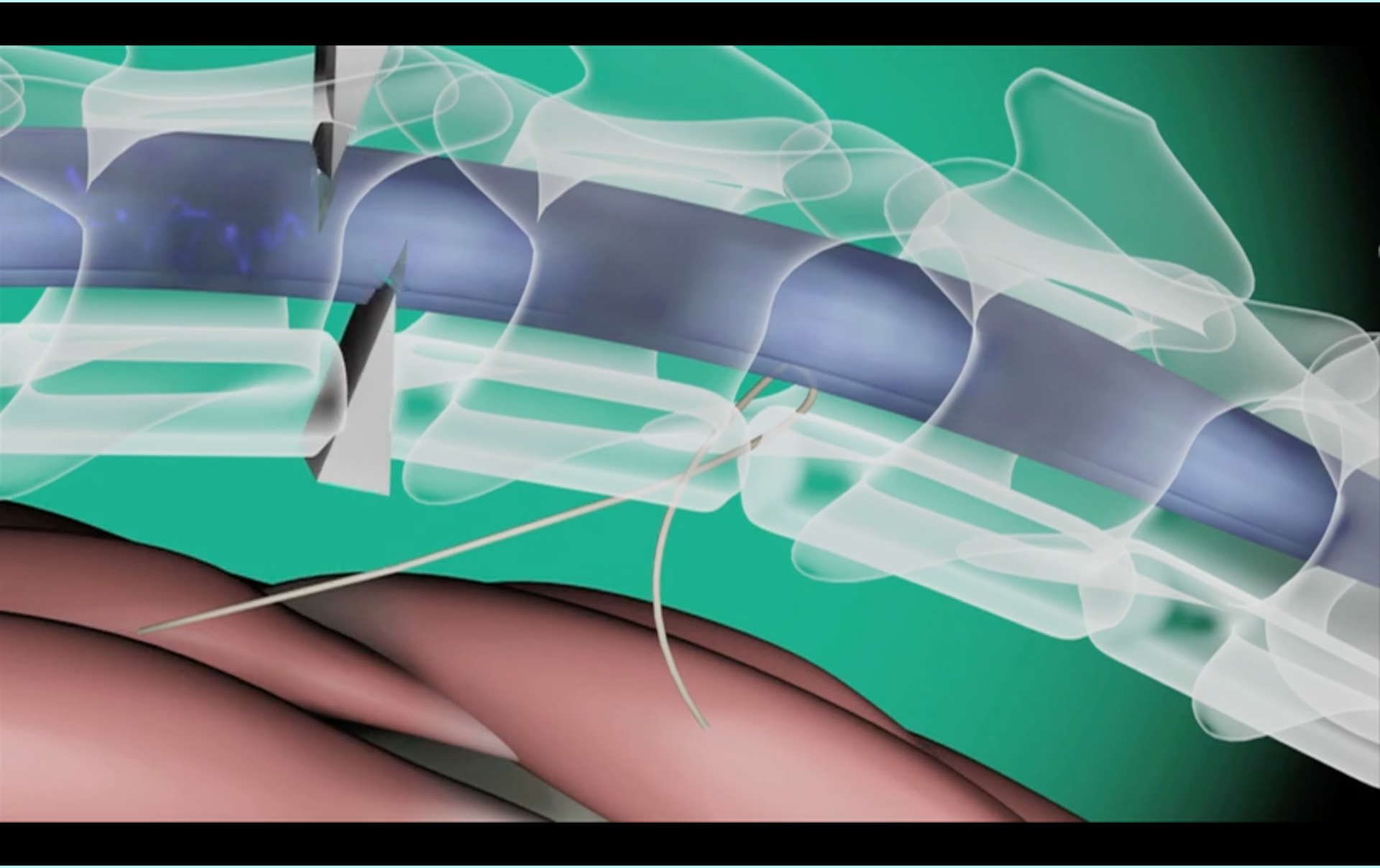

Tubulin
molecules
~ 8nm
polymerization
depolymerization
Microtubules
~1-100μm

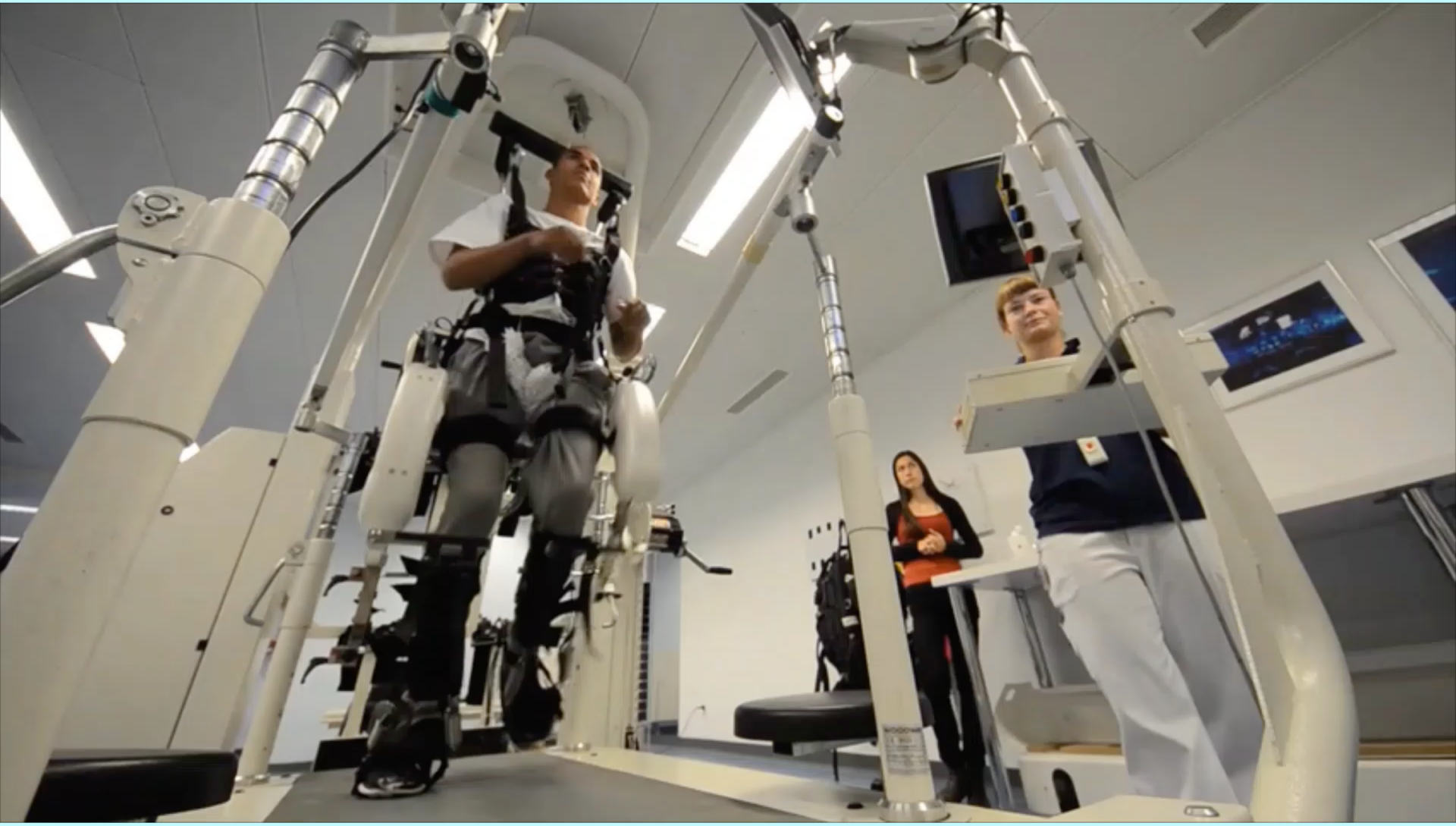

4 nm




REPAIR OF
CUT NERVES
Grégoire Courtine
Swiss Federal Institute of technology (EPFL)







Could we use bundles of conducting nanofibers to splice severed nerves, to restore function without all the external hardware?

Acknowledgements

- All my students and postdocs
- Colleagues
- The University of Akron
- Donghua University
- Everyone who has inspired me, criticized me, used my work and from whom I have adopted ideas

You saw atoms inside segments of polymer molecules.

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THE END