Group name: Procesamiento sensorio-motor en áreas subcorticales
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Title of the TFM:
The brain bridge that enables both hemispheres to coordinate tactile processing

Summary of the Project:
In the brain, touch processing is usually lateralized: each hemisphere mainly receives information from the opposite side of the body. However, regions close to the midline, such as the mouth or nose, send a large amount of information to the other hemisphere through the corpus callosum. This means that when someone touches a part of the body near the midline, both hemispheres become active, unlike what happens with more lateral body regions. In other words, neurons that process midline touch respond in a similar way to stimulation on either side of the body.
This occurs because callosal neurons copy the main sensory response from the activated hemisphere and send it to the opposite one. This idea is known as the midline fusion theory. Our group recently demonstrated this theory through the study of the mouse whisker system (Montanari et al., 2023): the most medial whiskers (row A whiskers) generate activity that is transmitted to the opposite hemisphere. Neurons in row A barrels create a copy of the tactile signal and send it across the corpus callosum.
What we still do not know is why this copy exists or how the mouse uses it.
This project aims to answer questions such as:

- Why is midline tactile information duplicated in the opposite hemisphere?
- How does the mouse use this extra information during exploration?
- Which neurons are directly involved in interhemispheric communication, and how do they operate?
- We also want to understand how other brain regions involved in sensorimotor integration and movement control combine bilateral tactile information coming from both medial and lateral whiskers.

In summary, this project aims to uncover how the two hemispheres communicate in the mouse whisker system, what the purpose of this communication is, and how bilateral whisker signals are integrated.

Recommended reading: *Callosal inputs generate side-invariant receptive fields in the barrel cortex.* Montanari R, Alegre-Cortés J, Alonso-Andrés A, Cabrera-Moreno J, Navarro I, García-Frigola C, Sáez M & Reig R. **Science Adv**. 2023 9: (48)
http://doi.org/10.1126/sciadv.adi3728

Methods and technology involved in the MRP/TFM Project:
To achieve this, we will use a powerful combination of techniques, including:

- **Behavioral experiments with genetic mouse models (such as TRAP2).**
- **In vivo and ex vivo electrophysiology and photometry.**
- **Optogenetics.**
- **Anatomical and molecular approaches.**
- **Advanced data-analysis tools.**

Member/s of the lab who will act as tutor/co-tutor of the project (if different from the group IP; PhD required to be tutor / co-tutor):

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