

Alumni of the BRAIN and MIND Sciences Seminar Series



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που οδηγεί σε Μεταπτυχιακό Δίπλωμα Ειδικότητας
*INTERDISCIPLINARY GRADUATE PROGRAMME in the
BRAIN and MIND sciences*
leading to Master's degree



Dual architectures of dopamine regulation for behavioral flexibility.

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Research Scientist,

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Thursday, May 21, 2026

14:00-15:00

[Alumni of the BRAIN and MIND Sciences Seminar Series ZOOM LINK](#)

Meeting ID: 898 1282 5746

Passcode: 703942

Info: Vassilis Raos, 4512, raos@uoc.gr



<http://brain-mind.med.uoc.gr>



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<https://uoc-gr.zoom.us/j/89812825746?pwd=dMF6fnZazDjbsWVU3MMsr3jEnmPqsW.1>

The speaker:***Iakovos Lazaridis***

BSc in Molecular Biology, University of Hertfordshire, UK, 2001; MSc in Immunology and Immunogenetics, University of Manchester, UK, 2003; MSc in Brain and Mind Sciences, University of Crete, Greece, 2007; PhD in Brain and Mind Sciences, University of Crete, Greece, 2011; Thesis: “Neurosteroid-neurotrophin receptor interactions and neuroprotective mechanisms in experimental models of neurodegeneration”; Postdoctoral Fellow, Department of Neuroscience, Karolinska Institutet, Sweden, 2011-2017; Research Scientist, Karolinska Institutet, Sweden, 2017-2021; Research Scientist, McGovern Institute for Brain Research, Massachusetts Institute of Technology, USA, 2021-present.

My research interests center on the circuit mechanisms by which the basal ganglia support reinforcement learning, action selection, and behavioral flexibility in changing environments. A major goal of my work is to understand how dopaminergic signals are regulated across parallel basal ganglia loops to shape learning and motivation. My current work focuses on two complementary control systems: pathway-defined striosomal feedback circuits and astrocyte-mediated local dopamine feedback. Together, these mechanisms modulate dopamine dynamics and behavioral state transitions in the dorsal striatum.

Summary of the presentation:

Basal ganglia circuits support reinforcement learning, action selection, and behavioral flexibility, operating across parallel cortico-basal ganglia-thalamo-cortical loops and across multiple time scales. Dopamine is central to these processes, but a single, uniform dopamine signal is unlikely to provide the specificity and temporal structure required to regulate distinct computations in distinct loops. In this talk, I will present a dual-architecture framework for dopamine regulation that matches this control requirement. First, using projection-defined circuit mapping and perturbations, we show that striosomal D1 spiny projection neurons directly target substantia nigra pars compacta (SNpc) dopamine neurons, whereas striosomal D2 neurons influence SNpc indirectly through a central external globus pallidus node, forming opponent pathways with distinct effects on dopamine and action selection from canonical matrix circuits. Second, using *in vivo* recordings and manipulations, we show that dorsal striatal astrocytes preferentially track disengagement and re-engagement state transitions rather than trial outcomes. Dopamine transients precede astrocytic events, nigrostriatal dopamine recruits striatal astrocytes through Drd2-dependent signaling, and astrocytic activation is followed by prolonged astrocyte-dependent adenosine release, identifying a local feedback system that converts phasic dopaminergic input into longer-lasting regulation of dopamine release and striatal state. Together, striosomal feedback and astrocyte-mediated gating provide complementary circuit- and state-dependent control of dopamine, enabling channel-weighted teaching and behavioral flexibility.