## Life Sciences Seminar

# The mechanical control of neuron shape and function

**Michael Krieg**
institute of photonic sciences Castelldefels, Barcelona

Host: Carl-Philipp Heisenberg

All animals and plants, even protozoa, have evolved specialized molecular sensors that convert mechanical stress into behavioral responses. The touch receptor neurons (TRNs) in Caenorhabditis elegans respond to gentle body touch and are especially well characterized on a physiological and ultrastructural level, a knowledge which is unavailable in other animals. Moreover, C. elegans is a unique model organism to study the mechanics of neurons due to their simple shapes, the known wiring diagram and a rich repertoire of simple behaviors, thus permitting a systems perspective on cell function. As in other animals, neuron morphology is critical for function in C. elegans. Some neurons are highly branched and curved, while others are extremely straight. How the constituent molecules of these different neurons establish a functional organization and how nanometer sized molecules can determine cell shape in the millimeter scale is still not understood. To establish this paradigm, we first analysed different mutant neurons defective in spectrin and tau cytoskeleton, which undergo reformations highly reminiscent of a twisted, elastic thread under compression and modeled their shapes using a discrete elastic rod modelborrowed from differential geometry. We then used electron, STED and force-FRET microscopy in conjunction with mechanical measurements to test the predictions from the model and found that a balance of axial tension, bending rigidity and mechanical torque ensures that long slender axons comply smoothly under external stresses. At the end Ihighlight, how these mechanical parameters influence neuronal function during the sense of touch.

## Wednesday, September 20, 2017 11:00am - 12:00pm

Meeting room 1st floor / Central Bldg. (I01.1OG - Zentralgebäude)

---

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station.
Please find a schedule of the ISTA Shuttle on our webpage:
https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.