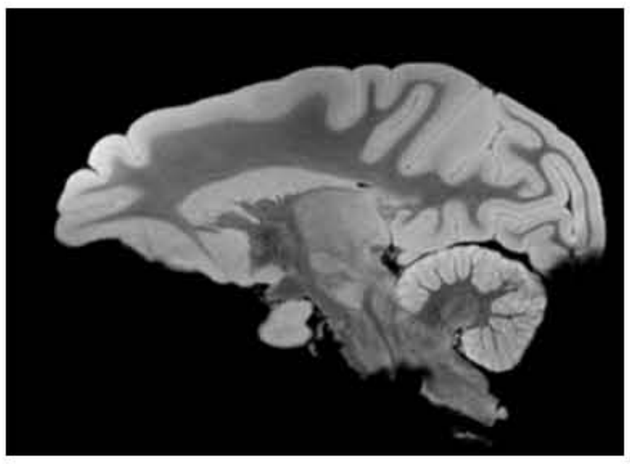
INSTITUT DE NEUROSCIENCES DE LA TIMONE

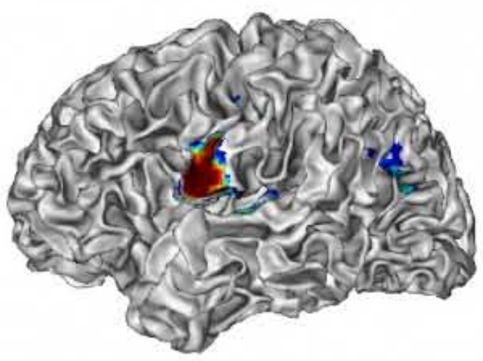
The mission of INT is to develop high-level research in fundamental neuroscience, from cellular to cognitive levels, and to break down the barrier between fundamental and clinical approaches.

Integrative neuroscience, by binding different levels of organization of the nervous system within a functional approach, plays a crucial role in understanding the neural basis of our behaviors and its dysfunctions in neurological and psychiatric diseases. INT promotes team-based, interdisciplinary research bridging levels of approaches for studying a selection of brain functions (motor control, low- and mid-level perception, emotions regulation and social interactions).

INT hosts 30 CNRS researchers and 23 Aix-Marseille University academics from the Schools of Sciences and Medicine organized in 11 research teams:

- Spinal Cord - CSF Interface (SpiCCI – Dr N Wanaverbecq)
- Live imaging of cell interactions in the normal and diseased brain (ImaPath – Dr F Debarbieux)
- Plasticity and Physio-Pathology of rhythmics Motor networks (P3M – Dr F Brocard)
- Dynamic Neuronal Operations in visual Topographic maps (NeOpTo – Dr F Chavane)
- Inference in Visual Behaviours (InVibe – Dr G Masson)
- Cognitive Motor Control (CoMCO – Dr T Brochier)
- Neural basis of communication (BaNCo – Dr P Belin)
- Basal Ganglia, Motivation and Reward (BaGaMoRe – Dr C Baunez)
- Micro-RNA & Social Cognition (mirCOS – Dr E Gascon)
- Social Cognition across Lifespan and Pathology (SCaLP – Dr C Deruelle)
- Methods and Computational Anatomy (MeCA – Dr O Coulon)





Scientific expertise

- **Exploring, understanding and modeling the normal and pathological functioning** of the brain and spinal cord, with an integrated approach from neuron to behavior through neurophysiology and multi-scale imaging. For a given function (perception, motor control, motivation, social cognition ...), our objective is to understand how the neuronal activity is regulated at the cellular level, propagated at the level of the small cortical or subcortical networks and assembled within large systems that underlie the behavior.

- **Elucidating the neuronal code**, i.e., to understand how the dynamics of the neural networks explain the most integrated behaviors such as the perception, the emotions or the control of the movements of the hand or the eyes .

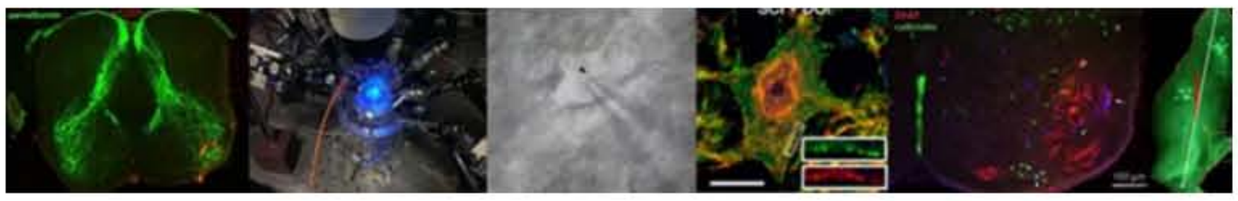
- **Understanding how dysfunctions or cell death of neurons and glial cells** cause neurological or psychiatric disorders such as motor neuron diseases, spinal cord injury (spasticity), impulsivity control disorders (including addictions, especially in Parkinson's disease), pathologies of cognitive and social development (autism, bipolar disorder, schizophrenia), or stress-related pathologies (post-traumatic stress disorder, depression).

Technical characteristics

INT operates 7 technical platforms for clinical and pre-clinical functional exploration of the nervous system in humans and animals.

- Human behavior (exoskeleton / kinarm, transcranial magnetic stimulation ...) and cognition (psychophysics, neuropsychology..)
- Molecular and cellular biology (biomarkers, viral transfections and tracing, genomics…)
- 3T high-field MRI with full cognitive test-bench for clinical and pre-clinical imaging
- Functional Photonic Imaging (In vivo 2-photon microscopy, Optical Imaging)
- NeuroComputing Center (512-core computing cluster, 210TB storage cluster) for data analysis, neuro-imaging and computational neurosciences
- Pre-clinical animal models for fundamental and biomedical research
- Design and manufacture of experimental devices





Fields of application and translational neuroscience

- Neurofunctional evaluation of cognition
- Functional rehabilitation
- Development of new strategies for therapeutics and diagnosis
- Neuroimaging and biomedical image analysis
- Neuro-engineering and brain-machine interfaces (neuroprostheses, deep brain stimulation)

Training

INT trains students, young scientists and clinicians at Master, PhD and post-doctoral levels. PhD students are enrolled in the *Integrative and Clinical Neurosciences* PhD Program of Aix-Marseille University in an international, lively and challenging atmosphere. INT also hosts several EU-funded Marie-Curie networks and individual fellowships.

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