Nicolás Gravel, Ph.D. *Curriculum vitae*

Contact Information

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Frédéric-Joliot Institute, CEA-Saclay
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Languages: es, en, de (b.2.1)

Research Interests

Cognitive neuroimaging, visual neuroscience, functional neuroanatomy, applied biomedical research, education and sustainability.

Academic Appointments

Postdoctoral researcher **December 2024 to present**

Investigation of the relationship between retinotopically organized visual cortex and higher-order cognition in congenital blindness.

- Cognitive Neuroimaging Unit, Institut National de la Santé et de la Recherche Médicale, Commissariat à l'Energie Atomique et aux Énergies Alternatives, Centre national de la recherche scientifique, Université Paris-Saclay, NeuroSpin, Paris, France. (PI: Stanislas Dehaene)

Guest scientist **November 2024**

Retinotopically constrained dynnamic flow network analysis.

- Institut de Neurosciences de la Timone, Faculty of medecine, Aix-Marseille University, France. (PI: Matthieu Gilson)

Guest scientist **April 2024 to October 2024**

Analysis of infra-slow EEG oscillations during embodied interactions.

- Embodied Cognitive Science Unit, Okinawa Institute of Science and Technology Graduate University, Tancha, Onna-son, Okinawa, Japan. (PI: Tom Froese)

Postdoctoral researcher **April 2019 to March 2024**

- Neural Dynamics of Visual Cognition group, Department of Education and Psychology, Freie Universität Berlin, Germany. (PI: Radoslaw Cichy)
- In collaboration with the Mechanisms and Functions of Rhythmic Neuronal Synhronization unit, Ernst Strüngmann Institute for Neuroscience, Frankfurt, Germany. (PI: Pascal Fries)

Visiting researcher **September 2018 to March 2019**

Implementation of fMRI compatible eye-tracking system

- Laboratorio de Neurodinámica de la Cognición, Departamento de Psiquiatría, Facultad de Medicina, Universidad Católica de Chile, Santiago.
  (PI: Tomás Ossandón)

Visiting researcher **March 2016 to January 2017**

Brain-network modeling and computational connectomics

- Computational Neuroscience Group, Department of Biology, Universidad Pompeu Fabra, Barcelona, Spain. (PI: Gustavo Deco)

Doctoral researcher **June 2013 to September 2018**

Development of anatomical MRI techniques and fMRI analysis methods

- Laboratory for Experimental Ophthalmology, Department of Ophthalmology, Groningen University Medical Center, The Netherlands.
  (Advisor: Frans Cornelissen)

Research assistant **March 2010 to March 2012**

Implementation of electrophysiological recording and closed-loop control equipment for behavioural experiments in rodents

- Neuronal Circuits Laboratory, Department of Psychiatry, Faculty of Medicine, Catholic University of Chile, Santiago, Chile. (PI: Pablo Fuentealba)

Research assistant **March 2009 to December 2009**

Video-tracking of insect behavior

- Institute of Entomology, Department of Biology, Metropolitan University of Educational Sciences, Santiago, Chile. (PI: Cristián Villagra)

Teaching assistant **March 2008 to March 2009**

Introduction to bio-instrumentation

- Laboratory of Biology of Cognition, Department of Biology, Faculty of Sciences, University of Chile, Santiago, Chile. (PI: Juan Carlos Letelier)

Education

University of Groningen, Groningen, The Netherlands.

Ph.D., Behavioral and Cognitive Neuroscience **August 2013 to April 2018**

- Thesis: *The Neuroanatomical Organization of Intrinsic Brain Activity Measured by 7T fMRI in the Human Visual Cortex*
- Advisor: Frans Cornelissen

Universidad de Chile, Santiago, Chile.

Licentiate Degree in Sciences with Mention in Biology, (equivalent to a B.Sc. and M.Sc.) **March 2004 to December 2009**

- Specialization in neuroscience

Hardware and Software Skills

- Developed hardward/software applications using microcontrollers and integrated circuits (ATmega, FPGA, Intan amplifiers & A/D chips, Open Ephys).
- Computer programming (Python, Matlab, Lab-View, KiCad, C++, Java).
- Analog and digital electronics, printed circuit board (PCB) design.

Peer-reviewed Journal Publications

[1] Valerio, D., Debray, S., Karami, A., Caute, M., **Gravel, N.**, Dehaene, S. (2026). A cortical semantic space integrating fractions and integers. bioRxiv

[2] **Gravel, N.**, Formento, N., Froese, T. (2025). Interpersonal alignment in infra-slow EEG rhythms and bodily signals anticipates mutual recognition. bioRxiv 2025.05.29.656704

[3] Invernizzi, A., **Gravel N.**, Haak KV., Renken, R., Cornelissen, FW. (2021) Assessing Uncertainty and Reliability of Connective Field Estimations From Resting State fMRI Activity at 3T. Frontiers Neuroscience 15, 625309

[4] **Gravel, N**., Renken, R., Harvey, B., Deco, G., Cornelissen, FW. , Gilson. M. (2020). Propagation of BOLD activity reveals task-dependent directed interactions across human visual cortex. Cerebral Cortex 200, 5899-5914.

[5] Hindriks, R., Mantini, R., **Gravel, N.**, Deco, G. (2018). Latency analysis of resting-state BOLD-fMRI reveals traveling waves in visual cortex linking task-positive and task-negative networks. NeuroImage 200, 259-274.

[6] Servaas, M., Kos, C., **Gravel, N.**, Marsman JB., van Tol, MJ. , Aleman, A. (2018). Rigidity in Motor Behavior and Brain Functioning in Patients With Schizophrenia and High Levels of Apathy. Schizophrenia bulletin 45 (3), 542-551.

[7] **Gravel, N.**, Harvey, B., Renken, R., Dumoulin, SO. , Cornelissen, FW. (2018). Phase-synchronization-based parcellation of resting state fMRI signals reveals topographically organized clusters in early visual cortex. NeuroImage 170, 424-443.

[8] Nordhjem, B., Petrozzelli, C., **Gravel, N.**, Renken, R. , Cornelissen, FW. (2015). Eyes on emergency: Fast detection yet slow recognition of emerging images. Journal of Vision 15, (9), 8.

[9] **Gravel, N.**, Harvey, B., Nordhjem, B., Haak, K., Dumoulin, SO. Renken, R., Curcic-Blake, B. , Cornelissen, FW. (2014). Cortical connective field estimates from resting state fMRI activity. Frontiers in neuroscience 8, 339.

Invited Seminars and Lectures

[1] **Gravel, N.** (2026). Retinotopic maps subsist in congenital blindness and are recycled for mathematical and linguistic processing. Paris Île-de-France Neuroscience, Theory, and Systems (PINTS), Paris, France.

[2] **Gravel, N.** (2023). Linking Structure-Function Relationships in Human Visual Cortex through Computational Neuroimaging and Electrophysiology. Max-Planck-Institut für Kognitions- und Neurowissenschaften, Leipzig, Germany; Institut de Neurosciences de la Timone, Marseille, France.

[3] **Gravel, N.** (2023). Cortical Neuronal Circuits Underlying Human Visual Perception: Insights from Neuroimaging and Laminar Electrophysiology. Laboratory for Experimental Ophthalmology, University Medical Center Groningen, The Netherlands.

[4] **Gravel, N.** (2019, 2020, 2021, 2022). Introduction to fMRI (lecture for the Cognitive Neuroscience PhD course). Catholic University, of Chile, Santiago, Chile.

[5] **Gravel, N.** (2020). Sensory ethology: evolutionary accounts of animal cognition (lecture for the Cognitive Neuroscience MSc. course). Department of Education and Psychology, Freie Universität Berlin, Germany.

[6] **Gravel, N.** (2019). Directed influences across human visual cortex revealed by fMRI. Department of Biomedicine, Aarhus University, Denmark; First Chilean Conference on Computational Neuroscience, Valparaíso, Chile; Department of Psychiatry, Catholic University, of Chile, Santiago, Chile.

[7] **Gravel, N.** (2018). Dynamic systems theory as a framework for psychiatry. An enactive approach to psychiatry and (psycho)therapy. Berlin School for Brain and Mind, Berlin, Germany.

Conference Abstracts

[1] **Gravel, N.**, Gilson, M., Knapen, T., Cichy, RM,. Cornelissen, FW. (2023). Task-dependent Directed Interactions Across Early Visual Cortex Measured with 7T fMRI. Organization for Human Brain Mapping, Montreal, Canada.

[2] **Gravel, N.**, Gilson, M., Renken, R., Cornelissen, FW. Deco, G. (2017). Propagation of BOLD activity reveals directed interactions across human visual cortex. Organization for Human Brain Mapping, Vancouver, Canada.

[3] **Gravel, N.**, Harvey, B., Dumoulin, SO., Renken, R., Cornelissen, FW. (2016). Spatial phase coherence analysis reveals discrete cortical modules within early visual cortex. 39th European Conference on Visual Perception, Barcelona, Spain.

[4] **Gravel, N.**, Harvey, B., Dumoulin, SO., Renken, R., Cornelissen, FW.(2015). Changes in the periodicity of BOLD co-fluctuations underlie the variability of cortico-cortical population receptive field maps derived from resting state data. Society for Neuroscience, Chicago, United States of America.

[5] **Gravel, N.**, Harvey, B., Dumoulin, SO., Renken, R., Cornelissen, FW. (2014). Retinotopic organization of resting state fluctuations in the early visual cortex. Organization for Human Brain Mapping, Hamburg, Germany.

[6] **Gravel, N.**, Harvey, B., Dumoulin, SO., Renken, R., Cornelissen, FW. (2014). Cortical Connective Field Estimates from Resting State fMRI Activity. 37th European Conference on Visual Perception, Belgrade, Serbia.

[7] Nordhjem, B., Petrozzelli, CK., **Gravel, N.** Renken, R., Cornelissen, FW.(2014). Systematic eye movements during recognition of emerging images. Vision Sciences Society Annual Meeting, Florida, United States of America.

[8] van Dijk, M., **Gravel, N.**, Haak, KV., Cornelissen, FW. (2013). Cortical connective fields in a hemispherectomized patient. Applied Vision Association, Leuven, Belgium.

[9] Nordhjem, B., Petrozzelli, CK., **Gravel, N.** Renken, R., Cornelissen, FW. (2013). Eye movements while viewing coarse and fine image information. 36th European Conference on Visual Perception, Bremen, Germany.

Awards and fellowships

[1] **Alexander von Humboldt fellowship for post-doctoral research** (Germany).

[2] **Advanced Human Capital post-doctoral research scholarship** (Chile).

[3] **Professor Mulder Stitching doctoral research scholarship** (The Netherlands).

[4] **Advanced Human Capital PhD scholarship** (Chile).

[5] **Abel-Tasman pre-doctoral internship scholarship for young talents in the biomedical sciences** (The Netherlands).