Founded in 1973 and headed since 2012 by Prof. Laurence Ris after a 17-year career at the FNRS, the Neuroscience Department of the University of Mons (UMONS) lies at the interface between fundamental science and clinically-oriented medical science.

With around fifteen members, the Neuroscience Department is part of the UMONS Faculty of Medicine, Pharmacy and Biomedical Sciences and the Health Sciences and Technologies Research Institute (which includes Prof. Ris' Neuroscience research group). It is renowned for its expertise in electrophysiology, which enables the functional analysis of neuronal networks.

Prof. Laurence Ris, Head of the Neuroscience Department at UMONS - © UMONS

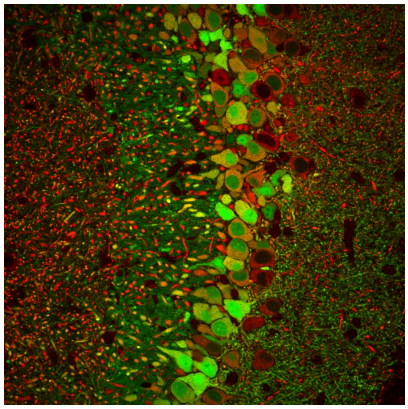

Illustration of neuronal cells in the hippocampus (immunohistochemistry) - © Agnès Villers, Departement of Neuroscience

The Neuroscience Department is developing two complementary areas of research: basic research and clinical research. Its basic research focuses on the cellular and molecular mechanisms of synaptic plasticity in a physiological or pathological context. It combines electrophysiological, molecular and cellular approaches, physiological measurements with behavioural measurements, immunohistochemistry and proteomic analysis – all using animal models of disease and human cell cultures (hPSC). Based on numerous collaborations in Belgium, Europe and beyond, current projects focus on understanding the pathophysiological processes of Alzheimer's disease (two projects funded by the STOP Alzheimer Foundation in collaboration with the Karolinska Institute and the FMRE in collaboration with ULB and UAntwerp) and on sensory plasticity (a project funded by 'Les Amis des Aveugles' in collaboration with KULeuven).

Boosted by the opening of a master's degree in medicine at UMONS, clinical research in the Neuroscience Department is carried out by neurologists in collaboration with regional hospitals (HELORA, HUMANI). They focus on neurodegenerative diseases (Alzheimer's) and neuro-immune diseases (multiple sclerosis) with the support of the Centre for Interdisciplinary Research and Training in Psychophysiology and Electrophysiology of Cognition (CiPsE). Co-founded in 2018 by the Neuroscience Department, CiPsE brings together the activities of 7 research departments from 4 faculties at UMONS. Its aim is to create an environment conducive to the development of multidisciplinary projects enabling the integration of new technologies (physiological, psychological and electrophysiological measurements of brain activity during cognitive tasks) and the training of PhD students in the service of innovative and effective research. CiPsE is involved in two major projects: the TRIAD project (UMONS, UCLouvain, KU Leuven, UAntwerpen, UGent) focuses on the study of the transmission of stress and resilience within families using the hyperscanning method; the AI4BRAIN project, part of the MedResyst portfolio (network and systems medicine), aims to integrate new technological tools for analysis, classification, prediction and digital modelling into the care pathway of patients with neurological or psychiatric disorders.

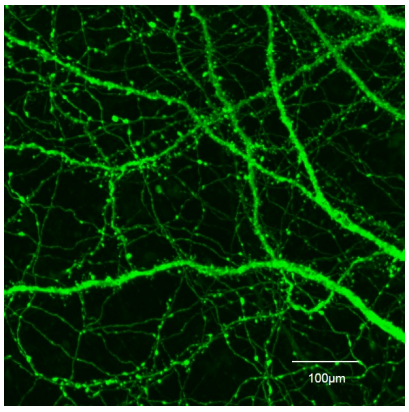

Illustration of dendritic spines of hippocampal neurons (EGFP labelling) - © Paula Paci, Department of Neuroscience

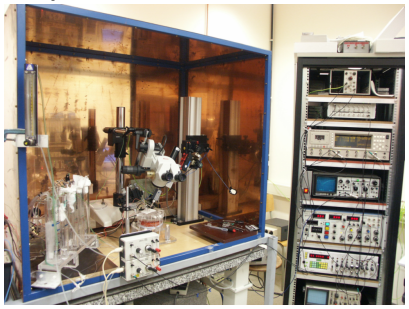

Illustration of the electrophysiological set-up - © Laurence Ris, Department of Neuroscience

Prof. Ris is also a member of the Raoul Warocqué Foundation for Medical Research in Hainaut, which raises funds to provide the necessary resources for research in universities, research centres and hospitals, for the benefit of the health of the population of the province of Hainaut. This is an issue close to her heart. According to Prof. Ris, the challenges ahead include gaining a better understanding of the precise mechanisms of neurodegenerative diseases such as Alzheimer's disease and the processes of brain plasticity throughout life, which are involved in neurodevelopment, mental health and healthy ageing. This includes the potential development of brain-machine interfaces and better use of artificial intelligence to model neural circuits. Prof. Ris therefore calls for an interdisciplinary approach (engineering, mathematics, philosophy, psychology, biomedical sciences and neurology) capable of giving rise to new concepts, advancing research into how the brain works and, ultimately, providing better care for patients with brain diseases.

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