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# THE FUTURE OF BIOMEDICAL RESEARCH

## CIPF Lecture Series

**Genetics, activity and patterning in a mouse model of a recently described neurodevelopmental brain disorder**

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Date: **14/02/20 – 12:30h**

Place: Salón de Actos CIPF

**Abstract:** Neocortical arealization is a developmental process in which the primordial cortical neuroepithelium becomes shaped into a structure subdivided into several tangential domains with distinct and complex functions. Despite an apparently similar laminar and cell-type organization, neocortical areas have distinct features in terms of molecular identity, morphology, activity and long-range connectivity of residing projection neurons, leading ultimately to the formation of functional cortical maps. The molecular mechanisms by which neuronal subtypes within cortical layers and across functional domains are specified as well as their precise assembly into distinct functional areas of the neocortex, remains largely unknown. Several transcription factors expressed in distinct prospective areas and cortical subtypes control the specification and connectivity of a given neuronal sub-population, by promoting its particular fate but also by repressing alternative fates. This talk will give an overview on how a key area patterning gene, called Nr2f1 or COUP-TFI, act during early organization of the primordial cortex and what are the consequences of its loss in mice and human patients. Understanding the basic mechanisms of cortical development is primordial, if we want to properly diagnose and help children with genetic cognitive disorders. Overall, our work has contributed in unraveling some of the developmental mechanisms of how diverse populations of cortical projection neurons are coordinated into high-functional territories and how they interact during assembly of cortical circuits in distinct functional areas in healthy and pathological conditions.

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### Relevant publications:

1. Del Pino I., Tocco C., Magrinelli E., Marcantoni A., Ferraguto C., Tomagra G., Alfano C., Leinekugel X., Frick A., Studer M. **COUP-TFI/Nr2f1 orchestrates intrinsic neuronal activity during cortical area patterning.** *bioRxiv/2019/728402*. doi: <https://doi.org/10.1101/728402>
2. Simi A. & Studer M. Developmental genetic programs and activity-dependent mechanisms instruct neocortical area mapping. *Curr Opin Neurobiol.* 2018, Jul 10; 53:96-102. doi: 10.1016/j.conb.2018.06.007.
3. Bertacchi M., Parisot J., Studer M. The pleiotropic transcriptional regulator COUP-TFI plays multiple roles in neural development and disease. *Brain Res.* 2018, Apr 27. doi: 10.1016/j.brainres.2018.04.024.
4. Alfano C., Magrinelli E., Harb K., Hevner R. F. and Studer M. Postmitotic control of sensory area specification during neocortical development. *Nature Communications*, 2014 Dec 5;5:5632.
5. Tomassy Srubek G., De Leonibus E., Jabaudon D., Lodato S., Alfano C., Mele A., Macklis J.D. and Studer M. Area-specific temporal control of corticospinal motor neuron differentiation by COUP-TFI. *PNAS*, 2010, 107(8): 3576-81.
6. Armentano M., Chou S. J., Srubek Tomassy G., Leingärtner A., O'Leary D.D.M. and Studer M. COUP-TFI regulates the balance of cortical patterning between frontal/motor and sensory areas. *Nature Neuroscience*, 10, 2007, 1277-1286.

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