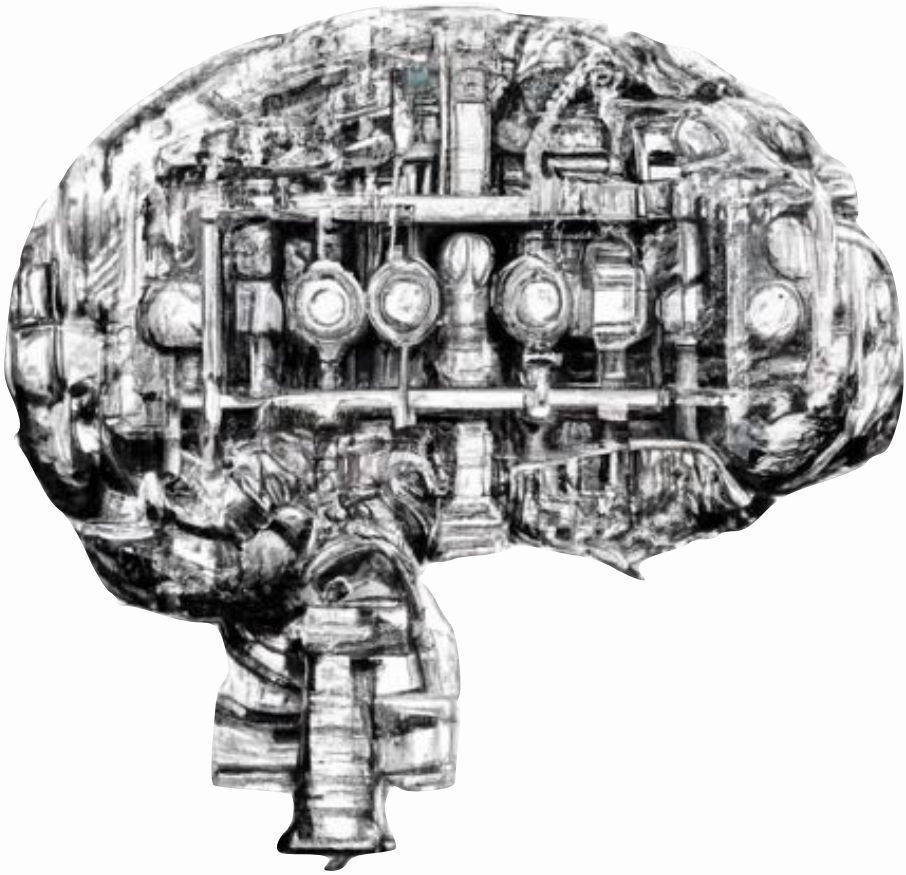
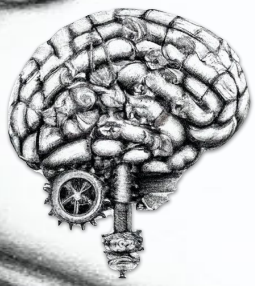
December 15th Neurocampus, Bron



symposium

MECHANICS OF BRAIN DYNAMICS

& defense



INTRO

December 15th 2022, Neurocampus Bron
Amphitheater

Dear everyone,

It is my great honor and pleasure to welcome you to the

MECHANICS OF BRAIN DYNAMICS

symposium and thesis defense. We will kick things off with four 20- to 25-minute talks by a selection of great speakers who will present their views on cortical computational principles with a particular focus on temporal brain dynamics. New advances in the field of neuroimaging as well as new theoretical approaches will be discussed with respect to dynamic brain activity on multiple scales. All speakers are members of my PhD thesis defense committee, which will evaluate the results of my project that I will present thereafter.

I look forward to inspiring talks and discussions and would like to express my deep gratitude for this great opportunity.

Tommy Clausner

Special thanks to:

Gaëlle Pereda and Johanna Trost for their great support !

Organized by:

Mathilde Bonnefond - mathilde.bonnefond@inserm.fr
Tommy Clausner - tommy.clausner@inserm.fr

Menu

09:00 - coffee

09:30 - Simon Hanslmayr (Glasgow, UK)
[remote]
Fire-together, wire together: The role of human hippocampal oscillations and spike-timing dependent plasticity in shaping episodic memory codes.

10:00 - Floris de Lange (Nijmegen, NL)
[remote]
to be announced

10:30 - coffee

11:00 - Johanna Zumer (Birmingham, UK)
Linking neural and hemodynamic imaging

11:30 - Rene Scheeringa (Nijmegen, NL)
EEG correlates of laminar fMRI connectivity in the visual cortex.

12:00 - lunch

13:00 - Tommy Clausner (Lyon, FR)
The Role of neuronal oscillations in local computations and network brain dynamics

Simon Hanslmayr

Uni Glasgow

[remote presentation]

Fire-together, wire together:

The role of human hippocampal oscillations and spike-timing dependent plasticity in shaping episodic memory codes

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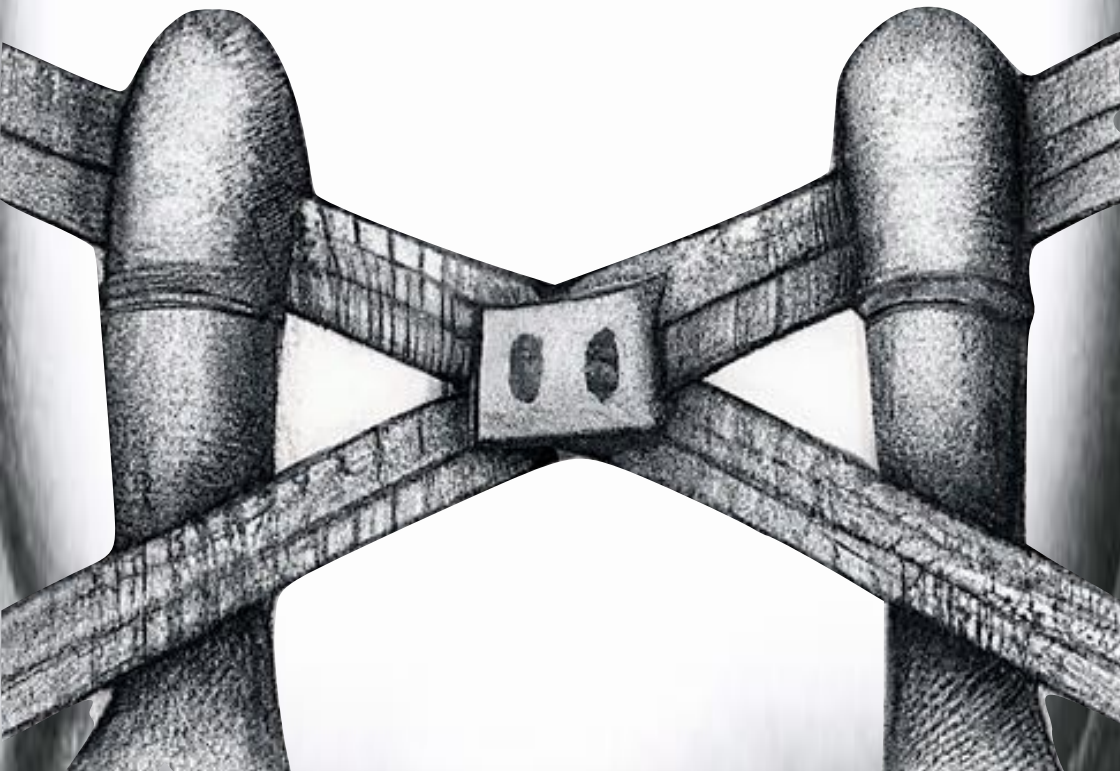
I will present recent findings where we investigated how hippocampal gamma and theta oscillations support memory formation. We recorded human single units in the human hippocampus during encoding of episodic memories and found that the firing of neurons was coupled to theta and gamma oscillations. These oscillations were correlated with co-firing between pairs of neurons in time windows consistent with spike-timing-dependent plasticity. I will then present results from non-invasive MEG and EEG recordings where we modulated neural synchrony via rhythmic sensory stimulation in theta and gamma frequencies and were able to confirm specific predictions of spike-timing-dependent-plasticity for episodic memory formation. I will also present evidence from computational modelling studies to show that these results are consistent with spike-timing dependent plasticity. Finally, I will present results from human single neuron recordings where we identified neurons which represent an episode specific conjunctive code for unique memory episodes.

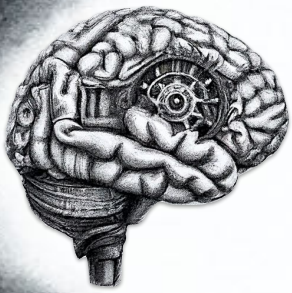
FLORIS DE LANGE

DCCN Nijmegen

[remote presentation]

to be announced





JOHANNA ZUMER
Aston Uni Birmingham

Linking neural and hemodynamic imaging

To best understand neural activity in relation to behavior using non-invasive methods, the optimal combination of spatial and temporal resolutions is needed. Hence, simultaneous EEG-fMRI is a highly-relevant tool. However, methods such as MEG can be more sensitive to gamma band activity than EEG, for example. Thus, useful insights can be gained from comparing MEG to fMRI experiments even though not simultaneously recorded. Data and open questions for considerations in this area will be discussed.

RENE SCHEERINGA

DCCN Nijmegen

EEG correlates of laminar fMRI connectivity in the visual cortex.

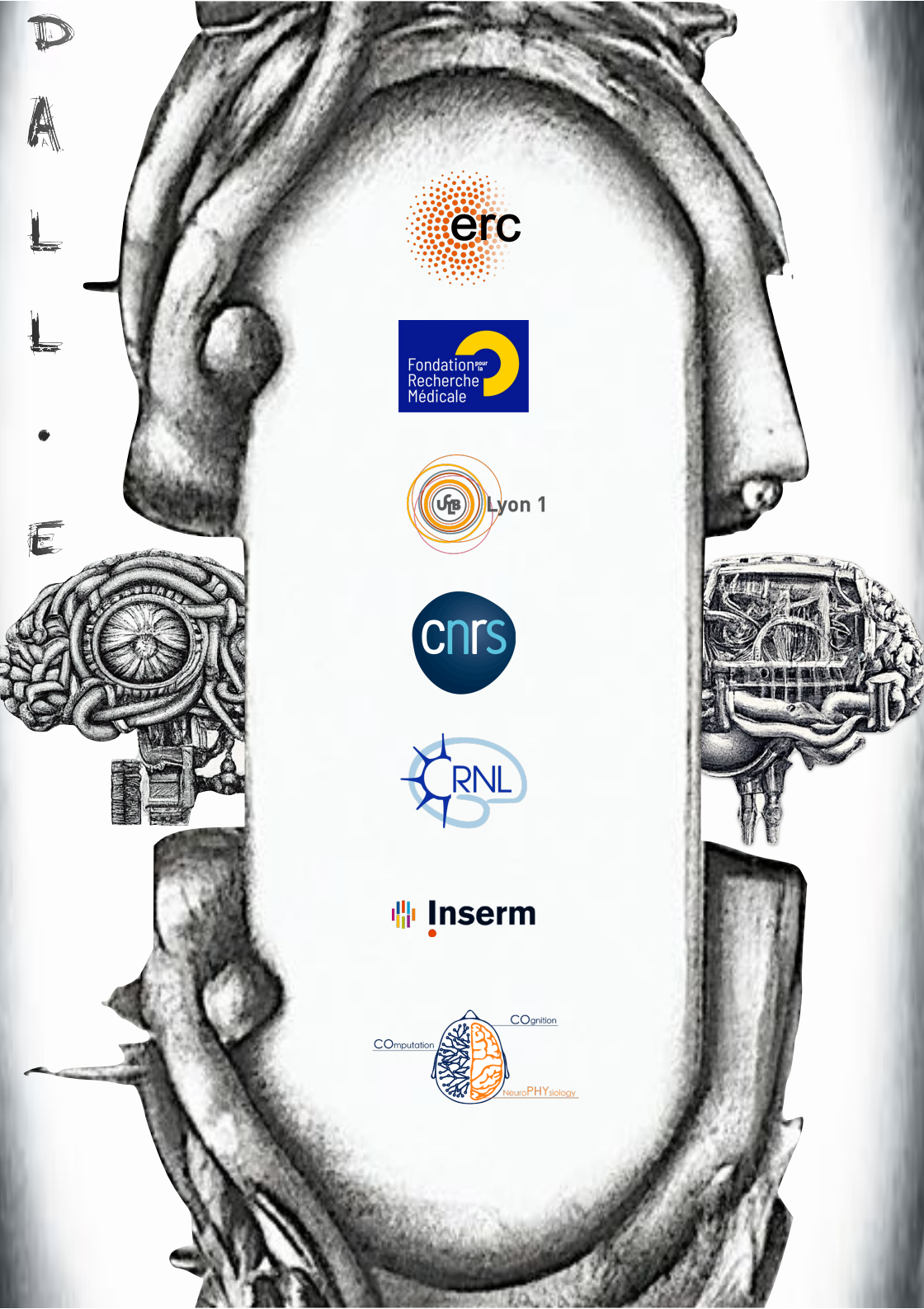
Measuring fMRI at the laminar level holds the promise to compute connectivity between layers within and between brain regions from different brain regions. Since different cortical layers relate to feedforward and feedback projection between regions, this would give a handle on the directional flow of information. In addition, neural oscillations have been linked to specific cortical layers and feedforward and feedback projections as well. I will present data from a simultaneous EEG and fMRI study where we link neural oscillations measured by EEG to laminar connectivity between regions in the visual cortex computed from laminar level fMRI.

TOMMY CLAUSNER

Inserm Lyon

The Role of neuronal oscillations in local computations and network brain dynamics

The human brain is a vastly expensive information processing machine with respect to its relative energy uptake compared to other organs. Hence, due to a limitation in resources, it can be hypothesized that the algorithmic implementations of brain computations are extremely efficient, outperforming any artificial system in terms of energy per operation by far. However, the exact implementations of underlying brain computations remain widely unclear. It has been demonstrated countless times that neuronal oscillations - rhythmically synchronized neuronal activity - play an important role in cortical signal processing and are a likely candidate to achieve computational efficiency. Nonetheless, the exact role of neuronal oscillations with respect to the actual ongoing information processing remains still widely unclear. The present thesis not only demonstrate how the gap between human and animal models can be bridged methodologically by implementing state of the art neuroimaging pipelines, but furthermore targets core predictions derived from animal models and patient studies with respect to the role of neuronal oscillations in local computations and network brain dynamics.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