Ph.D. projects in progress

Mentor: Roland Patai

Doctoral School: University of Szeged, Doctoral School of Theoretical Medicine

Ph.D. student: Tamás Polgár

Title of the research topic: Developing automated morphometric systems for structural analysis of neuronal samples

Description of the research topic: Characterization of the cellular and sub-cellular morphological changes of the neurons and non-neuronal cell types (e.g. microglia and astrocytes) have a crucial role in acute and chronic neurodegeneration. Objective morphometric parameters – which can be determined by using geometrical statistical methods – can be used as a marker of pathological functions. Our aim is to develop new and interactive platforms by adapting and automating stereological methods on a wide morphomical range from light microscopy to electron microscopic imaging. Besides the capability to assess "piece by piece" changes e.g. neuronal loss or changes in the number of synaptic connections, the platforms will be enhanced further with automated image analysis to determine physiological and pathological alterations in well-defined structures, such as microglia and their morphological polarization in neuroinflammation or remodeling of the mitochondrial structures under oxidative stress. By combining the geometrical statistics with cutting-edge image analysis, a high-throughput application can be achieved to examine multiple morphometric parameters in different neuroanatomical regions simultaneously.