NEUROSCIENCE STUDY TRACK
Director: Jean-René Cardinaux, Center for Psychiatric Neuroscience, CHUV
Curriculum in Neuroscience in the School of Biology

- 1st year BSc: nervous tissue
  (module: biologie cellulaire des tissus)
- 2nd year BSc: introduction to neurosciences
- 3rd year BSc: neurobiology
  (module: physiologie des systèmes complexes)
  + optional courses
- Master in Medical Biology: Neuroscience track
- …Lemanic Neuroscience Doctoral School
From genes to synapses to circuits in order to understand brain function, behavior and neuropsychiatric disorders.
1st semester of the Master in Medical Biology:

Neuroscience Disorders:
10h course + 2h article presentations

Jean-René Cardinaux, CNP

Andrea Volterra, DNF.

Bogdan Draganski, DNC

Pascal Steullet, CNP

Liliane Tenenbaum, DNC
2\textsuperscript{nd} semester of the Master in Medical Biology:

**Neuroscience study path: 6 modules**

- Brain Development
- Sensory Functions
- Neuron-Glia Biology
- Neuronal Death and Repair
- Modulation of Synaptic Transmission
- Introduction to Psychiatric Neuroscience
Module 1 – Brain Development
Claudia Bagni
- Cerebral cortex development
- Patterning and cell lineage in the vertebrate nervous system
- Neurogenesis
- Epigenetic control
- Journal Club
- Neuroanatomy practical

Module 2 – Sensory Functions
Claudia Bagni and Jean-René Cardinaux
- Pain
- Olfaction
- Audition
- Gustation
- Vision
- Cortical plasticity
- Multisensorial integration
- Journal Club
Module 3 – Neuron-Glia Biology
Andrea Volterra
- Glial cells: introduction and historical perspective
- Multimodal control of the territory by astrocytes
- Neurometabolic, neurovascular coupling and brain imaging
- Gliotransmission
- The blood brain barrier
- The role of peripheral Schwann cells
- Neuroinflammation and brain diseases: Multiple Sclerosis
- Journal Club

Module 4 – Modulation of Synaptic Transmission
Dirk Fasshauer
- Molecular mechanisms of neurotransmitter secretion
- Post-synaptic receptors
- Synaptic plasticity: LTP and LTD
- Role of the neurotrophic factors NGF and BDNF
- Pharmacological modulation of synaptic transmission
- Journal Club
### Module 5 – Neuronal Death and Repair in the CNS
Nicolas Toni

- Cell death: introduction; physiological neuronal death in development
- Excitotoxicity and neuroprotection against excitotoxicity
- Apoptosis
- Cerebral ischemia: strategies for treatment
- Parkinson’s Disease
- Adult Neurogenesis and Neuronal Stem Cells
- Cell replacement and gene therapies
- Journal Club

### Module 6 – Introduction to Psychiatric Neuroscience
Jean-René Cardinaux

- Genes-environment interactions in neurodevelopment and stress-associated disorders
- Environmental risk and epigenetic mechanisms in psychiatry
- Experimental models of psychiatric disorders: cognitive and emotional behaviours
- Addiction: psychopathology and neurobiological mechanisms
- Mood disorders: psychopathology and neurobiology of depression
- Schizophrenia: psychopathology, neurobiological mechanisms and therapy
- Journal Club
The Neuroscience network UNIL-CHUV

>30 Labs for Master Projects

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<td>Radiology and Center for Biomedical Imaging (CIBM) at CHUV</td>
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<td>Anesthesiology</td>
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## Approaches and techniques available in the labs

- **Cell cultures**
- **Acute brain slices, organotypic slice cultures**
- **Living animals**
- **Humans**

- **Immunoprecipitation**, cell fractionation
- **ELISA, FACS**
- **Immunohistochemistry**, cytochemistry and western blotting, 2D gel electrophoresis, autoradiography
- **HPLC-MS**
- **In situ hybridization**
- **Real-time RT-PCR**
- **RNA interference**
- **Gene array**
- **Viral vectors and in utero injection**

### Models

- **Optical microscopy** (epifluorescence, confocal, TIRF, time-lapse, Ca2+ and Na+ imaging, AFM, image analysis, morphometry)
- **Electron microscopy**
- **fMRI**

### Biochemistry

- **Optogenetics**
- **Patch-clamp electrophysiology**, extracellular field potentials
- **Electroencephalography, telemetry**

### Molecular Biology and Genetics

- **Behavioural tests** (self-administration, operant conditioning, conditioned place preference, working memory, social interaction and other tests)
Why study neuroscience? Academic and career opportunities

Lemanic strength...

According to the American journal Science, the Lake Geneva region is considered to be the third most important study centre in Europe for neuroscience behind Oxford and Cambridge in Britain.
About Synapsy

The scientists and psychiatrists of the National Center of Competence in Research - Synapsy have joined together to study the biological basis of psychiatric disease. The aim of this joint venture between psychiatry and neurobiology is to better understand the origins of psychiatric and cognitive disorders in order to improve diagnosis and treatment. Its long-term goal is to provide patients with new possibilities for curing their illnesses and improving their quality of life.

A novel combination
For the first time in neuroscience and psychiatry, a research center is bringing together laboratory scientists and clinical doctors. This union could give rise to a better understanding of the mechanisms involved in the development of mental illness.

A better future for patients
By identifying the biological basis for mental illness, the scientists hope to be able to develop better tools for diagnosing and treating patients.

Core Values
→ Scientific excellence
→ Dialogue
→ Respect
→ Humanism
→ Patient-orientation
→ Transparency

SYNAPSY LEAFLET

Download it! (in French)