

NEW LAB MEMBERS

Rachel Thomas

INM

I'm Rachel and I'm currently completing my M1 Cognitive Neuroscience Masters of Cognitive Science (Cog_SUP at Sorbonne University & Université Paris Cité). I'm working with Florent Meyniel's team, with Alex Paunov and Sofia Raglio, to study how latent state dynamics impact learning and decision factors.



I have a background in Psychology and developed an interest in computational approaches studying individual differences in sequential judgements and learning at the Rutledge Lab, and at Cardiff University studying the effects of lifetime alcohol consumption on learning and decision making under a Bayesian framework, investigating associations between model parameters and monoaminergic activity in the brain. More broadly, I am interested in extending this understanding to psychiatric disorders, and am hoping to complete a PhD in the future in the field of computational psychiatry.

Outside of science I love climbing, hiking, and live music events. I'm so happy to join the lab and am very excited to meet everyone!

Rebekka Lagacé-Cusiac

Office 2030

Hi everyone, my name is Rebekka, and I have recently joined the lab as a postdoc working with Prof Stanislas Dehaene on investigating the cognitive correlates of mathematical operations. My research thus far has focused on how people process relative magnitudes, such as proportions, ratios, fractions, and music symbols, using behavioral and neuroimaging methods.



My research journey started with a bachelor's degree in cognitive neuroscience at the Université de Montréal. I then completed my master's and PhD in psychology at the University of Western Ontario, more specifically in numerical and music cognition.

I'm originally from Montréal, Canada, so it's no surprise that I love climbing plastic rocks and eating poutine. I also used to play the saxophone and guitar. I am naturally curious, love to learn and am always happy to discuss ideas, so I'm excited to meet everyone and learn more about your research!

Anaëlle Montagnes

Social Open Space

Hi everyone! I'm Anaëlle, I'm joining the lab for my M1 internship under the supervision of Marie Amalric and with Lucie Hertz-Pannier in the NeuroImaging of Development group.



I'm currently studying at an engineering school, specializing in health and technology.

During this internship, I'll be working on functional connectivity in adolescents who had a neonatal stroke.

Outside of work, I enjoy playing board games and volleyball with friends. I also love going to the theater or seeing musicals. In my free time, I enjoy visiting museums and exhibitions with my family. Otherwise, I'm very involved in scoutism.

Caroline Huron, Thomas Hock, Malo Renaudin, Gustavo Loiola, Clément Despesse, Carole Hosono

Alexandre Mallet

Newsletter UNICOG – July 2026

A lab is defined by the people who work in it

ACHIEVEMENTS, PUBLICATIONS

Characterizing error types in the comprehension of fractions: The number line test

Maxime Cauté, Cassandra Potier Watkins, Chenxi He, Stanislas Dehaene

Understanding fractions is a major hurdle for many students. A key aspect of fraction comprehension is the ability to evaluate their numerical magnitude. Here, we use a number-to-line task, where students point to the location of a number on a graduated line, to characterize errors in fraction comprehension. A total of ~ 26,000 French pupils from 6th to 10th grade were tested (U.S. equivalent grades). Error rates were high, almost 80 % in 6th grade and 45 % in 10th grade. Errors could be classified into seven dominant patterns, whose frequency varied by grade level and individual performance. Younger and lower-performing children mostly confused fractions with decimals. Older and higher-performing children often confused a fraction and its inverse. All grades also confused the roles of the numerator and the denominator. We propose a theoretical framework suggesting that errors arise as bugs in the execution of one of two main strategies: children converting the fraction into a decimal, or partitioning the line into units and counting them. This model explains the observed error patterns as stemming from inappropriate strategy selection, flawed execution, or incorrect corrective steps due to flawed execution. Our analysis provides a deeper understanding of the various traps that students face when interpreting a fraction's magnitude, the frequency of these errors, and their sequential order.

[Journal of Experimental Child Psychology](#)

Alpha power indexes working memory load for durations

Sophie K. Herbst, Izem Mangione, Charbel-Raphaël Segerie, Richard Höchenberger, Tadeusz Kononowicz, Alexandre Gramfort, Virginie van Wassenhove

Estimating and comparing how long events last requires the temporary storage of durations. How durations are stored in working memory is unknown, despite the central role of memory systems in timing. We investigated the neural signatures of working memory for sequences of durations with magnetoencephalography (MEG) while human participants performed an n-item delayed reproduction task. Sequences orthogonally varied in the number of items (one or three) and their durations. The number of durations in the sequence, but not the duration of the sequence, affected recall precision and could be decoded from alpha and beta oscillatory activity during retention. Our results extend earlier behavioral findings, suggesting that durations are itemized in working memory and that their number, not their duration, modulates recall precision. Crucially, we establish that alpha power reflects a universal signature of working memory load and mediates recall precision, even for abstract information such as duration.

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Cortical localization and dynamics of elementary mathematical concepts

Samuel Debray*, Alireza Karami*, Daniela Valerio, Maxime Cauté, Christophe Pallier, Stanislas Dehaene

How the brain encodes abstract concepts remains poorly understood. Current theories propose that, in brains and computers alike, word meanings are represented by vectors of neural activation whose similarities reflect semantic relationships. Here, we tested whether this hypothesis also applies to abstract concepts of elementary mathematics. We collected behavioral, 7 Tesla functional MRI and magneto-encephalography (MEG) data and used representational similarity analysis to ask where, when and how fifteen concepts of integers, fractions, and geometric shapes are encoded in the adult brain. Behavioral similarity ratings revealed a rich conceptual structure characterized by both categorical distinctions (numbers vs shapes, integers vs fractions), a numerical distance effect for integers, and systematic correspondences between items involving the same number (e.g. three, third, triangle). Functional MRI identified a bilateral cortical network whose neural encodings of concepts correlated with their semantic similarity, overlapping with classic math-responsive regions and encompassing IPS and ITG as well as dorsolateral prefrontal cortex (dlPFC). A double dissociation was observed, with a preference for arithmetic in the right anterior intraparietal sulcus (IPS), and for geometry in left inferior temporal gyrus (ITG) and bilateral posterior IPS. MEG revealed that a semantic neural code common to written words and symbols is activated by about 230 ms, again primarily distinguishing integers, fractions

and geometry concepts. Together, these findings suggest that mathematical concepts are organized in the brain along both categorical and numerical dimensions, with overlapping but partially distinct sites supporting arithmetic and geometry domains.

<https://www.biorxiv.org/content/10.64898/2026.04.30.721827v1>

An ordinal Language of Thought supports human memory for regular sequences

Elyes Tabbane, Santiago Figueira, Lucas Benjamin, Stanislas Dehaene, Fosca Al Roumi

This work extends the Language of Thought framework — previously established in our group for geometric visual sequences and temporal binary auditory sequences — to visual sequences with ordinal structure. Using a delayed reproduction paradigm with over 250 participants (data collected online), we show that the minimum description length derived from our LoT model predicts memory performance with high accuracy ($r = .96$), substantially outperforming seven alternative complexity metrics from information theory as well as participants' own subjective complexity ratings. We also find that inter-click intervals during sequence reproduction slow at structural components' boundaries as described by the LoT programs, providing a direct behavioral signature of internal mental syntax in the timing of motor actions.

<https://www.biorxiv.org/content/10.64898/2026.05.14.725160v1>

Disentangling hierarchical and sequential computations during sentence processing

Christos-Nikolaos Zacharopoulos 1, Stanislas Dehaene 2, Yair Lakretz 3

Sentences in natural language have a hierarchical structure that can be described in terms of nested trees. To compose sentence meaning, the human brain needs to link successive words into complex syntactic structures. However, such hierarchical-structure processing could co-exist with a simpler, shallower, and perhaps evolutionarily older mechanism for local, word-by-word sequential processing. Indeed, classic work from psycholinguistics suggests the existence of such non-hierarchical processing, which can interfere with hierarchical processing and lead to sentence-processing errors in humans. Here, we conducted a combined magnetoencephalography and electroencephalography experiment to study hierarchical versus sequential computations during sentence processing in the human brain. We studied whether the two processes have distinct neural signatures. Our results show a large dominance of hierarchical processing in the human brain compared to sequential processing, pointing to a major difference between how humans process sentences and sequences of non-linguistic items. This shows that once words enter the language system, computations are dominated by structure-based processing and largely robust to sequential effects.

[Cortex](#), Volume 199, June 2026, Pages 165-186

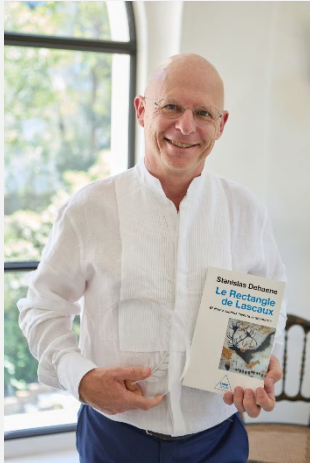
FOCUS PLATEFORME : NEUROSPIN/MEG, plateforme lauréate de l'AMI « Data papers et Plateformes » de l'Université Paris-Saclay, avec un jeu de données relatives à des acquisitions MEG et EEG chez l'homme

<https://www.scoop.it/topic/life-sci-news-upsacly>

A global workspace in language models

[New Anthropic research](#): A global workspace in language models. Of everything happening in your brain right now, only a tiny fraction is consciously accessible—thoughts you can describe, hold in mind, and reason with. They found a strikingly similar divide inside Claude.

Read the [commentary](#) by Stanislas Dehaene and Lionel Naccache



Stanislas Dehaene Wins the Fourth Prix Bourrienne for his work *Le Rectangle de Lascaux*, published by Odile Jacob