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Biology

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Born in 1982 in Athens

Studied Biology at the University of Athens and Bioinformatics at the Universitat Pompeu Fabra, Barcelona

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PROJECT

The Deep Evolutionary Origins of the Nervous System

The origin of intelligence and consciousness has long captured human imagination. We are gradually acquiring the molecular analytical tools and data to disentangle the evolutionary origins of the nervous system. The first nervous system emerged early in the evolution of animals and led to the physiological and behavioral complexity that characterizes animal life. Neurons, the basic building blocks, evolved as specialized cells interconnected by synaptic junctions, transmitting signals by electrical and chemical means. The system diverged in the various metazoan lineages together with their specific traits and adaptations. The study of the biochemistry of the nervous system, as well as of eukaryotic diversity, by means of systematic sampling efforts and genome sequencing projects, is providing the comparative basis to look at the problem from an evolutionary perspective. Core synaptic proteins have been found in single-celled and colonial organisms, suggesting that the origin of part of the molecular machinery of the neuron predates the emergence of the neuron itself. As in all major biological transitions, in the first steps, preexisting modules, combined with innovation within a novel context, resulted in increased complexity. During my stay at the Wissenschaftskolleg, I intend to establish a framework for the study of the evolutionary origins of the nervous system, through the history of its molecular components. I imagine the system broken down into a) a proteome component widely shared across animal phyla and beyond, of more ancient inferred origin, b) an animal-specific component, emerging together with the proto-neuron and the proto-synapse, and c) lineage-specific components of more recent origin. Based on the corresponding genes incorporated in the different stages, my objective is to reconstruct a timeline of the distinct functionalities integrated during the evolution of the animal nervous system.

Recommended Reading

Pittis, A. A. and T. Gabaldón (2016). "Late acquisition of mitochondria by a host with chimaeric prokaryotic ancestry." Nature 531, 7592: 101.

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Burkhardt, Pawel and Simon Sprecher (2017). "Evolutionary origin of synapses and neurons - bridging the gap." BioEssays 39, 10.