Antwerp University Research centre for Equilibrium and Aerospace (AUREA)
University of Antwerp

esa
European Space Agency

Le Cerveau

Un petit univers dans l'espace

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GIGA
CRC In vivo Imaging

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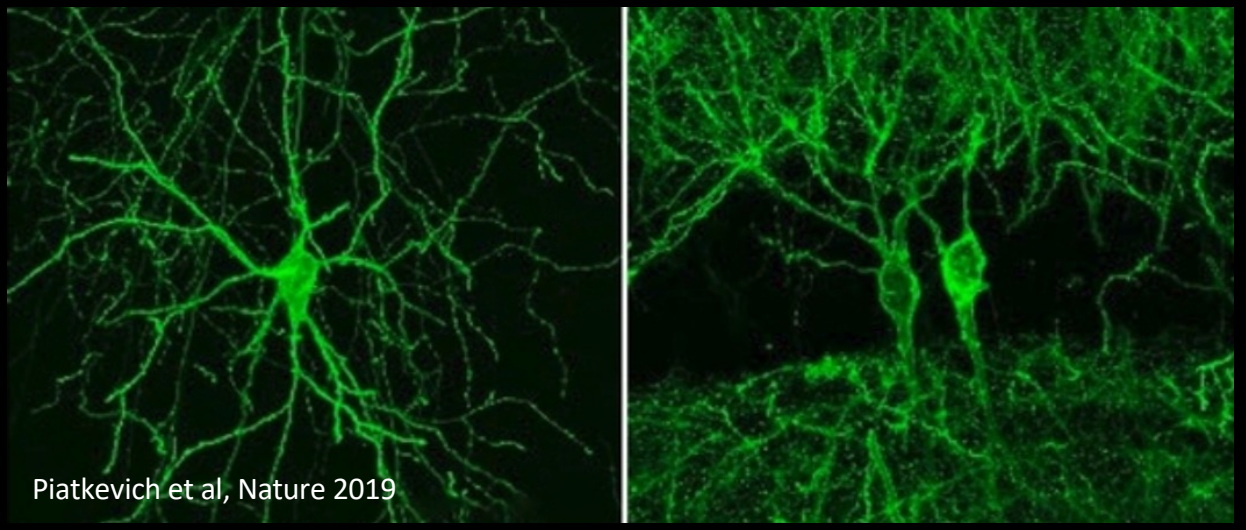
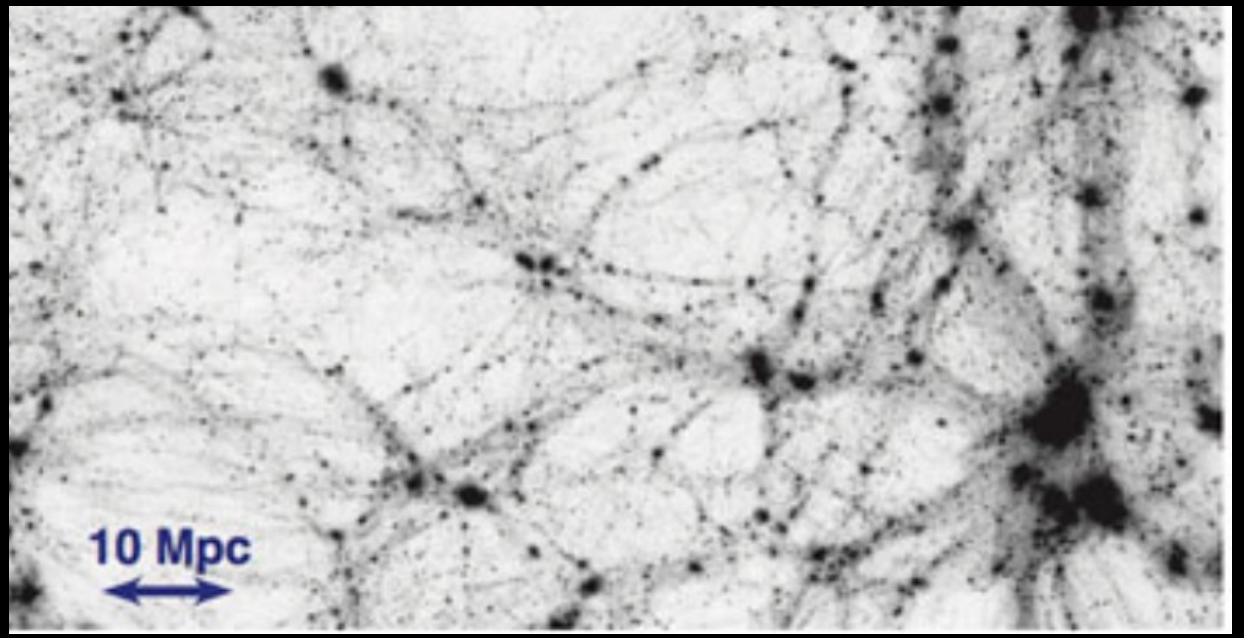
JEUNES POUSSES : 30 JEUNES LIÉGEOIS QUI FONT BRILLER LA VILLE

by Boulettes Magazine / juin 8, 2021

Les neurones

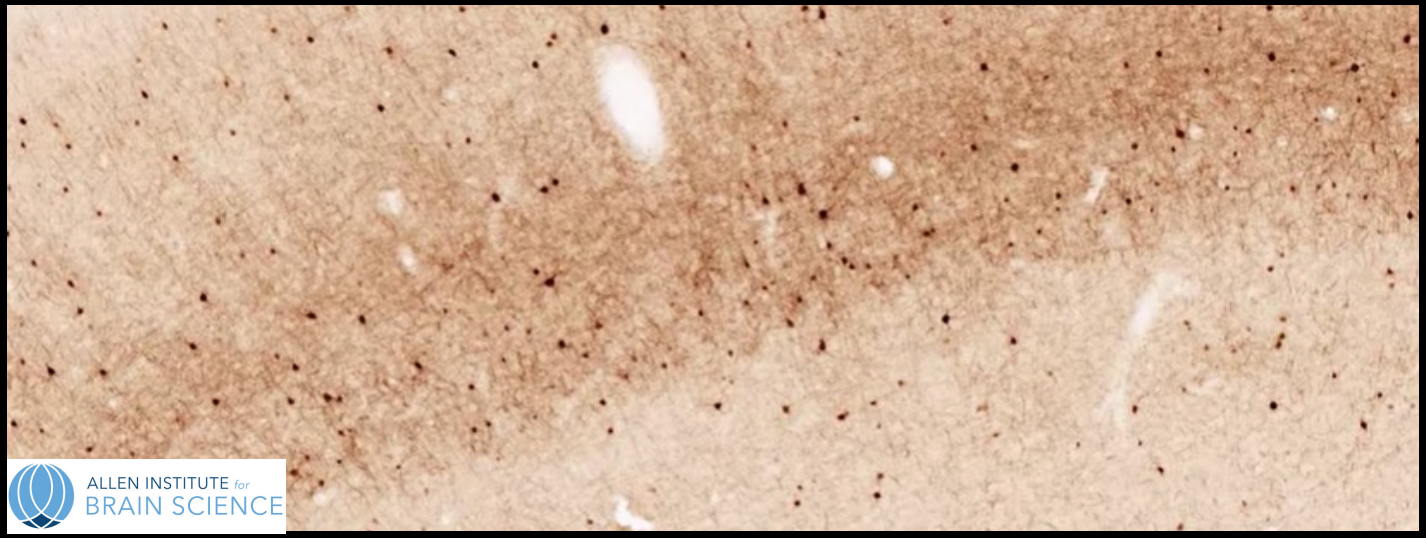




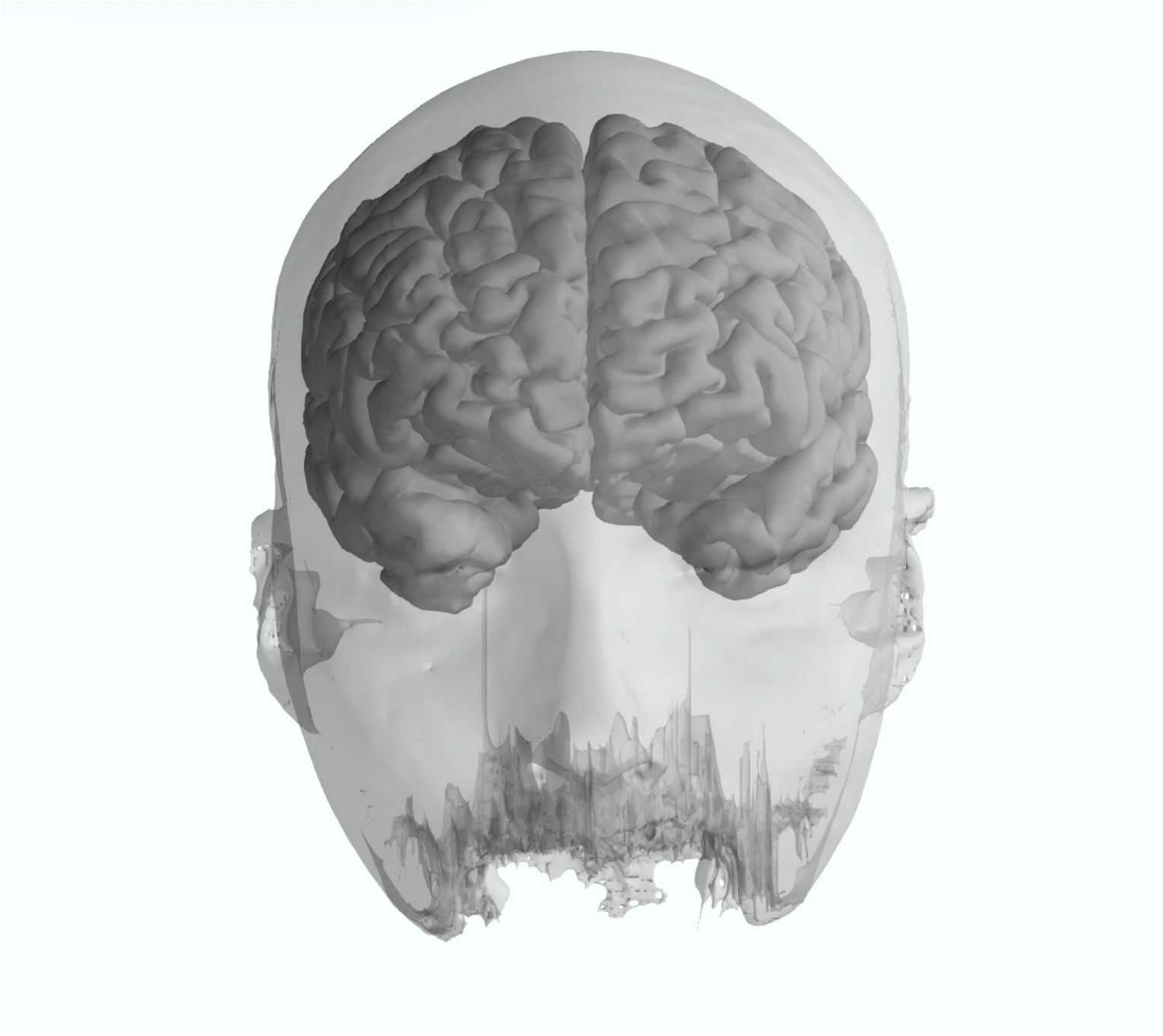
Vazza & Feletti Front Phys 2020

Cosmic Web

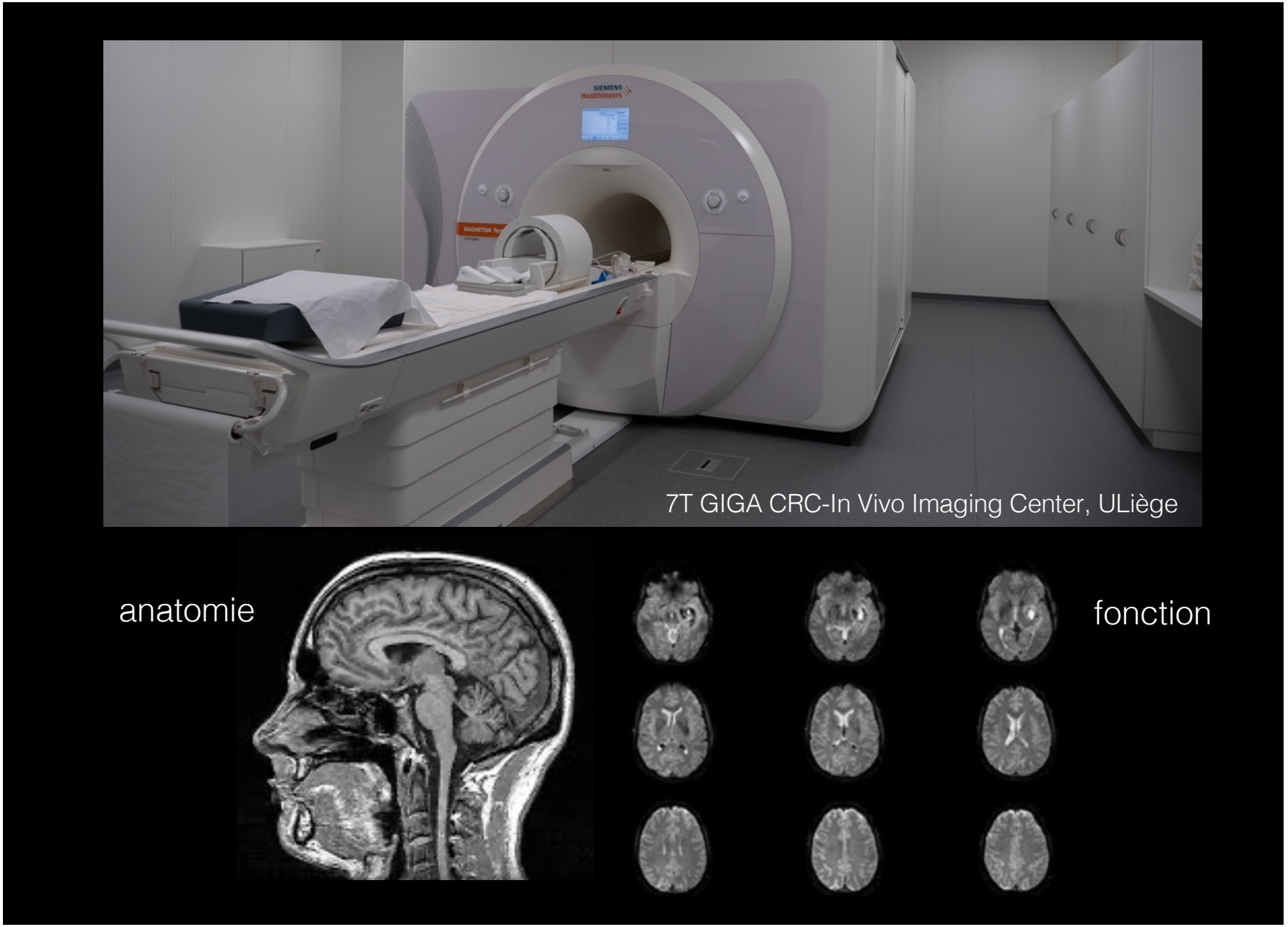
Le Cerveau



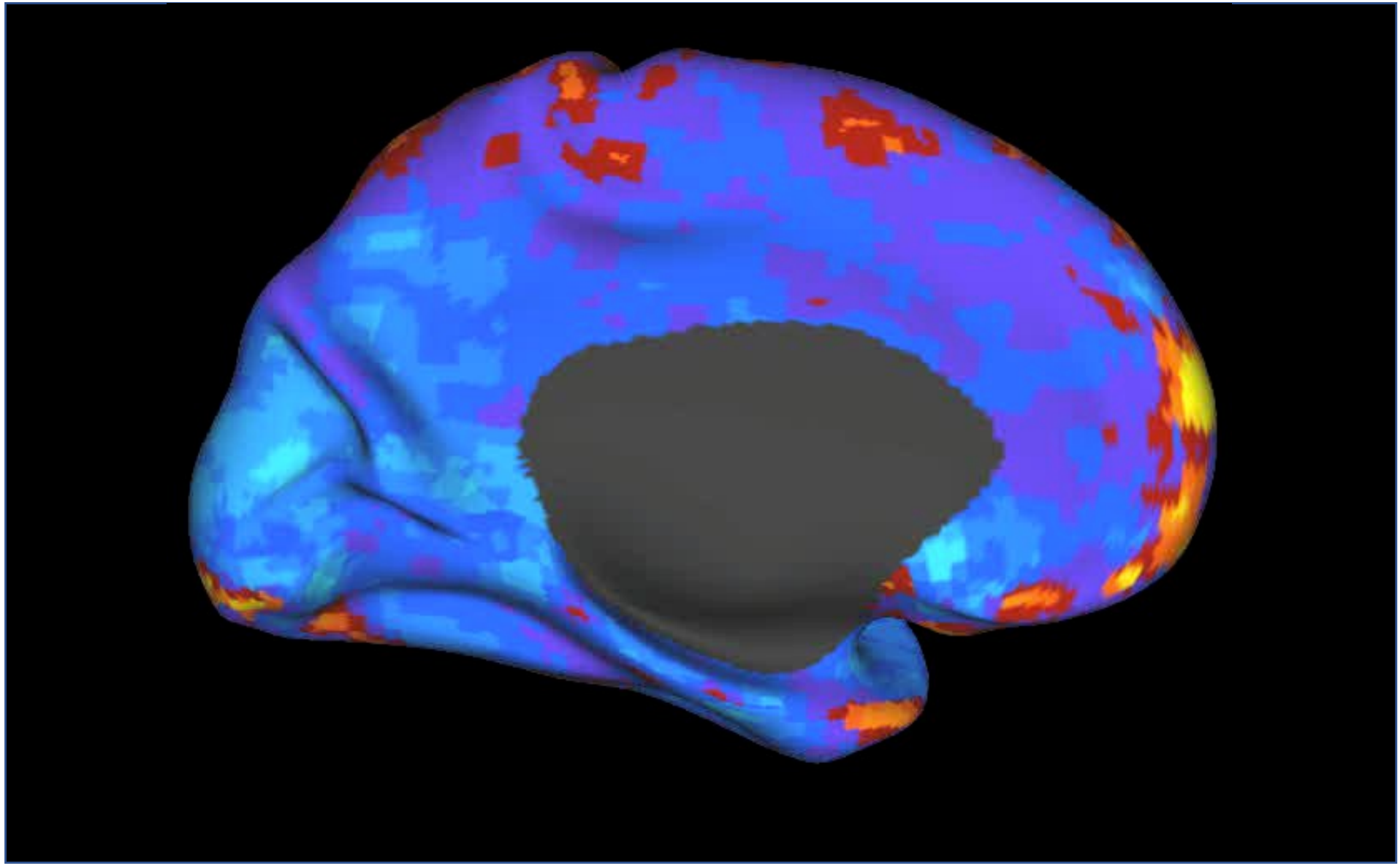
L’universe



Imagerie par resonance magnétique



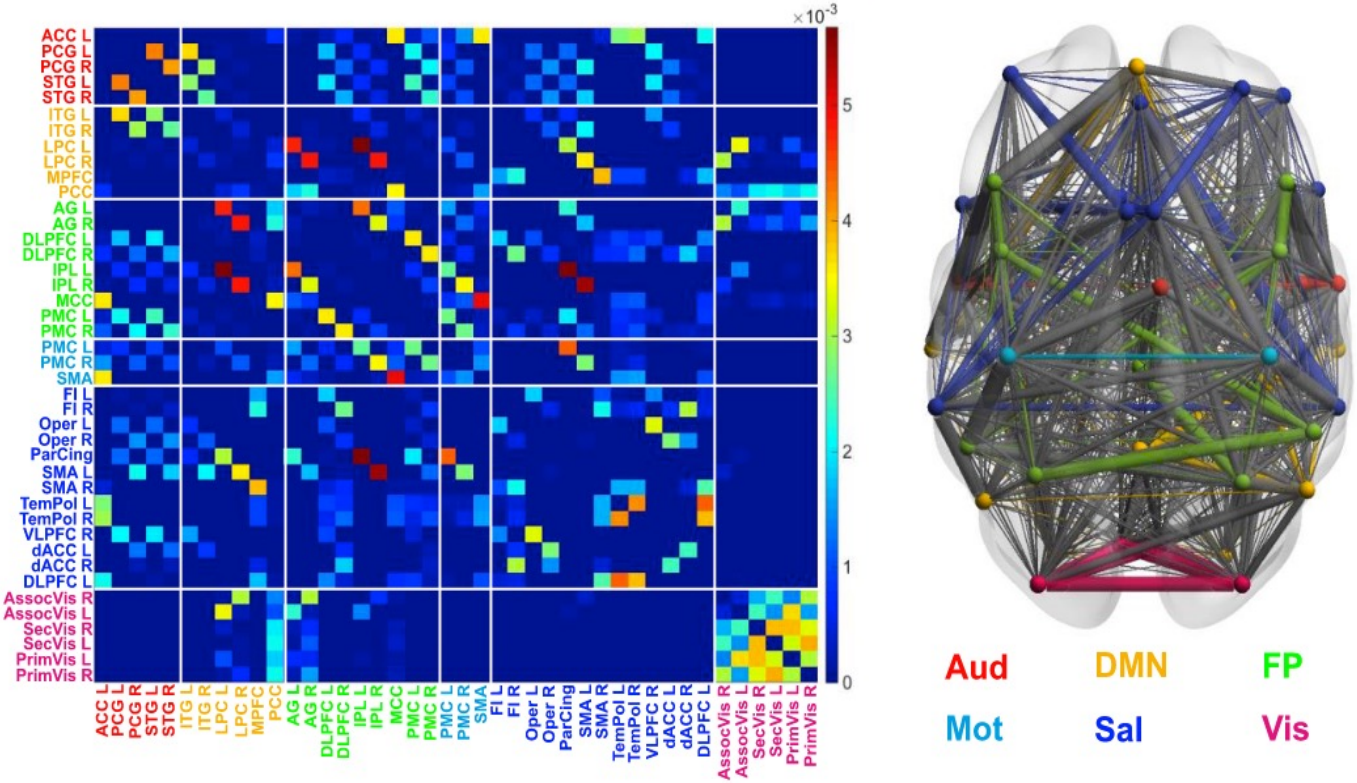
Activité cérébrale au repos



Le cerveau vu comme un réseau

100 billion neurons, ~100 trillion synaptic connections

The Connectome



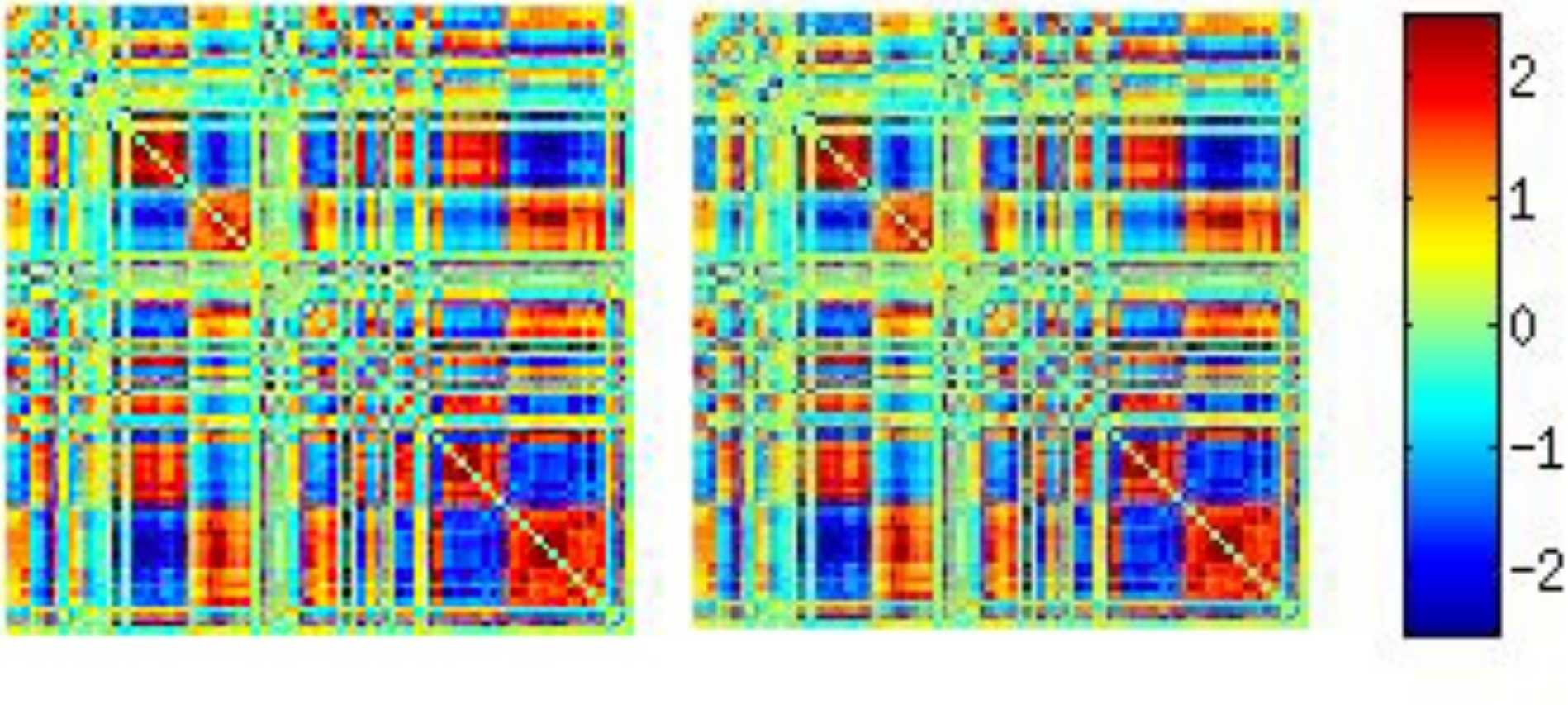
Fornito, Zalesky, Bullmore. Ch 1: An Introduction to Brain Networks. *Fundamentals of Brain Network Analysis, Academic Press* 2016

Image from: Demertzi & Tagliazucchi, Dehaene, Deco, Barttfeld, Raimondo […] et al, *Science Advances* 2019

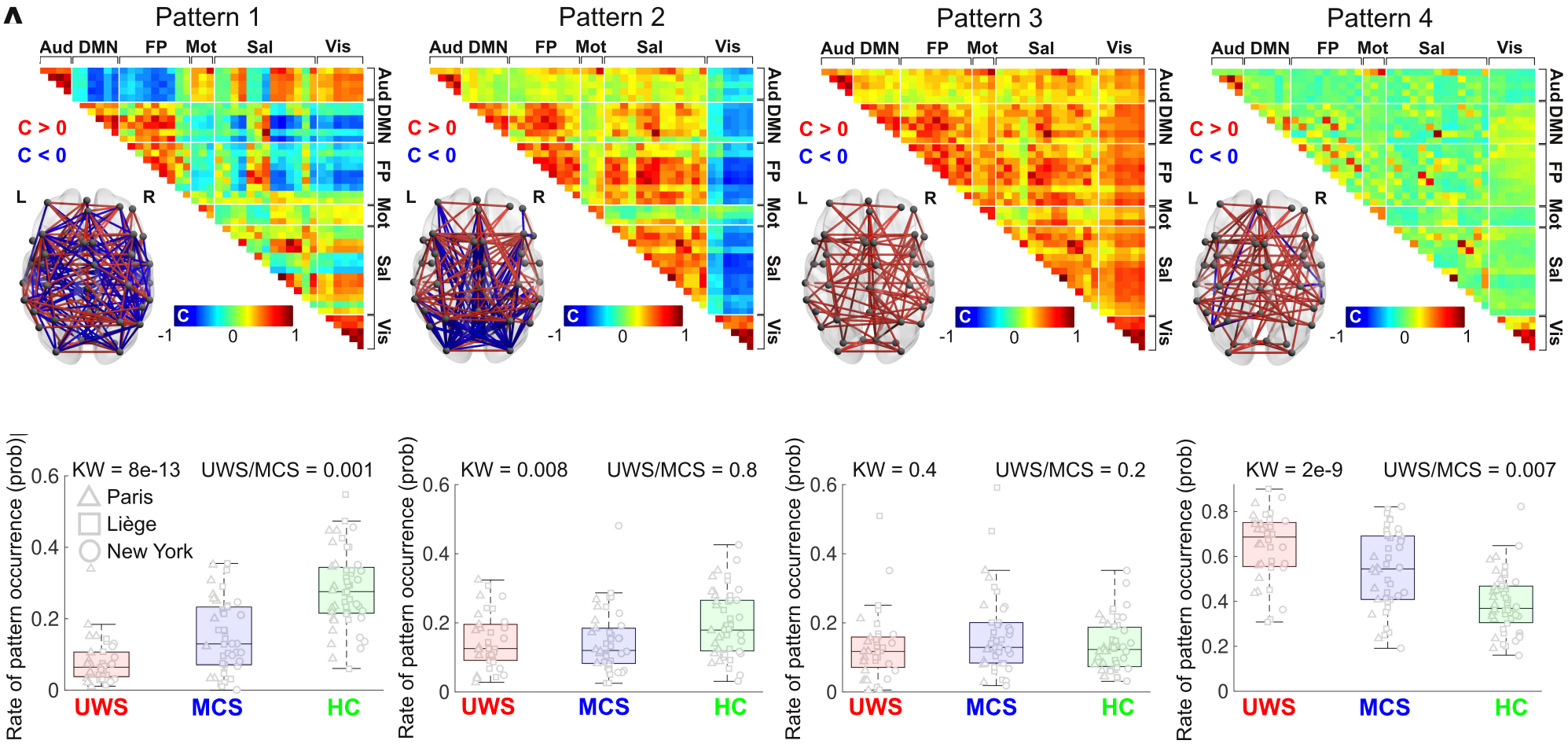
Dynamisme cérébral

Averaged connectome

Dynamic connectome

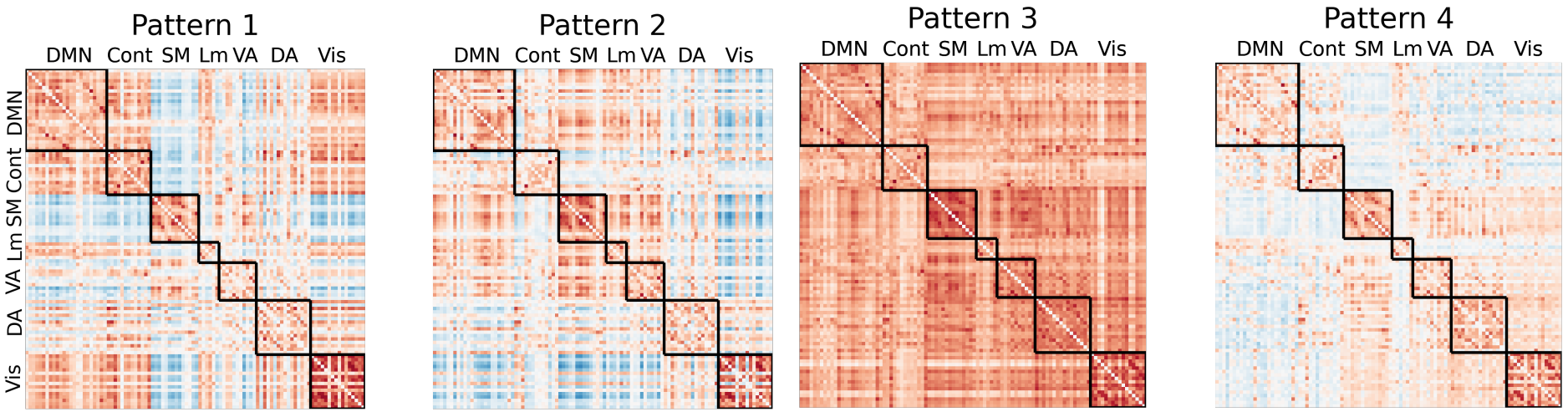


Configurations complexes dans les états de conscience supérieurs



Demertzi & Tagliazucchi, Dehaene, Deco, Barttfeld, Raimondo, Martial, Fernández-Espejo, Rohaut, Voss, Schiff, Owen, Laureys, Naccache, Sitt. *Science Advances* 2019

L'hyperconnectivité bloque le contenu mental

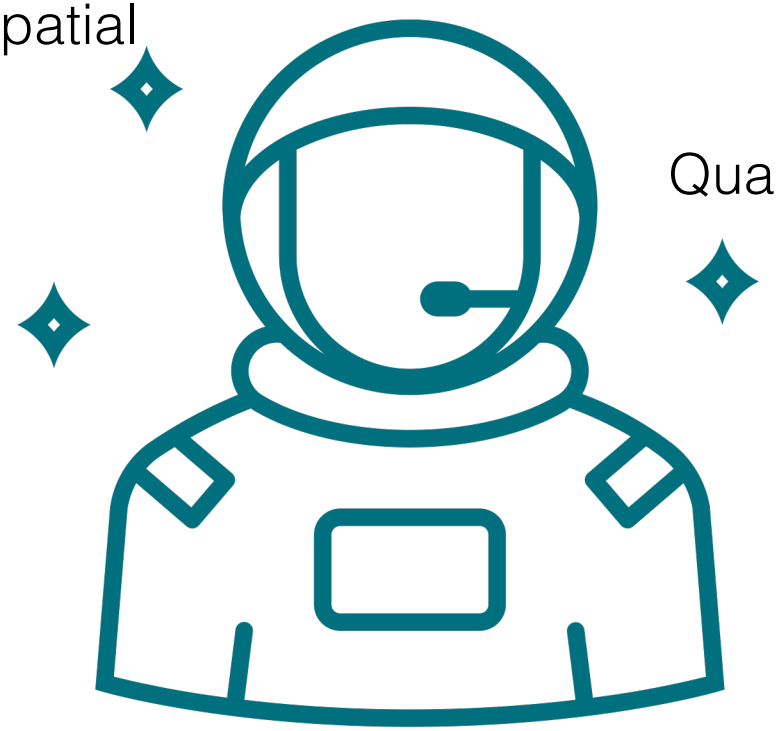


Mortaheb, Van Calster, Raimondo, Klados, Boulakis, Georgoulaa, Majerus, Van De Ville*, Demertzi*. *PNAS* 2022
Van Calster, D'Argembeau, Salmon, Peters, Majerus*, J Cogn Neurosci* 2017

Environnement extrême

Isolement social

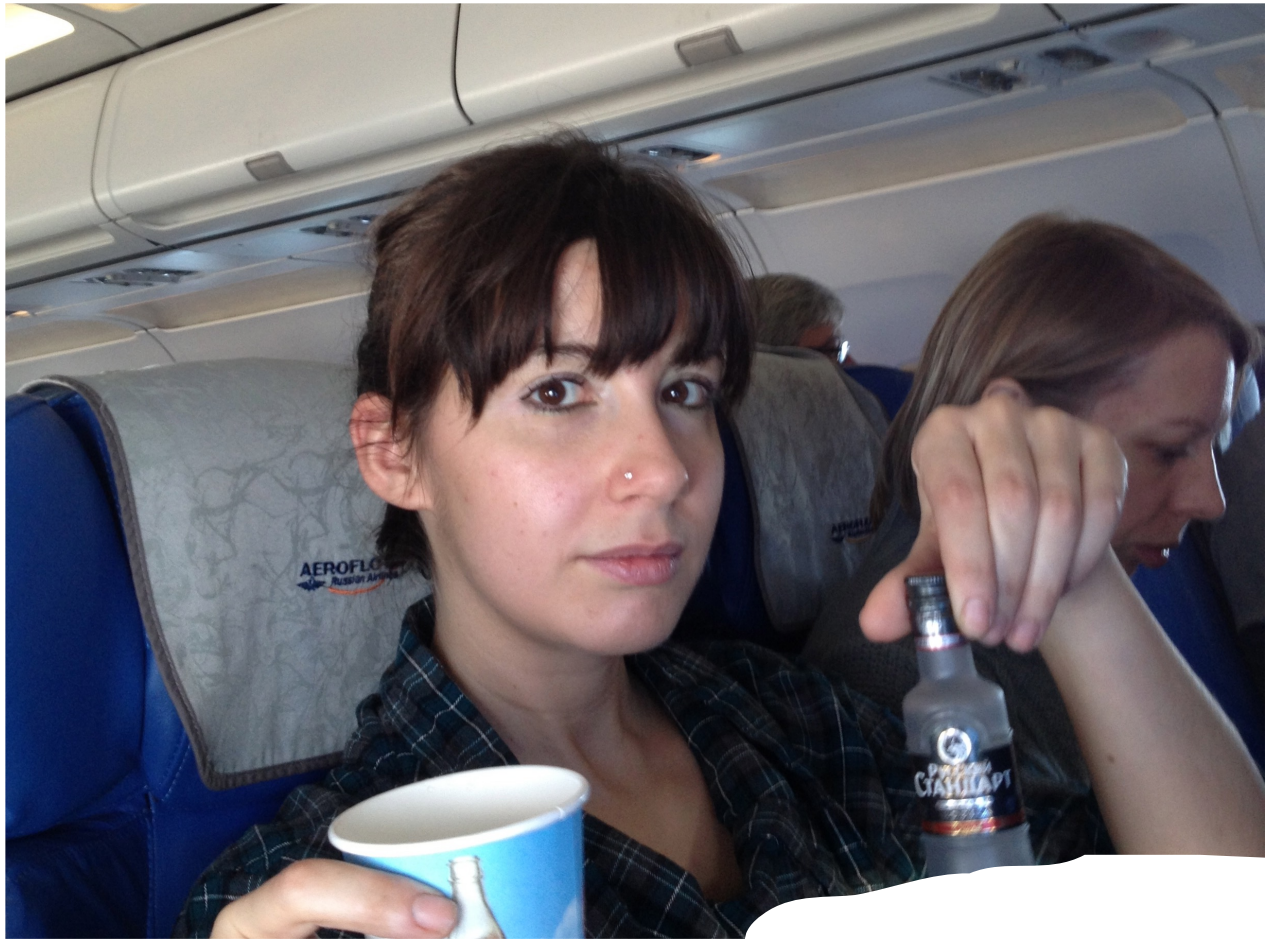
Rayonnement spatial

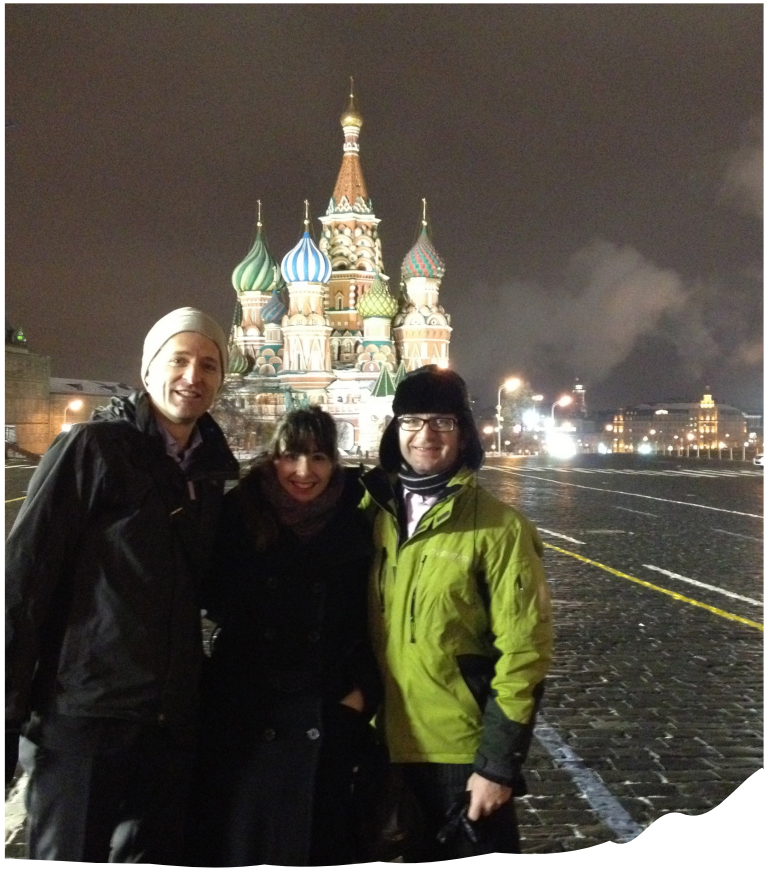


Qualité du sommeil altérée

Microgravity

Perturbation du rythme circadien

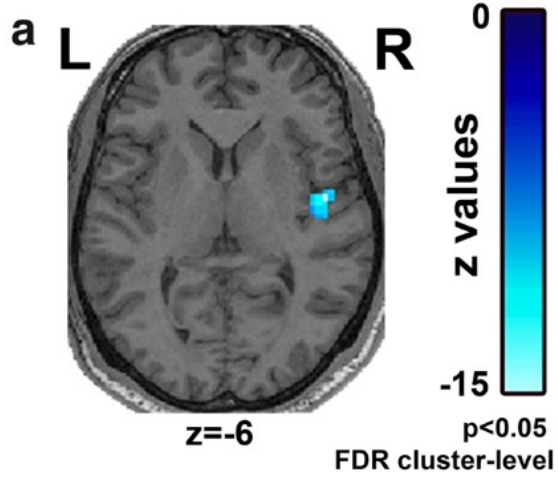


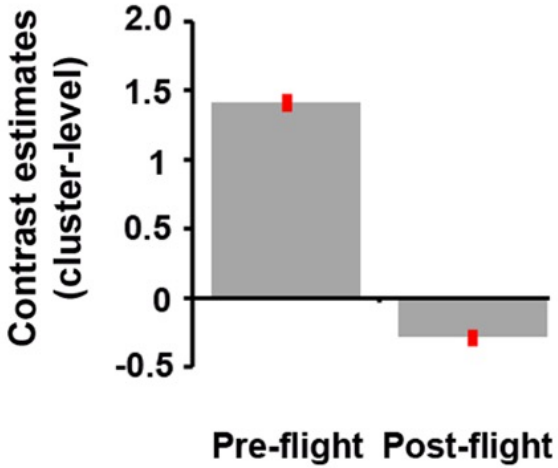


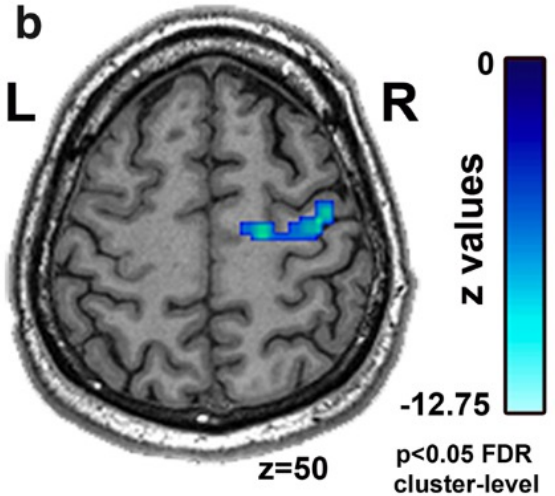
Moscou 2012

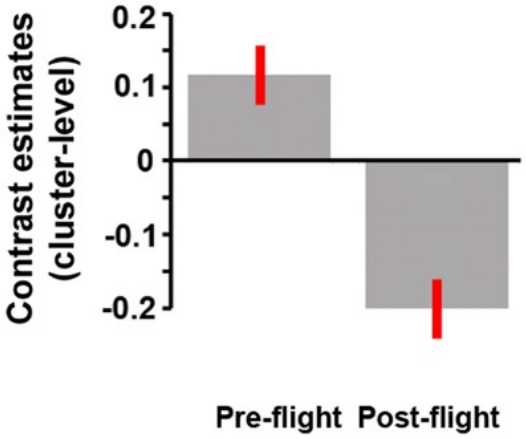
Réorganisation corticale d'un astronaute

- 44-year-old male cosmonaut
- First long-duration mission (169 days) to the ISS in 2014
- fMRI protocol
  - Pre-flight: 30 days
  - Post-flight: 9 days after Earth re-entry



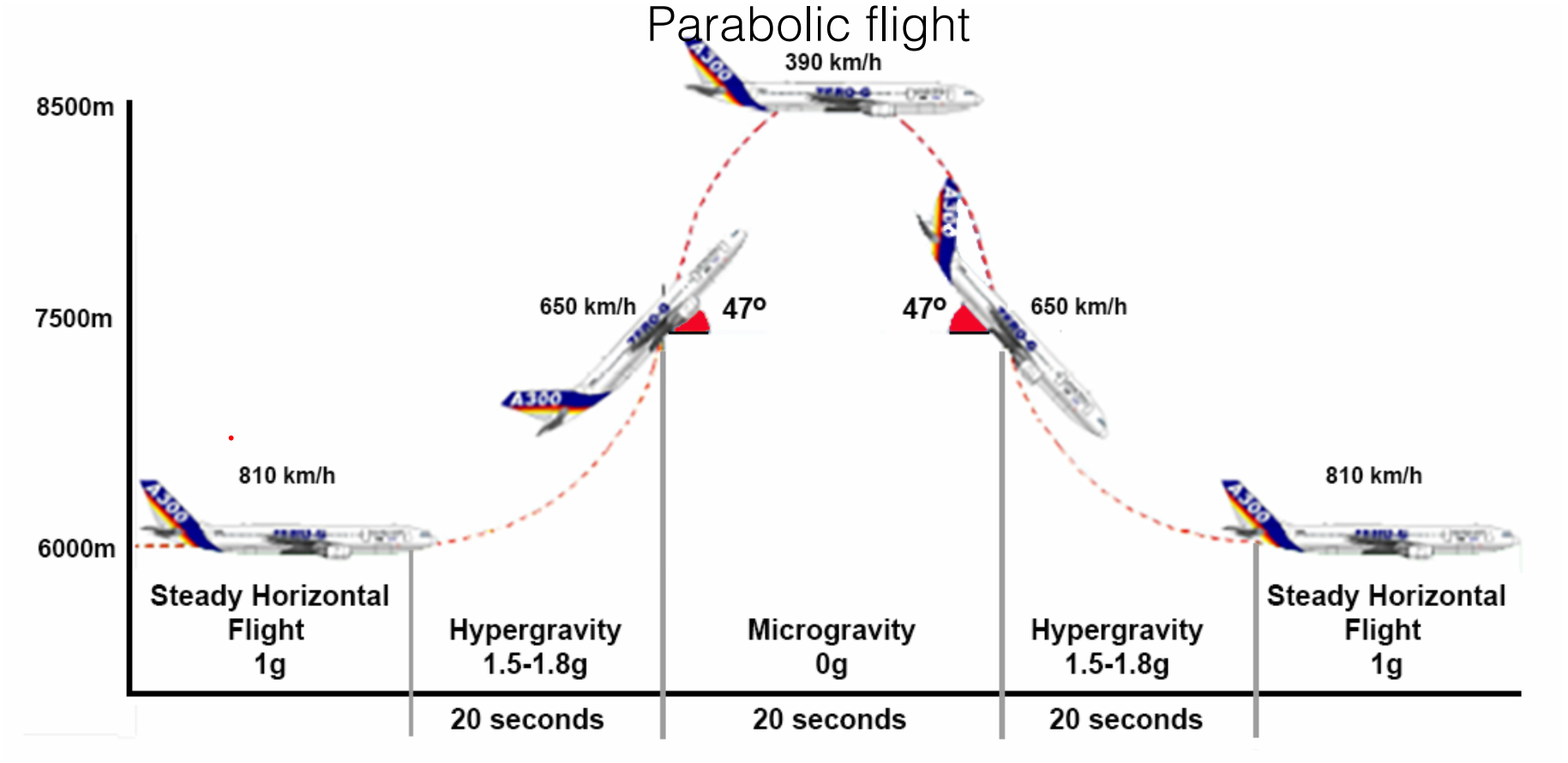






Demertzi & Van Ombergen et al, ***Brain Structure and Function*** 2015

Spaceflight analog



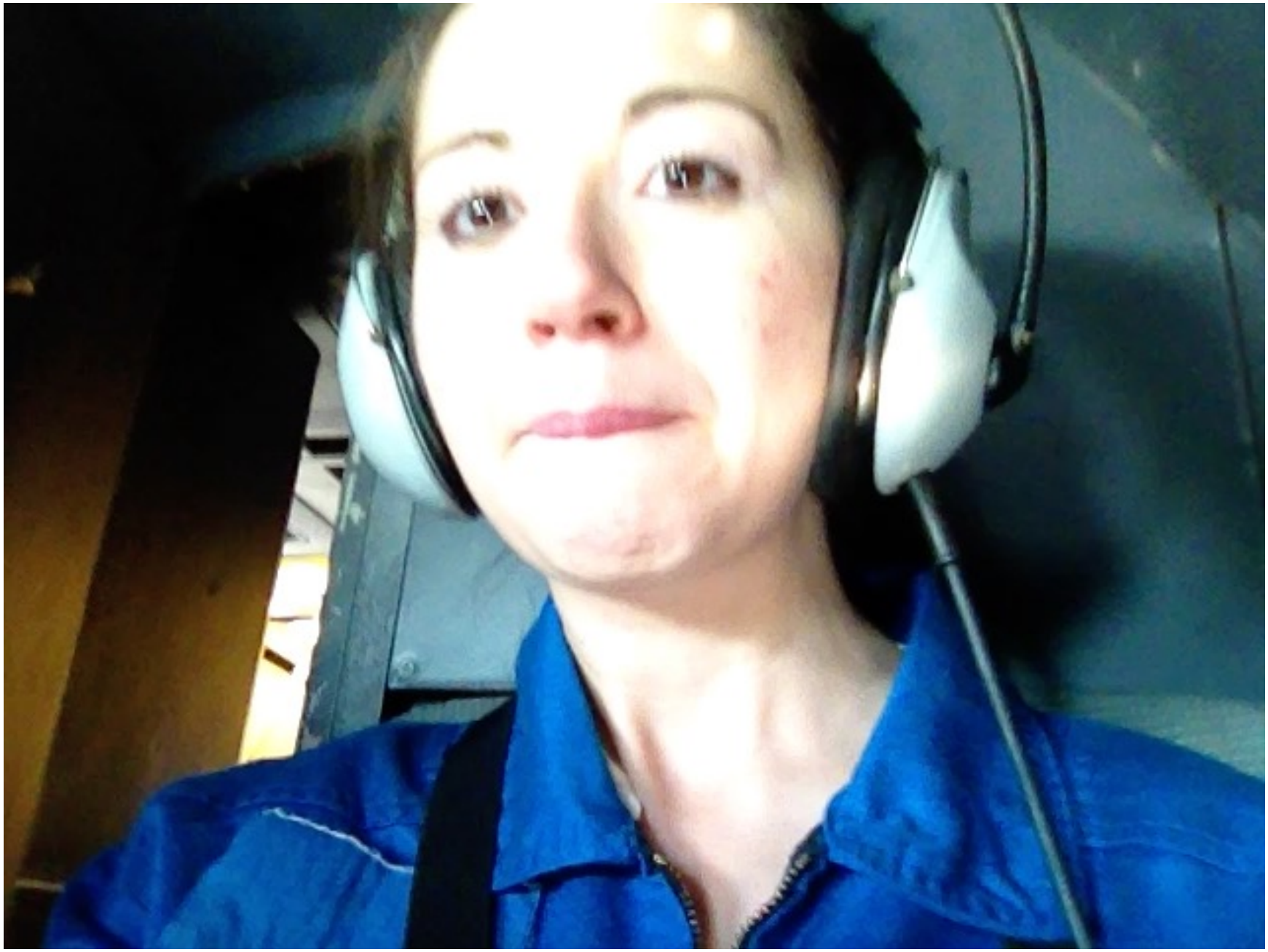
Flight trajectory

Angelique Van Ombergen[1], Floris L. Wuyts[1], Ben Jeurissen[2], Jan Sijbers[2], Floris Vanhevel[3], Steven Jillings[1], Paul M. Parizel[3], Stefan Sunaert[4], Paul H. Van de Heyning[1], Vincent Dousset[5], Steven Laureys[6] & Athena Demertzi[6,7]

SCIENTIFIC REPORTS
Published online: 08 June 2017

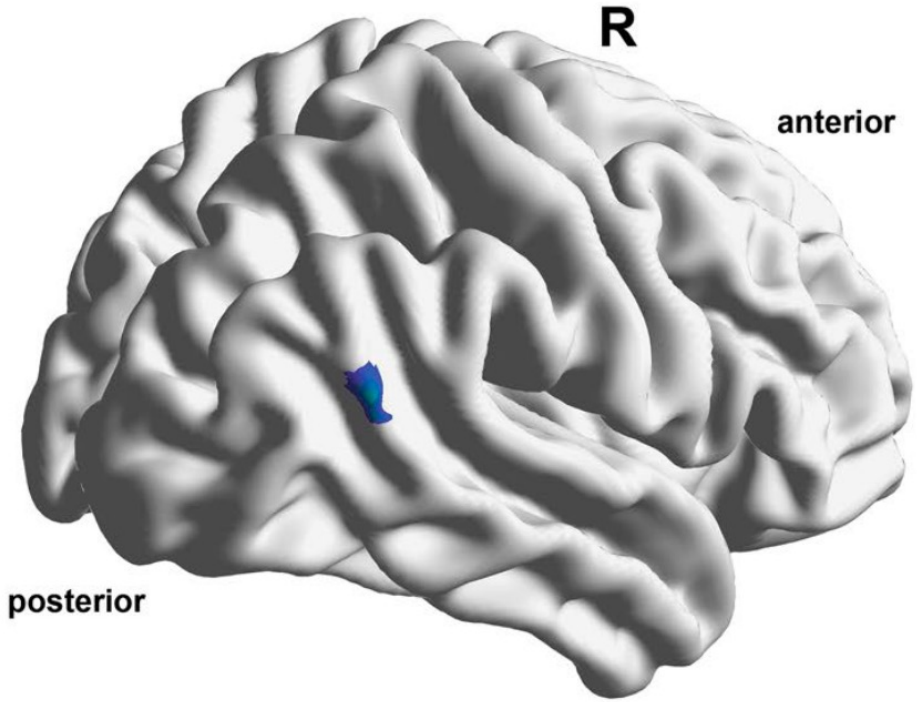
Spaceflight analog

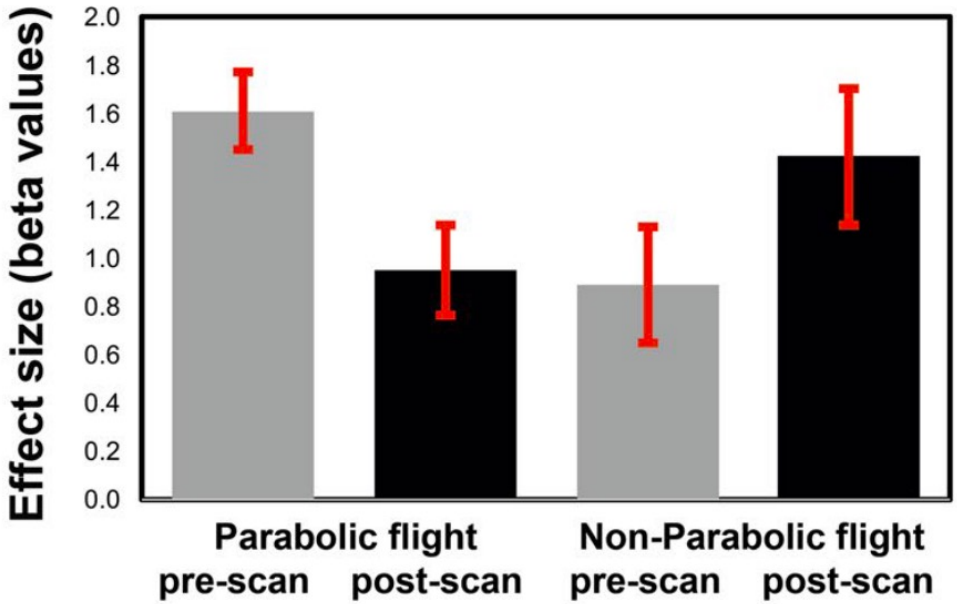
Bordeaux, 2014



Bordeaux, 2014

La jonction temporo-pariétale a diminué la participation à la connectivité cérébrale





Van Ombergen … and Demertzi, ***Sci Reports*** 2017

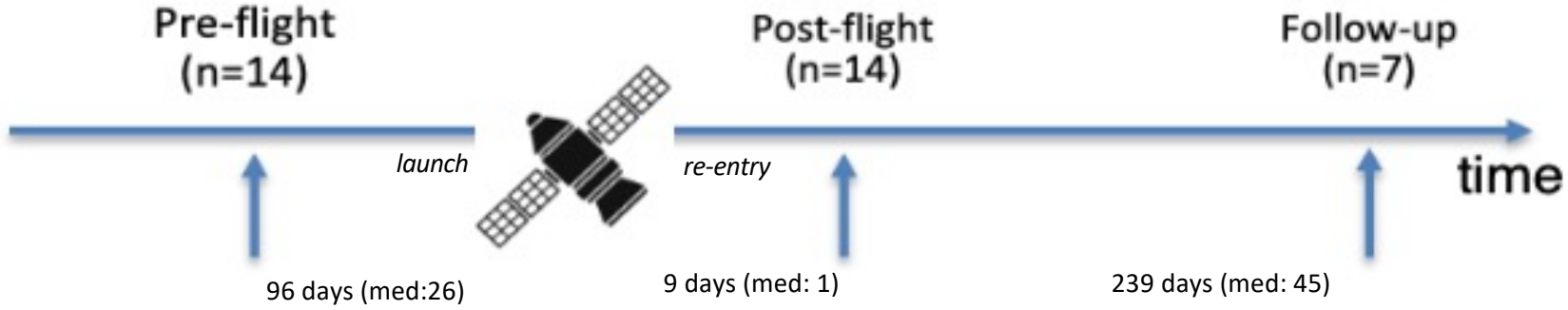
communications biology

ARTICLE

https://doi.org/10.1038/s42003-022-04382-w OPEN

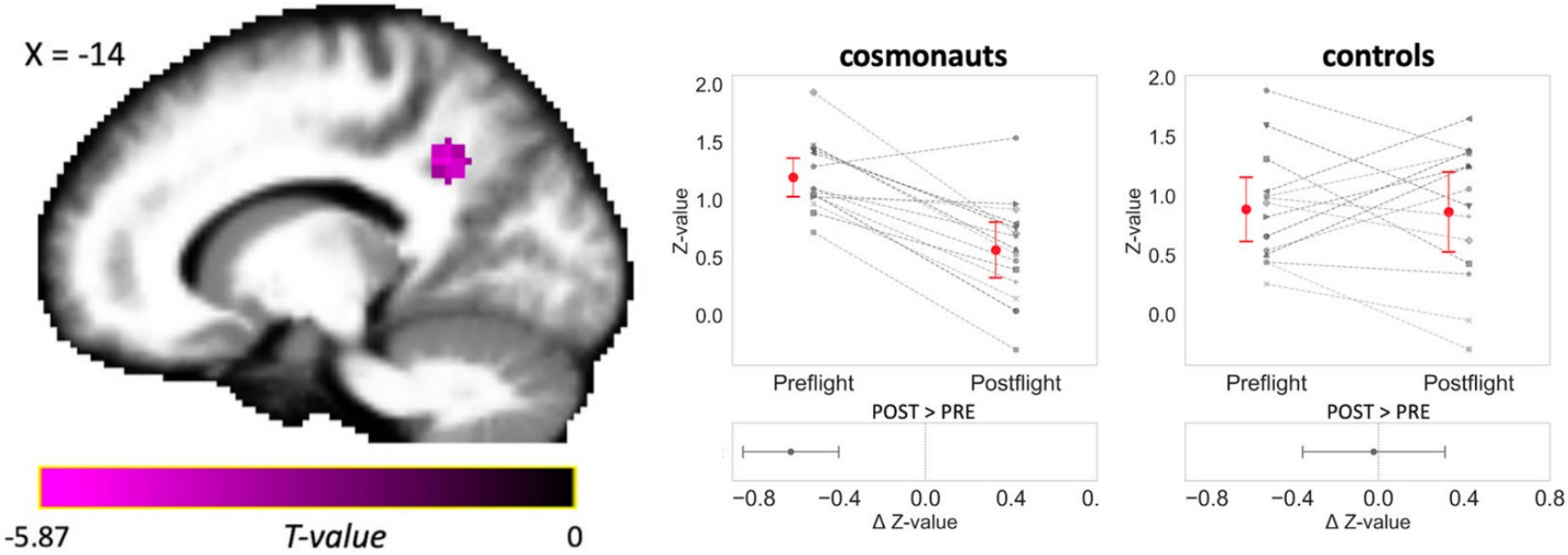
Prolonged microgravity induces reversible and persistent changes on human cerebral connectivity

Steven Jillings[1✉], Ekaterina Pechenkova[2], Elena Tomilovskaya[3], Ilya Rukavishnikov[3], Ben Jeurissen[1,4], Angelique Van Ombergen[1,5], Inna Nosikova[3], Alena Rumshiskaya[6], Liudmila Litvinova[6], Jitka Annen[7], Chloë De Laet[1], Catho Schoenmaekers[1], Jan Sijbers[4], Victor Petrovichev[6], Stefan Sunaert[8], Paul M. Parizel[9], Valentin Sinitsyn[10], Peter zu Eulenburg[11], Steven Laureys[7,12,13], Athena Demertzi[14,15,16] & Floris L. Wuyts[1,16]



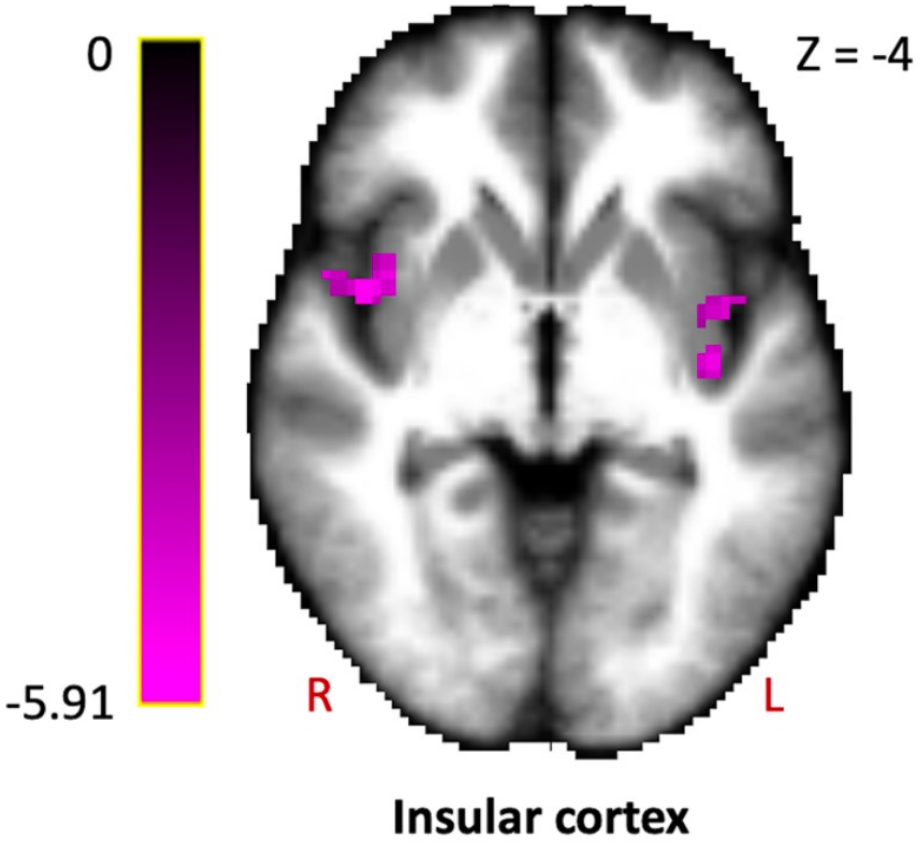
Cosmonauts: Males, Age: 45±6 y.o.; Days in Space: 185±76

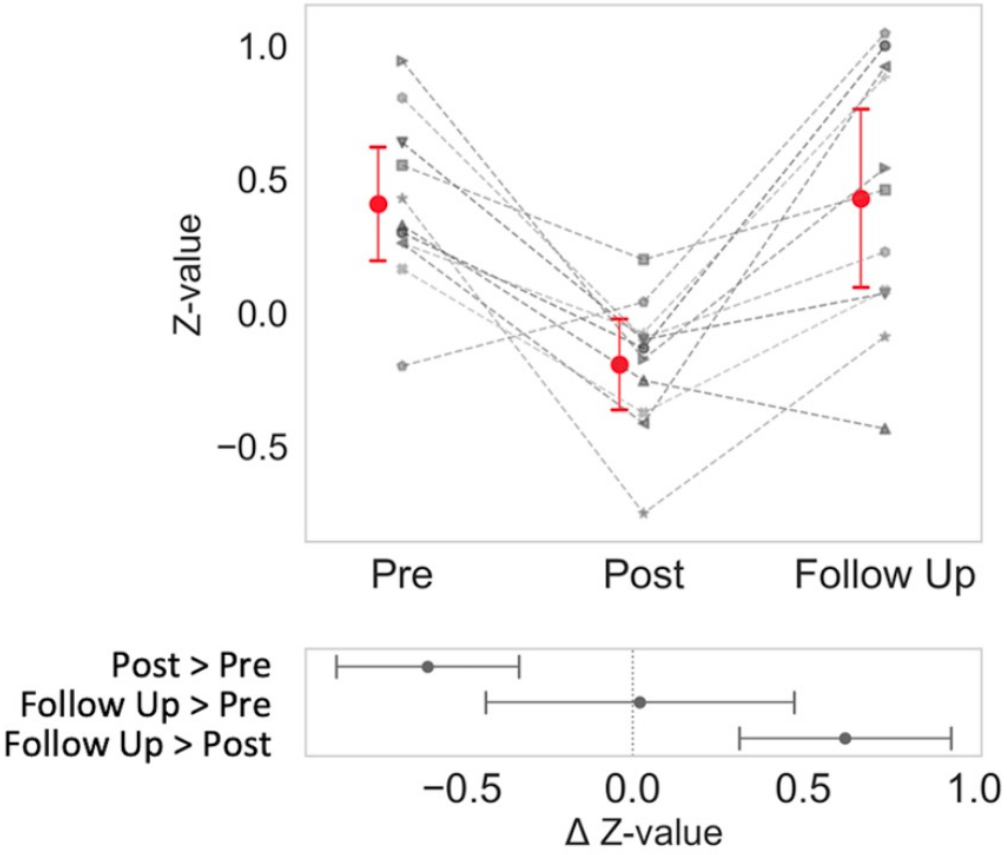
Le vol spatial affecte la connectivité cérébrale



Jillings et al, ***Commun Biol*** 2023

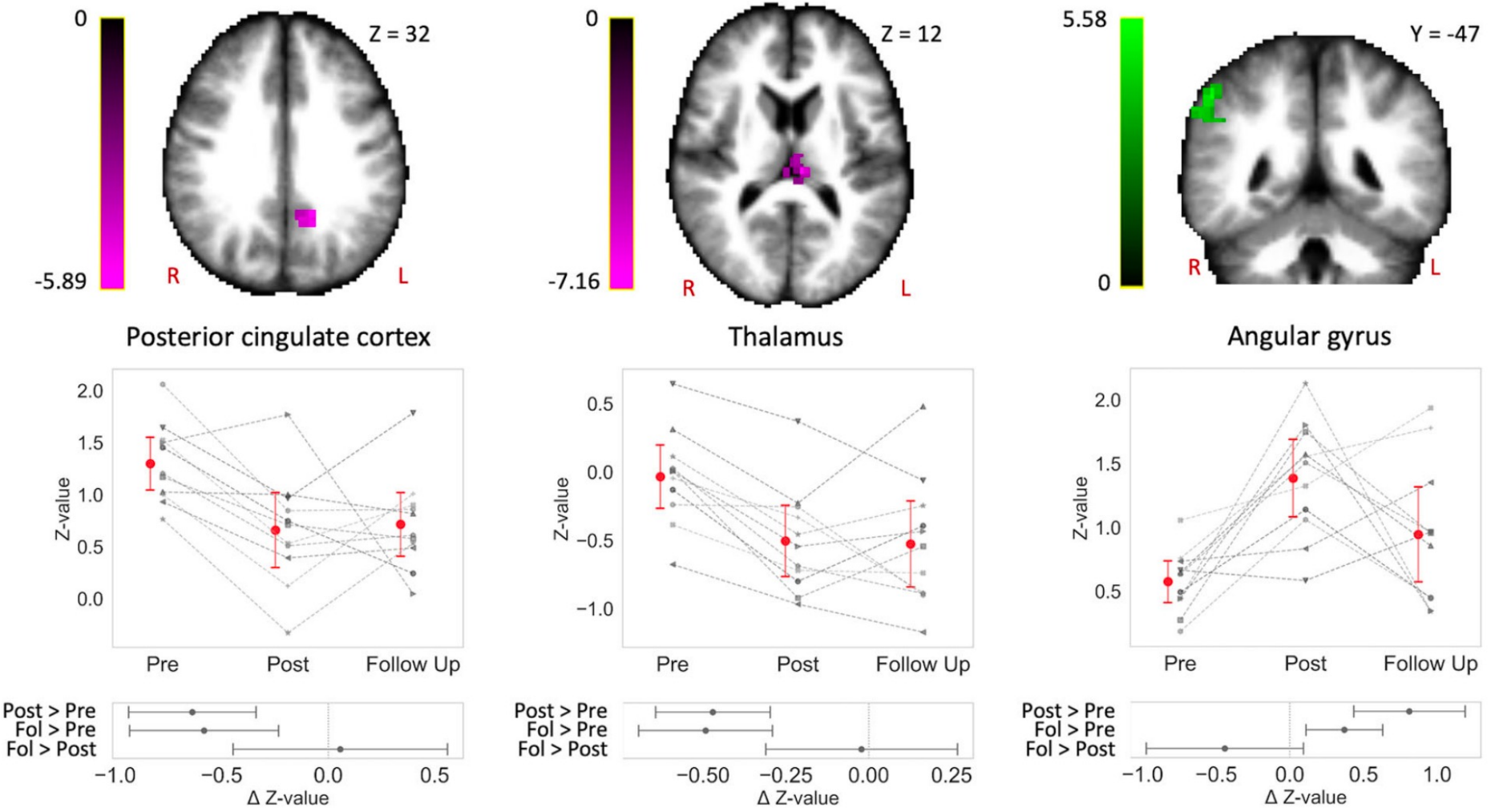
Modifications normalisées





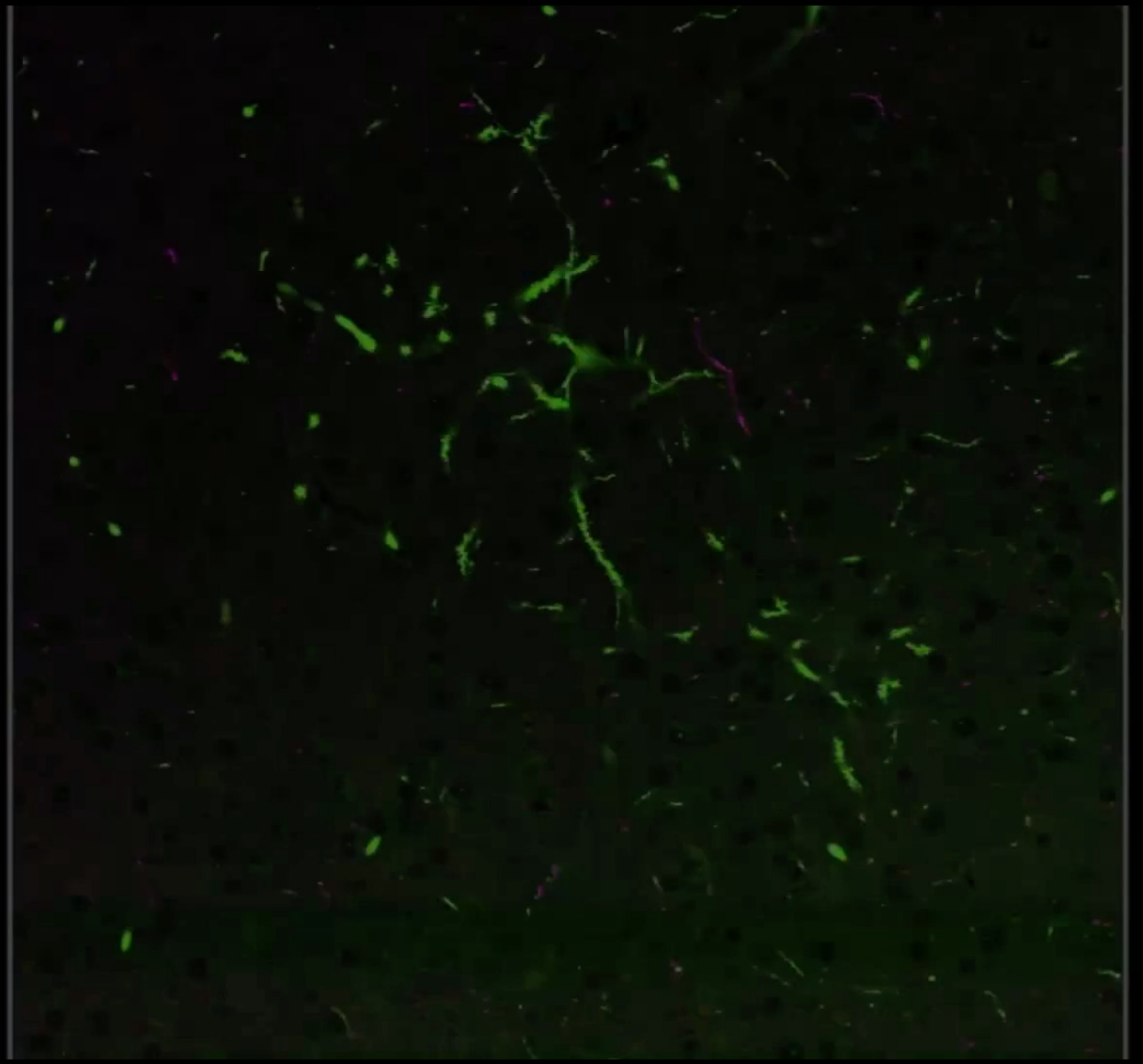
Jillings et al, *Commun Biol* 2023

Modifications persistantes



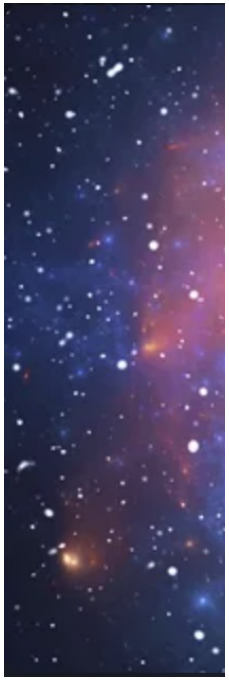
Jillings et al, *Commun Biol* 2023


cnes
ZERO

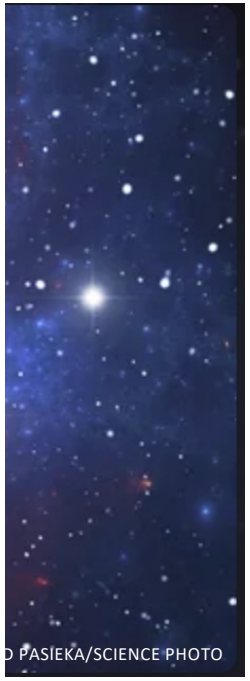


https://www.youtube.com/watch?v=m0rHZ_RDdyQ

Thank you!



PHYSIOLOGY OF
COGNITION LAB



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