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Towards personalized medicine: investigating Parkinson's disease by patient-derived midbrain organoids

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One of the most exciting advancements in stem cell research of the last few years has been the development of human brain organoids. This in vitro system consists of multiple cell types that can self-organize in three-dimensions representing a brain region able to recapitulate physiological and pathological relevant aspects. Compared to animal models, patient-derived organoids provide emerging prospects for testing new drugs and developing precision medicine. Human midbrain organoids (hMBOs) can mimic the sunstantia nigra, the brain region that degenerates in Parkinson's disease (PD), including the complex interaction of dopaminergic neurons with other types of neurons and glial cells. In this work, we characterized hMBOs derived from healthy subjects and PD patients carrying monogenic mutations identified to cause PD in a highly penetrant manner. In order to address the complexity of hMBOs, we combined patch-clamp, multielectrode arrays (MEA) and two-photon microscopy, testing potential therapeutic compounds.

Presenter: Prof. BORTOLOZZI, Mario (Department of Physics and Astronomy)

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