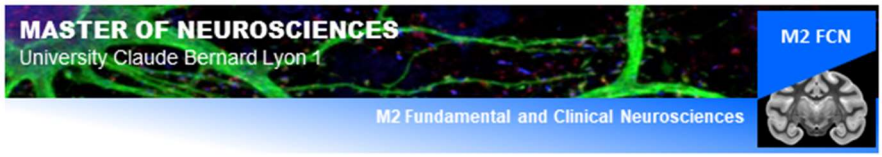

MASTER 2 Fundamental and Clinical Neurosciences

Internship proposal 2024-2025

(internship from January to June 2025)

Host laboratory:

Spinal Circuits in Sensorimotor Disorders Lab *(Assistant Professor Claudia Kathe)*

Department of Fundamental Neuroscience, University of Lausanne

Rue du Bugnon 9, 1005 Lausanne, Switzerland

Host team :

Spinal Circuits in Sensorimotor Disorders Lab (specific link will be updated, current link is to the department): https://www.unil.ch/dnf/en/home.html

And Wyss Center of Bio and Neuroengineering, Campus Biotech, Geneva: https://wysscenter.ch

Internship supervisors :

Claudia Kathe, Assistant Professor DNF, Unil: claudia.kathe@unil.ch

Thomas Hutson, Group Leader, Wyss Center, thomas.hutson@wysscenter.ch

Project title : Importance of the spinocerebellar tract for functional recovery after spinal cord injury

Project summary :

Individuals with spinal cord injury have to re-learn motor programs to regain voluntary control over movements. The cerebellum is widely recognized as a critical region for motor learning and motor adaptation, and it receives input from the spinal cord via the spinocerebellar tract, which conveys unconscious proprioceptive signals. At the Spinal Circuits Lab, we use preclinical mouse models of spinal cord injury to dissect how the anatomy and functionality of neuronal circuits evolve during spontaneous recovery of motor function. The first aim of the proposed Masters' project will use viral vector mediated chemogenetics to determine the role of the spinocerebellar tract in restoring motor function after spinal cord injury (Aim 1).

Subsequently, using viral tracing techniques the project will elucidate how the connectivity between the cerebellum and other motor regions of the brain changes after spinal injury (Aim 2). To conclude, the project will provide novel insights into how the spinal cord and brain interact, offering potential avenues for enhancing therapies for individuals with sensorimotor dysfunction.

3-5 recent publications :

The neurons that restore walking after paralysis
Kathe C*, Skinnider M.A.*, Hutson T.H.*, Regazzi N, Gautier M, Demesmaeker R, Komi S, Ceto S, James N.D., Cho N, Baud L, Galan K, Matson K.J.E., Rowald A, Kim K, Wang R, Minassian K, Prior J.O., Asboth L, Barraud Q, Lacour S.P., Levine A.J., Wagner F, Bloch J, Squair J.W., Courtine G; **Nature,** 2022 Nov 9. Doi :10.1038/s41586-022-05385-7

Wireless closed-loop optogenetics across the entire dorsoventral spinal cord in mice
Kathe C*, Michoud F*, Schönle P*, Rowald A, Brun N, Ravier J, Furfaro I, Soloukey S, Hutson T.H., Paggi V, Kim K, Soloukey S, Asboth L, Hutson T.H. Jelescu I, Philippides A, Alwahab N, Gandar J, Hubert D, De Zeeuw C.I., Barraud Q, Huang Q, Lacour S.P. and Courtine G.; **Nature Biotechnololgy,** 2021 Sep 27. doi: 10.1038/s41587-021-01019-x

Intramuscular Neurotrophin-3 normalizes low threshold spinal reflexes, reduces spasms and improves mobility after bilateral corticospinal tract injury in rats
Kathe C, Hutson T.H., McMahon S.B., Moon L.D.F.; **eLife,** 2016: 19;5

Environmental enrichment induces axon regeneration via CBP-dependent histone acetylation: a druggable pathway promoting plasticity and recovery after spinal cord injury
Hutson T.H., Kathe C, Palmisano I, Bartholdi K.A., Hervera A, De Virgiliis F, McLachlan E, Zhou L, Kong G, Barraud Q, Danzi M.C., Medrano-Fernandez A, Lopez-Atalaya J, Boutillier A.L., Sinha S.H., Singh A.K., Chaturbedy P, Moon L.D.F., Kundu T.K., Bixby J.L., Lemmon V.P., Barco A, Courtine G, Di Giovanni S; **Science Translational Medicine** 2019 Apr 10;11(487):eaaw2064