



## MASTER 2 Fundamental and Clinical Neurosciences

### Internship proposal 2023-2024

*(internship from January to June 2024)*

**Host laboratory:** Stem Cell and Brain Research Institute (INSERM U1208), 18 avenue du Doyen Lépine, 69500 Bron

**Host team :** Neurobiology of Executive Functions, <https://sbri.fr/teams/neurobiology-of-executive-functions/>

**Internship supervisors :** Céline Amiez, DR2, [celine.amiez@inserm.fr](mailto:celine.amiez@inserm.fr)

**Project title :** The human-specific prefrontal operculum: schedule of its connectivity profile setup in the developing human brain

#### Project summary :

Identifying the evolutionary origins of human speech remains a topic of intense scientific interest. The most puzzling finding is that most of the neural infrastructure for speech in the frontal cortex is already present in non-human primates, including the classical Broca's area (1). The question therefore arises how a uniquely human ability can rely on mostly non-unique brain anatomy? Across the entire frontal cortex, we have recently identified only one new unique feature of adult human anatomy that might provide the missing link (2-4). This region, located adjacent and medial to the classical Broca's area, is called the PreFrontal extent of the frontal Operculum (PFOp). Current functional connectivity research in adult humans in the lab strongly suggest that the emergence of PFOp may confer an evolutionary advantage for supporting complex manipulation of cognitive representations required for modern speech abilities (4-5). As human children have the unique ability to acquire complex speech abilities in their first years of life, the goal of this internship will be to identify the functional connectivity profile of PFOp in children ranging from 0 to 8 years-old. This aim will be achieved by analyzing resting-state functional magnetic resonance imaging data provided in publicly available databases from the Human Connectome Project.

#### 3-5 recent publications :

1. Loh KK, Procyk E, Neveu R, Lamberton F, Hopkins W, Petrides M, and **Amiez C**. Cognitive control of orofacial and vocal responses in the human frontal cortex. P.N.A.S. 17(9):4994-5005, 2020.
2. **Amiez C**, Verstraete C, sallet J, Hadj-Bouziane F, Ben Hamed S, Meguerditchian A, Procyk E, Wilson CRE, Petrides M, Sherwood C, Hopkins WD. The unique anatomy of the prefrontal operculum in the human brain and its relevance to the emergence of speech. In revision in Communication Biology.
3. **Amiez C**, Sallet, J, Giacometti C, Verstraete C, Gaudaux C, Morel-Latour V, Meguerditchian A, Hadj-Bouziane F, Ben Hamed S, Hopkins WD, Procyk E, Wilson CRE, Petrides M. A revised perspective on the evolution of the lateral frontal cortex in primates. Science Advances, in press.
4. Hopkins WD, Sprung-Much T, **Amiez C**, Procyk E, Petrides M, Schapiro SJ, Sherwood CC. A Comprehensive Analysis of Variability in the Sulci that Define the Inferior Frontal Gyrus in the Chimpanzee (*Pan troglodytes*) Brain, 2022. American Journal of Biological Anthropology, 179(1):31-47.
5. Hopkins WD, Procyk E, Petrides M, Schapiro SJ, Mareno C, **Amiez C**. Sulcus Morphology in Cingulate Cortex is Associated with Voluntary Oro-Facial Motor Control in Chimpanzees (*Pan troglodytes*). Cerebral Cortex, 2021, Jan 14;bhaa392. doi: 10.1093/cercor/bhaa392.