



Arboreal Mind: Finding Self in Nerve Cell Branching

Giorgio Ascoli

The importance of neuronal morphology, i.e. the tree-like shape of nerve cells, in modern neuroscience is rooted in two foundational aspects. On the one hand, dendrites and axons mediate respectively the functional input and output of neurons. On the other, they constitute the essential substrates for network connectivity. To connect this level of scientific analysis to the philosophical problem of the mind-brain relation requires a radical shift in the current research paradigm to include first-person (subjective) experience as a legitimate topic of empirical investigation. To date, the exact neural correlates are not yet known for any conscious function. However, two general principles are commonly (if implicitly) believed. First, mental states (thoughts, feelings, memories, intentions, etc.) consist of spatio-temporal activity patterns in networks of neurons. Second, learning, meant as the acquisition of the potential to instantiate a previously unknown mental state, corresponds to the formation of new connections among neurons, enabling the activation of the new spatio-temporal pattern underlying said mental state. In this talk, I will introduce the notion that the branching structure of neurons provides a fundamental physical underpinning for a key cognitive function, namely the capability to learn. In particular, I will explain that this capability is far from trivial and that any individual can typically only acquire a fraction of the relations that can in principle be known. Moreover, I will illustrate how the spatial architecture of axons and dendrites provides a crucial constraint (and insight) on the capability to acquire knowledge. The seminar will be kept at a lay level because subjective experience and tree shapes are accessible to all humankind.

Dr. Giorgio A. Ascoli received a Ph.D. in Biochemistry and Neuroscience from the Scuola Normale Superiore of Pisa, Italy, and continued his research at the National Institutes of Health in Bethesda, MD, to investigate protein structure and binding in the nervous system. He moved to the Krasnow Institute for Advanced Study at George Mason University in 1997, where he is University Professor in the Molecular Neuroscience Department. He currently heads Krasnow's Computational Neuroanatomy Group. Dr. Ascoli is specifically interested in the description and generation of dendritic morphology, and in its effect on neuronal electrophysiology. In the long term, he seeks to create large-scale, anatomically plausible neural networks to model entire portions of a mammalian brain (such as a hippocampal slice, or a cortical column). Dr. Ascoli's interests also involve lucid dreaming, human consciousness, and protein structure and binding in the nervous system.

Saturday, Dec 11, 2010

1:30 pm

**National Science Foundation, Room 110
4201 Wilson Boulevard, Arlington, VA
FREE admission – Everyone welcome,
members and non-members**

For more information, call the 24-hour NCAS Sceptic Line recording at 301-587-3827.

ncas@ncas.org

www.ncas.org



National Capital Area Skeptics Public Lecture Series
20/20 since 1987

NCAS is a 501(c)(3) not-for-profit organization which promotes critical thinking and scientific understanding.

NCAS ... for good **reason**