



Istituto Nazionale di Neuroscienze
Consorzio Interuniversitario di Neuroscienze



UNIVERSITÀ
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Dipartimento di Neuroscienze
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NICO

Neuroscience Institute Cavalieri Ottolenghi

INN Open Neuroscience Forum

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Neuroscience Institute Cavalieri Ottolenghi

Seminar Room - Regione Gonzole 10 Orbassano (TO)

Cortical connectivity: axonal tracing, diffusion MRI and dynamics

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Host: Prof. Alessandro Vercelli

Abstract:

One of the strongest, time-honored structural-functional relations in the neurosciences is that between axon diameter and conduction velocity of action potentials established by Hirsch (1939) in a foundational study, supervised by Gasser, Grundfest and Lorente de No, at Rockefeller University. This relation was an essential building block in Erlanger and Gasser's structural/functional classification of peripheral nerve fibers leading to the attribution of Nobel Prize to Gasser in 1945. Over the last few years the analysis of axon diameters and conduction velocities was extended to the central nervous system using a combination of histological techniques coupled to the computation of axonal conduction velocities and axonally generated conduction delays. The overall picture is that the brain consists of axonal pathways conducting at different velocities and generating different conduction delays between brain sites. Diffusion MRI is overcoming severe obstacles to provide a reliable picture of brain connections, including estimates of axon diameters. A bewildering dynamic view of brain function is emerging where axons become the agent of fundamental computations particularly in the temporal domain. These studies of axons have prompted some functional interpretations although other aspects, raise open questions.

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