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# LE CERCLE

Le Club des ERC du site d'Aix-Marseille

6<sup>e</sup> session plénière du CERCle  
Jeudi 4 décembre 2025

# Foreword

In a scientific landscape marked by rapid change and increasing complexity, ambitious, curiosity-driven, and frontier research has never been more essential. The European Research Council (ERC) plays a central role in this endeavour by supporting pioneering projects that advance the boundaries of knowledge across all disciplines.

The CERClE—the *Club of ERC Researchers of the Aix-Marseille site*—was created to strengthen and structure the engagement of our research community with the ERC programme. Bringing together ERC grantees, former laureates, and prospective applicants, the CERClE provides a framework for exchanging expertise, sharing best practices, supporting grant preparation, and fostering bold scientific initiatives. It embodies the shared commitment of our founding institutions to cultivate an environment where excellence and scientific risk-taking are fully supported.

Through the CERClE initiative, the founding institutions reaffirm their ambition to enhance the visibility, competitiveness, and impact of research at Aix-Marseille. By promoting peer-to-peer exchanges and strengthening operational support, we continue to position our site as a leading research hub in Europe—a dynamic ecosystem whose collective efforts have enabled us to achieve a success rate above 20% in the Horizon Europe ERC calls. This performance reflects both the excellence of our researchers and the robustness of the support structures we have built.

The following pages present the objectives, activities, and achievements of the activities deployed in Aix-Marseille around the ERC programme. The founding institutions of the CERClE reiterate their strong commitment to supporting all ERC ambitions and projects at Aix-Marseille. With the ERC's preeminent role and the anticipated increase in support under the forthcoming Framework Programme (post-2027), we are confident it will continue to inspire and empower our community to achieve even greater scientific impact.

Today, the CERClE represents:

- 127 ERC projects\* on the site since the launch of the European Research Council (ERC) in 2007.
- 36 ERC laureates in the Horizon Europe program, 5 laureates benefiting from an ERC Proof of Concept project, and 3 researchers from the site associated with an ERC project from another site.
- 41 ERC laureates in the Horizon 2020 program, 5 laureates benefiting from an ERC Proof of Concept project, and 3 researchers from the site associated with an ERC project from another site.
- 29 ERC laureates in the 7th Framework Program and 3 researchers from the site associated with an ERC project from another site.

\* Project refers to ERC laureates and Proof of Concept projects. Some laureates may have been awarded multiple ERC projects.

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# Overview of Le CERCle

# 1.1 Presentation : Le CERCle

**T**he ERC Grants fund exploratory and high-risk research projects within the European Union. It is a “frontier science” programme dedicated to research at the cutting edge of knowledge, where the sole criterion for selection is scientific excellence. On May 15, 2017, Aix-Marseille University and its partners—the National Centre for Scientific Research (CNRS), the National Institute for Health and Medical Research (INSERM), the Institute for Research and Development (IRD), and the Atomic Energy Commission (CEA)—officially launched the **CERCle**, the Club of ERC Researchers, joined in 2018 by École Centrale. With financial support from Amidex, this initiative aims to implement a coordinated site-wide policy to support researchers in applying to the ERC programme, a key benchmark of scientific excellence.

## **Objectives:**

- Encourage and support ERC applications.
- Enhance the visibility of the site’s scientific excellence.
- Strengthen Aix-Marseille’s position as a major European research hub.

## **Composition:**

The CERCle is composed of members affiliated with a research unit from Aix-Marseille and includes:

- ERC grant awardees, either completed or ongoing.
- Current or former members of ERC evaluation panels.

## **The Mission Europe pour la Recherche (MER)**

Since 2024, the **CERCle** has been coordinated by the **Mission Europe for Research (MER)**.

MER is based on a shared operational model among four partner institutions—Aix-Marseille University and its subsidiary Protisvalor, CNRS, Inserm, and IRD. Its mission is to strengthen and streamline support for research units on the Aix-Marseille site, helping them secure European grants for research and innovation projects.

All activities related to European funding are now centralized within MER for the four founding institutions. This includes identifying relevant calls, raising awareness, fostering networking, supporting project development, assisting in negotiations, and managing non-financial aspects of European Research and Innovation projects.

With **Amidex** funding, MER coordinates and promotes the CERCle, ensuring that its initiatives are effectively implemented. This support is part of the **Multi-Year Action Plan Europe 2025–2027**, reflecting a long-term commitment to enhancing the site’s ERC success. By centralizing expertise and resources, MER enables researchers to navigate the ERC process more efficiently—from detecting project opportunities to preparing for selection interviews—thus maximizing the site’s impact in European research.

## 1.2 CERCle activities

**T**he CERCle offers tailored scientific support to all researchers preparing an ERC project. Each applicant benefits from individualized coaching and guidance throughout the submission process.

### Key activities to support ERC applicants include:

- Individual coaching sessions for ERC applicants.
- Writing workshops to assist in proposal preparation.
- Interview preparation, including both collective and individual training sessions.
- Information sessions on each type of ERC grant, open to all researchers.
- Learning from ERC laureates success and sharing best practices
- CV and bibliometrics benchmarking to support project submissions.

Our team also leads joint strategic reflections to strengthen the participation of local research teams in ERC and other European programs. We actively stimulate interactions among site teams to foster collaboration and increase engagement in European funding opportunities.

- Analysis of local ERC results and feedback interviews with interviewed candidates.
- Initiatives to enhance the visibility of local ERC laureates and strengthen their bibliometric profiles.
- Annual plenary session featuring presentations by candidates selected for funding.
- Annual Masterclass engaging ERC experts, local laureates, and candidates to share best practices.

**Through these activities, the CERCle aims to maximize the success of ERC applications from the Aix-Marseille site while fostering a culture of excellence, collaboration, and innovation across the local research community.**

# 1.3 Activities planned for 2026

Looking to 2026, the CERClé sets ambitious goals to strengthen Aix-Marseille's position in European research.

## Our priorities:

- **Enhancing Visibility:** Promote researchers' achievements, highlight projects, build partnerships.
- **Increasing Support:** Expand ERC coaching, workshops, and resources, including activities specifically dedicated for the Humanities.
- **Stimulating Innovation:** Launch initiatives to foster innovation and tackle societal challenges.

- **Expanding the European Network:** Strengthen collaborations with universities and research centers across Europe.

The CERClé combines collective training with individualized coaching and adapts continuously to European funding priorities. By enhancing researchers' profiles and visibility, we aim to boost their competitiveness and foster a collaborative, innovative research community.

Through these initiatives, the CERClé consolidates its leadership and serves as a model for other institutions, demonstrating how scientific excellence thrives alongside collaboration and innovation.

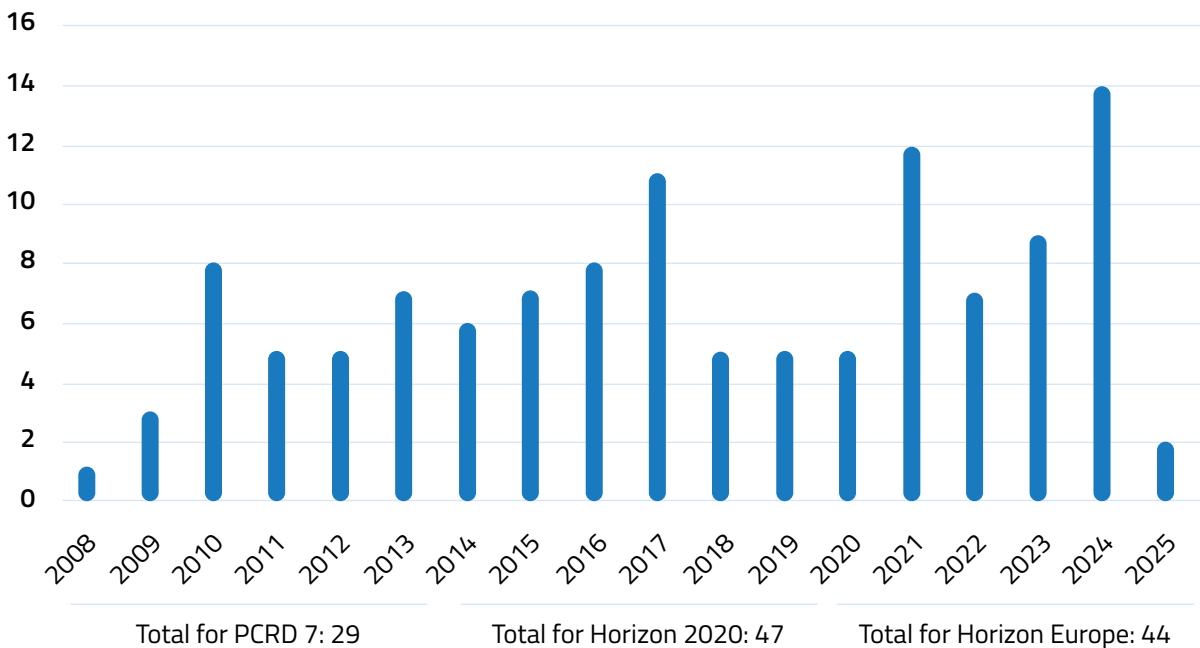
## CERClé 2026 calendar

*The exact dates might differ*

Event	Date	Description
Info days AdG	March 2026	Information sessions on AdG ERC grant, open to all researchers
Workshop AdG	April 2026	Writing workshops to assist in proposal preparation
Info days StG	May 2026	Information sessions on StG ERC grant, open to all researchers
Workshop StG	June 2026	Writing workshops to assist in proposal preparation
Workshop SHS – StG and AdG	June 2026	Writing workshops to assist in proposal preparation specifically for SHS researchers
Info days AdG	September 2026	Information sessions on StG ERC grant, open to all researchers
Workshop CoG	October 2026	Writing workshops to assist in proposal preparation
CERClé MasterClass	Summer 2026	Annual Masterclass engaging ERC experts, local laureates, and candidates to share best practices.
CAERClé Plenary Session	Winter 2026	Annual plenary session featuring presentations by candidates selected for funding.

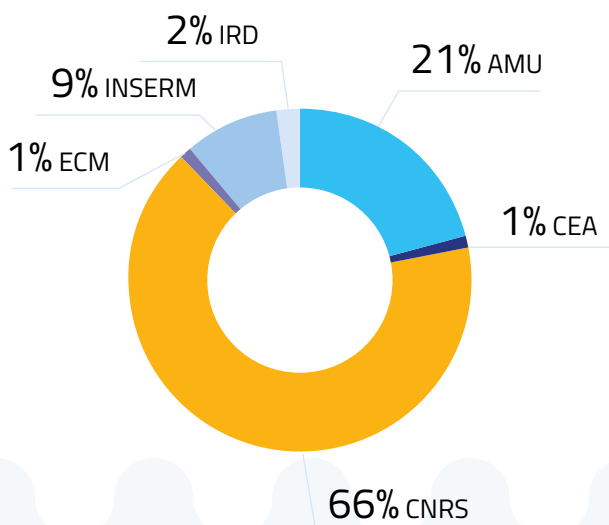
# 1.4 CERCle figures (since 2008)

## Number of ERC projects per year\*

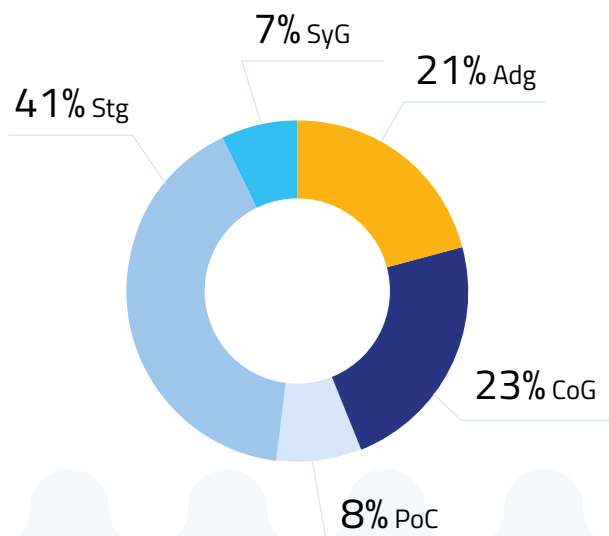


\*We are still waiting on results for 2025 calls

## ERC projects by institution

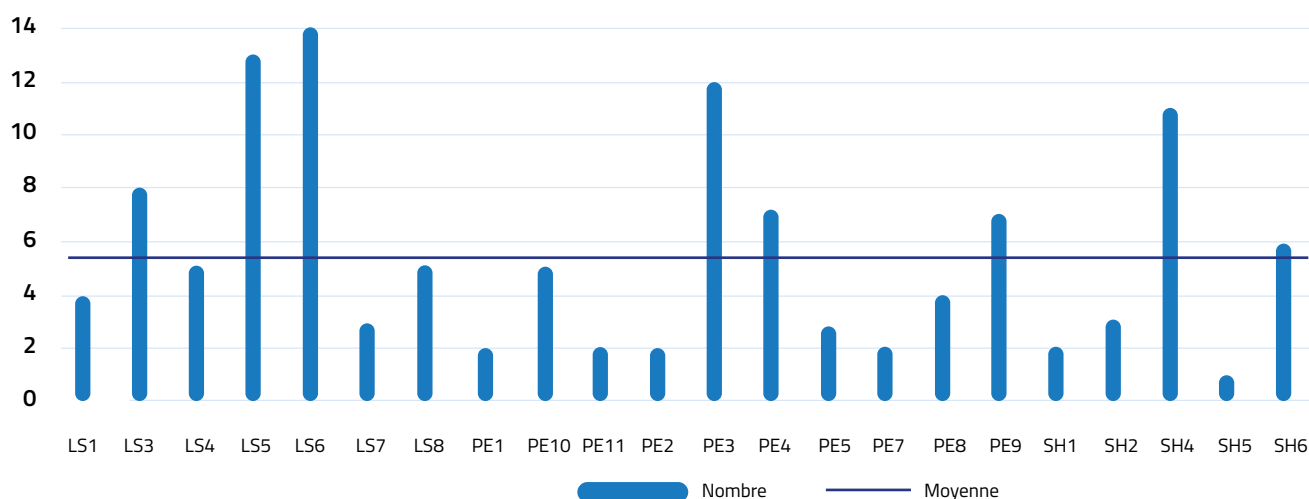


## ERC type repartition



# 1.4 CERCle figures (since 2008)

## Distribution of ERC projects by panel, compared to the site average of 5,5 per panel where projects have been submitted



## Distribution of ERC projects by field

20% Social Sciences and Humanities



38% Physical Sciences and Engineering Life

## ERC panels details with our site top panels highlighted

- PE1: Mathematics
- PE2 : Fundamental Constituents of Matter
- PE3 : Condensed Matter Physics
- PE4 : Physical and Analytical Chemical Sciences
- PE5 : Synthetic Chemistry and Materials
- PE7 : Systems and Communication Engineering
- PE8 : Products and Processes Engineering
- PE9 : Universe Sciences
- PE10 : Earth System Science
- PE11 : Materials Engineering
- LS1 : Molecules of Life: Biological Mechanisms, Structures and Functions
- LS3 : Cell Biology, Development, Stem Cells and Regeneration
- LS4 : Physiology in Health, Disease and Ageing
- LS5 : Neuroscience and Disorders of the Nervous System
- LS6 : Immunity, Infection and Immunotherapy
- LS7 : Prevention, Diagnosis and Treatment of Human Diseases
- LS8 : Environmental Biology, Ecology and Evolution
- LS9 : Biotechnology and Biosystems Engineering
- SH1 : Individuals, Markets and Organisations
- SH2 : Institutions, Governance and Legal Systems
- SH4 : The Human Mind and Its Complexity
- SH5 : Texts and Concepts
- SH6 : The Study of the Human Past

# 1.5 Overview of Horizon Europe Figures

**Focusing on the Horizon Europe figures our site**

**272**

**projects**  
submitted

**20%**

**success rate** on projects submitted where results have been announced\*.

*\*2025 grant evaluations are still ongoing*

**45**

successful projects for

**36**

ERC laureates

**€72 216 429**

of subventions from the ERC



②

2024-2025

Laureates



*Olga is a linguist and cognitive neuroscientist currently working as a CNRS Researcher at Aix-Marseille Université, France.*

*She obtained her PhD in Linguistics (Leiden University, Netherlands), following a BA (University of Wrocław, Poland) and MA (Leiden University) degrees in Dutch Studies and an MA in Linguistics (Vrije Universiteit Brussel, Belgium).*

*Olga's research investigates individual differences in (second) language acquisition and the effects of complex environments on brain development. Her PhD focused on neural mechanisms of foreign language learning, utilizing functional MRI, diffusion imaging, and EEG. She has also studied the impact of multilingualism on children's cognitive outcomes and language typology.*

## Diverse Sounds

### How Prenatal Language Experience Shapes Fetal Brain Development and Later Language Learning. A Longitudinal Study

#### UNIT

Laboratoire Parole et Langage

#### GRANT

ERC-2025-StG

**T**he prenatal period represents a critical window in which key neural structures and functions are shaped, laying the foundation for sensory processing, language learning, and cognitive function throughout an individual's lifetime. While research recognizes the importance of prenatal auditory and language stimulation, it is unclear whether and to what degree the language environment in utero shapes the fetal brain and language acquisition after birth. This proposal will focus on the prenatal language environment and its effects on neural plasticity and language development. We will adopt a longitudinal approach combining developmental cognitive neuroscience, linguistics, and information theory, using both novel and existing data.

Given the diversity of speech sounds across languages, multilingualism provides an excellent framework for studying environmental effects on early learning in typical development. DiverseSounds will investigate input-driven neuroplasticity of fetal brain organization, assess which characteristics of speech are processed

by human fetuses, determine fetal neural predictors of interindividual differences in speech sound perception in early infancy, and investigate if fetal neuroplasticity longitudinally predicts language learning mechanisms in infancy.

We will use state-of-the-art brain imaging techniques (MRI and EEG) in monolinguals and multilinguals, and novel measures of phonological diversity informed by descriptive and typological linguistic work. We propose to examine the relationship between prenatal experience and subsequent developmental trajectories of language acquisition from 25 weeks of gestation to 6 months of age. This research will advance our understanding of fetal and infant development and therefore bears significant implications for theory building, language therapy, and public health policy.



*Hugo Bisio's research combines molecular biology and cell biology to understand the functions of numerous genes and the evolution of giant virus genomes.*

*After completing his master's degree in Uruguay, Hugo obtained his PhD at the University of Geneva (2015-2020) under the supervision of Prof. Dominique Soldati-Favre. He then joined the IGS, headed by Chantal Abergel, as a postdoctoral researcher. During this period, he developed tools for the genetic manipulation of giant viruses and their amoebic hosts.*

*Recruited by the CNRS and Aix-Marseille University to a junior professorship, he is starting his own independent research team within the same laboratory.*

## PSDisrupt

AI-driven discovery broad-spectrum antivirals targeting Nucleocytoviricota factories via phase separation modulation

### UNIT

Information Génomique et Structurale

### GRANT

ERC-2025-POC

**T**he phylum Nucleocytoviricota includes (re-)emerging dsDNA viruses of major concern, such as monkeypox virus (mpox) and African swine fever virus (ASFV). Despite their economic and public health impact, no formally approved antivirals exist for these pathogens. Viral factories (membrane-less organelles essential for replication) are highly conserved across Nucleocytoviricota, presenting an attractive and untapped target for antiviral intervention.

PSDisrupt builds on findings from the ERC-funded ViDaMa project, which identified scaffold proteins governing phase separation in viral factories. These proteins share a conserved «molecular grammar» essential for condensate formation. Disrupting this process is expected to broadly inhibit viral replication while minimizing the development of resistance.

This PoC project will design phase-separation grammar-targeting antivirals using AI-driven pipelines. Deep learning models will enable the screening of ultra-

large chemical spaces to identify: (i) broad-spectrum inhibitors targeting conserved scaffold proteins across Nucleocytoviricota, and/or (ii) virus-specific antivirals for mpox and ASFV.

PSDisrupt's translational goal is to design and advance lead compounds into preclinical validation and assess their commercial potential. We will:- Discover and design drugs by leveraging high throughput screens and deep learning-based algorithms.- Perform biophysical and cellular assays to validate compound efficacy.- Establish IP protection for novel inhibitors.- Engage with pharmaceutical and biotech partners for licensing and further development. By bridging virology and AI-driven drug design, PSDisrupt pioneers a novel antiviral strategy with broad applications beyond infectious diseases. The AI framework could be adapted to target phase separation in diverse pathological conditions, including cancer, neurodegeneration, and other condensate-associated diseases, significantly expanding its biomedical and commercial impact.



*After completing her secondary education at the German School of Athens, Arietta Papaconstantinou pursued all her higher education at the University of Strasbourg.*

*After sixteen years in the United Kingdom, where she lectured at the University of Reading, she joined amU in September 2023. Her research focuses on the religious, social and economic history of Egypt and the Near East during the transition from the Roman Empire to the Caliphate.*

*She is particularly interested in the evolution of Christian communities during the first two centuries of the Islamic Empire, notably the power dynamics within village communities and how they were affected by changing imperial demands.*

## Imperial Encounter

### The Imperial Encounter in Early Islamic Egypt: Dissecting the Aphrodito Archive

#### UNIT

Laboratoire d'Archéologie Médiévale et Moderne en Méditerranée

#### GRANT

ERC-2024-ADG

**N**amed 'Aphrodito archive' because it originates in that otherwise unremarkable Middle-Egyptian town, the most important papyrological archive of the early Caliphate contains the papers of an early-eighth-century district administrator, including correspondence with the provincial governor in the new Muslim capital Fustat, and with village heads in his district, as well as registers and accounts generally related to tax and resource extraction. Known for over a century, the Aphrodito archive remains underexploited, largely because of its inaccessibility.

Its three languages (Arabic, Coptic, Greek), difficult-to-access editions, and lack of translations have acted as a break to its study, and the partial nature of the existing translated texts (mainly those coming from above) has created a skewed view of its nature, which is much more organic and dialectical than has been allowed for. IMPERIAL ENCOUNTER will make this invaluable group of documents available to scholars by providing a full translation of the archive's documents.

IMPERIAL ENCOUNTER will also use this archive to produce a microhistory of the Aphrodito area and its engagement with the new empire. Containing documents from above and from below, the archive admirably illustrates the Caliphate's conception of empire and its implementation strategy on the one hand, and local reception empire on the other. A team with the necessary linguistic skills will produce several microhistorical studies exploring some key questions for the Umayyad caliphate and the functioning of early medieval empires: the balance between coercion and negotiation, the role of archives in establishing power, the indigenous reception of empire.

In this key period of ostensible power display by the Umayyads, the documents found in rural Aphrodito mention such projects as the building of the Umayyad mosque in Damascus and demonstrate how they affected tiny villages in a different province, providing a textbook case of global microhistory.



## GeoMorpho Geometric constraints and feedback during tissue morphogenesis

*Thomas Lecuit studies the origin of shapes in living organisms, such as neurons and embryos. During embryogenesis, millions of cells divide, move, change shape, and collectively give rise to a complex organism. What are the mechanical forces at play, and what information flows guide these complex processes to their conclusion? To answer these questions, he leads an interdisciplinary team that observes, characterizes, and disrupts the physical and biological properties of Drosophila development through experimental approaches, and develops theoretical and modeling approaches in collaboration with physicists. He is director of the Turing Center for Living Systems (CENTURI). He is a member of the French Academy of Sciences, the Academia Europaea, and an elected member of EMBO. He is also the recipient of the Liliane Bettencourt Prize for Life Sciences (2015) and the CNRS Silver Medal (2015).*

### UNIT

Institut de Biologie du  
Développement de Marseille

### GRANT

ERC-2024-ADG

**D**uring development, cell movements and shape changes give rise to complex 3D forms. What underlies the fidelity of morphogenesis? To date, much emphasis has been placed on understanding how genes and local mechanics drive cell shape changes and tissue scale morphogenesis. However, the roles of the geometric properties of a tissue and its physical boundaries, their size, dimensionality, curvature and overall shape have recently emerged as important yet overlooked features of morphogenesis.

This interdisciplinary project will unravel how geometry and geometric feedbacks constrain lower scale cell mechanics and how they contribute to tissue morphogenesis. We will study the interplay between geometry and active mechanochemical processes in two systems where physical boundaries constrain and guide morphogenesis. In *Drosophila* embryos, polarized tissue flow and a wave of tissue invagination depend on interactions with the surrounding egg envelope called the vitelline membrane. This envelope imposes

tissue curvature, forms a rigid adhesive substrate, and confines the diffusion of molecules within the extra-embryonic fluid. Likewise, formation of the wing during metamorphosis in the pupa is associated with a dramatic expansion of the tissue surface within a rigid pupal sac forcing a complex tissue packing without compromising flatness in adulthood. The mechanics of tissue flow and expansion are unknown. How flows within these constraints give rise to folding needs to be characterized.

These two systems share key similarities: their dynamics depend on the flow, expansion and folding of tissue layers, and 3D deformations are driven by internal active stresses and external constraints from rigid boundaries. In both cases we will dissect the mechanochemical active processes driving cell and tissue deformations and address how geometrical constraints impact cell and tissue mechanics. This project will thus reveal how tissue shape affects the processes from which shape emerges.

# Christian-Georges BENAR



*Cristian-George Benar graduated from École Supérieure d'Électricité (Supélec) in 1994. He then spent one year as an engineer at the Hospital Saint-Anne in Toulon (with Franck Vidal) and two years as a programmer at Stellate Systems in Montréal (under the direction of Jean Gotman). He completed his PhD under Jean Gotman's supervision at the Montreal Neurological Institute (MNI). Returning to France in 2004, his postdoctoral work was done in Marseille at the fMRI Center (with Jean-Luc Anton) and in Sophia Antipolis (with Maureen Clerc and Theodore Papadopoulo). He was appointed Inserm researcher in 2006 and became Inserm Director of Research in 2018. Since January 2012, he has been the leader of the «Dynamical Brain Mapping Group» at INS. Since September 2014, he has served as the scientific head of the Marseille MEG platform. As of 2023, he is a member of the scientific council of the Fédération Française de Recherche sur l'Épilepsie (FFRE) and an elected member of the Neurotechnology Task Force of the International League Against Epilepsy (ILAE). His research interests focus on signal processing applied to brain signals (EEG, MEG, intracerebral EEG) to characterize the spatio-temporal dynamics of networks in cognition and disease.*

## OptiMEG

Non-invasive recording of deep brain activity: mobile sensors optimized with intracerebral measures

### UNIT

Institut de Neurosciences  
des Systèmes

### GRANT

ERC-2024-ADG

**E**pilepsy presurgical evaluation consists in mapping the brain regions generating pathological activities, which can be surgically resected. The current method of choice is stereotaxic electroencephalography (SEEG), an invasive procedure which involves implanting a limited number of electrodes in the brain. Thanks to 4-He Optically Pumped Magnetometers (OPMs), a new generation of mobile sensors, I will be able to record magnetic activity non-invasively across the whole brain. Compared to classical magnetoencephalography, OPMs can be placed directly on the scalp, drastically reducing the distance to the brain and opening the way to optimise spatial sampling of magnetic fields. Thus, the OptiMEG project aims to develop a personalized, non-invasive tool based on OPMs for localizing epileptic activity.

I will use intracerebral (SEEG) signals recorded simultaneously with OPMs in order to learn how to retrieve the deep signals measured in SEEG from

OPM. My expertise in MEG and the collaboration I have already established with clinicians at the Timone Hospital will guarantee the success of OptiMEG. The questions that I will address are: 1) Design the optimal placement of mobile OPM sensors for retrieving non-invasively activity from deep brain regions 2) Identify the signatures on the surface OPM signals of the different regions seen on the deep SEEG contacts 3) Validate the resulting signatures as biomarkers in a clinical setting The OptiMEG project will revolutionize clinical practice by retrieving activity from deep brain regions without requiring implantation of depth electrodes, with unprecedented spatial and temporal resolution.

It will produce a more precise diagnostic by capturing activity across the whole brain. allow more patients to have access to epilepsy surgery, lowering risks and costs compared to SEEG. It will also bring non-invasive access to deep brain regions in other neurological pathologies and in fundamental neuroscience.



*Kristof Strijkers obtained an MA in Psychology (Theoretical and Experimental Psychology) from Ghent University in Belgium in 2006, and a second MA in Cognitive Neuroscience and Language in 2007 from the University of Barcelona in Spain. In 2012, he obtained his PhD, 'The Electrophysiology of Language Production: Lexical Access in Picture Naming', at the University of Barcelona.*

*He then obtained a Marie Curie postdoctoral fellowship at the CNRS at the Laboratory of Cognitive Psychology (LPC) in France. Since 2014, he has been a CNRS researcher at the Speech and Language Laboratory (LPL) in Aix-en-Provence.*

## LaDy Language in the Dyad. Linking linguistic and neural alignment.

UNIT  
Laboratoire Parole et Langage

GRANT  
ERC-2024-COG

**C**urrent research in linguistics, psychology, and neuroscience predominantly focuses on the individual, neglecting the dynamic interplay between interlocutors as the primary form of communication. This project aims to address this limitation by investigating language and the brain in their most functional context, the dyad. The objective is to connect the cognitive mechanisms of dialogue with the neurophysiology of interacting brains.

The central theme of this project is the concept of alignment, since it is observed in both behaviour and brain activity. Linguistic alignment concerns the convergence of language use between interlocutors. Neural alignment refers to correlated brain activity between speakers and listeners. While tempting to assume both phenomena are related, at present this is an open question. This project sets out to investigate whether neural alignment is the brain's signature of linguistic alignment, and whether prediction is the mechanism that can link neural and linguistic alignment.

To achieve these objectives, the project employs a novel paradigm combining EEG hyper-scanning with

interactive dyadic language games. Preliminary results highlight the feasibility of this novel paradigm to assess interactive naming behaviour. Using this approach, three work packages will explore (1) neural alignment for basic linguistic components, (2) the impact of prediction on alignment, and (3) the emergence of neural alignment in spontaneous linguistic interactions.

This interdisciplinary proposal has ground-breaking potential: If successful, the project will significantly advance our understanding of language in interaction, shed light on the role of prediction in the dyad, and provide a brain basis for models of dialogue and conversation. In sum, this comprehensive approach seeks to unravel the intricate connections between neural and linguistic alignment while exploring the role of prediction as a fundamental driver of these phenomena.



*Bruno L. Giordano is a CNRS permanent researcher (CRCN) at the Institute of Neurosciences de la Timone (INT; Aix-Marseille Université & CNRS). He completed his PhD in Perception and Psychophysics at the University of Padova, Italy, and IRCAM-CNRS, Paris, in 2005. Before joining CNRS in 2017, he held positions at McGill University and the University of Glasgow.*

*His research focuses on understanding the neural and behavioral processes underlying the perception of natural sounds, integrating psychoacoustics, auditory neuroscience, and computational modeling. Dr. Giordano's work has been published in journals such as Nature Neuroscience, Neuron, and Nature Human Behavior.*

## NASCE

### Natural Auditory SCENes in Humans and Machines: Establishing the Neural Computations of Everyday Hearing

**UNIT**  
Institut de Neurosciences  
des Systèmes

**GRANT**  
ERC-2024-SyG

In an office, on a metro, or at home, diverse sounds may be surrounding you: a computer fan, footsteps and indistinct chatter, distant cars, the train slowing down. These sounds shape our environmental awareness, even when visual cues are absent. Despite its ecological relevance, understanding how our brain parses the acoustic scene into semantic objects remains a major scientific challenge. Moreover, individuals with hearing impairments, including those relying on hearing aids or cochlear implants, face challenges, both auditory and cognitive, in environments with multiple sound sources.

The NASCE project aims to mechanistically comprehend real-world auditory scene analysis (ASA) through a novel framework: the Semantic Segmentation Hypothesis (SSH). The SSH posits that semantic representations drive real-world ASA, shifting the focus from early acoustic processing to the semantic analysis of everyday sounds. It addresses fundamental questions, such as: How does the brain create semantic sound source representations? How do they interact with acoustic processing, and aid our ability to recognize sounds in a scene? NASCE integrates cognitive

psychology, neuroscience, and AI methods. Employing neuroimaging and behavioral paradigms, we aim to reveal how the brain dynamically represents auditory scenes across brain regions for relevant listening tasks. Using deep neural networks and ontologies, we aim to construct neuroscientifically grounded computational models simulating cerebral and behavioral responses under the same scenes and tasks as in the experiments.

Finally, with advanced analytical methods we will consolidate behavioral, computational, and neuroscientific insights and establish SSH as a groundbreaking theory of ASA. NASCE promotes a paradigm shift, fundamentally reshaping our comprehension of ecological hearing. Moreover, it paves the way for the applications in machine hearing of computational models that mimic human auditory cognition.



## hCerebEvol

Elucidating the cellular and molecular divergence of the human cerebellum

*Baptiste Libé-Philippot's research focuses on the evolution of neurons in humans, i.e., how their development and properties differ from those of other animals, including chimpanzees. After studying at the École Normale Supérieure and completing a doctoral thesis at the Institut Pasteur under the supervision of Christine Petit and Nicolas Michalski, he joined Pierre Vanderhaeghen's laboratory (VIB/KULeuven) as a postdoctoral researcher. He has also carried out a scientific mediation mission at the Palais de la Découverte. Admitted as a research fellow at the CNRS in 2024, he is creating his team at the IBDM this year. During his career, Baptiste Libé-Philippot has received various awards: the Paul Dellheim Prize from the Collège de France (2015), the Thesis Prize from the Society for Neuroscience (2017), and the Marc Hurard Prize from the Belgian Queen Elisabeth Medical Foundation (2024). He is also a laureate of the ATIP-Avenir program (2024).*

### UNIT

Institut de Biologie du Développement de Marseille

### GRANT

ERC-2024-STG

**S**peciation involves the emergence of new behavioural features that rely on the evolution of neural circuits. The human species displays higher cognitive features which have been linked in part to the evolution of the cerebral cortex, but the involvement of the other brain regions, such as the cerebellum, remains largely unexplored. The human cerebellum displays divergent features at the anatomical, functional, and behavioural levels.

It is associated with both higher cognitive functions and cognitive disorders. However, the properties of human cerebellar cells & circuits have not been compared with those of other species, including non-human primates. This knowledge gap hinders our understanding of human brain evolution. Here, I aim to identify and functionally study the impact of human genomic novelties on cerebellum development and function, focusing on neuronal and & circuit levels. I will first investigate the role of a novel human molecular pathway in the cerebellum, based on the hominid transmembrane receptor family LRRC37, which I have

recently identified. I will identify the cellular distribution, molecular partners, and function of LRRC37 receptors in cerebellar neurons using three approaches: cross-species tissue comparison, gain-of-function in vivo in the mouse cerebellum, and human models based on pluripotent stem cells. In parallel, I will identify new molecular novelties acting in human cerebellar cells, focusing on human gene duplicates and differentially expressed genes, and link them to divergent cerebellar properties.

I will define the spatio-temporal expression patterns of these genes, followed by gain/loss-of-function in the mouse cerebellum and in human cerebellar neurons to study their function. Together, hCerebEvol will uncover entirely new aspects of human cerebellar evolution that will improve our understanding of brain development and function, and may lead to the identification of human-specific sensitivity to brain disorders.



## NidoRep Nidovirus Replication Complexes: How enzymes shape viral genomes

*Ashleigh Shannon is an Australian biochemist and structural biologist. Her research focuses on the regulation of RNA synthesis by viral replication complexes and their potential for the development of antiviral drugs. After completing her PhD (2013-2017) with Professor Paul Young (University of Queensland, Australia), she worked for the biotechnology company Vaxxas on a needle-free vaccination system. In 2018, she joined Bruno Canard's team in Marseille thanks to an Australian scholarship (Endeavour Research Fellowship). During the Covid-19 pandemic, she contributed to the characterization of therapies against coronaviruses, leading to several patents and the advancement of a molecule to phase III clinical trials. Recruited by the CNRS as a research fellow in 2023, she is now seeking to extend her research to more diverse viruses with the potential for spillover into humans.*

### UNIT

Architecture et Fonction des  
Macromolécules Biologiques

### GRANT

ERC-2024-STG

**N**idoviruses are an intriguing group of +RNA viruses, whose diverse genome sizes (11-41 kb) reflect a long history of adaptation to suit specific niches. They remain mostly neglected, with the exception of the large-genome Coronaviridae (CoV) family (32 kb), which includes the notorious human pathogen SARS-CoV-2. At the other end of the size-spectrum is the small-genome Arteriviridae (ArV) family (11 kb), an understudied group of prevalent, animal-infecting pathogens. Viral replication is mediated by a suite of enzymes known as the replication transcription complex (RTC), at the core of which is the RNA-dependent RNA polymerase (RdRp) and its unique N-terminal domain, known as the NiRAN. NidoRep aims to bridge the prevalent knowledge-gap between small and large genome nidoviruses, by deciphering the specific structural and mechanistic features of the RTC that regulate genome replication across such vastly different viruses. It will be divided into three distinct objectives:

Objective 1 will focus on small-genome nidoviruses, providing the first structural and functional characterization of an ArV RTC.

Objective 2 will probe how RdRp speed and fidelity have been fine-tuned to accommodate the distinct and conflicting replication requirements of diverse nidoviruses. This will be achieved through the development of an innovative in vitro sequencing assay, also providing a new and robust tool for screening drugs that corrupt RNA synthesis.

Objective 3 will investigate the role of the NiRAN in initiation of RNA synthesis through proteinpriming, providing new insight into the functional evolution of this complex domain, while also identifying novel drug-targeting sites.

NidoRep will determine how specific viral enzymes have structurally and functionally evolved to support remarkable genome diversification within a single viral order. It will expand our understanding of understudied viruses with epidemic potential, and guide drug design strategies against key viral targets.



## ThoughtOrigins

Developmental and evolutionary origins of the language of thought

*Researcher at the Laboratory of Cognitive Psychology , specialist in language development in infants and children. Isabelle Dautriche, who joined the CNRS in 2019 after studying mathematics engineering and obtaining a PhD in cognitive science, explores language acquisition, its cognitive constraints, and its invariable in young children. To do this, she draws on psycholinguistic experiments with infants and children, which she combines with computational methods. She recently set up a babylab in her laboratory, an experimental platform dedicated to the study of cognitive and sensorimotor development in young children. Following on from this work, Isabelle Dautriche is now working with non-human primates to establish inter-species comparisons. The aim is to gain a better understanding of the cognitive foundations of language, a communication system generally considered to be exclusive to humans.*

UNIT  
Laboratoire de Psychologie  
Cognitive

GRANT  
ERC-2024-STG

**H**ow do human infants and non-human animals think? Fodor famously framed the idea that human minds operate in a language-like format, a “language of thought” (LoT), where mental representations compose in the manner of formal language symbols, allowing us to build arbitrarily complex mental structures out of a small set of initial primitive operations. Through all areas of cognitive science, there has been rich evidence supporting the idea that a LoT could explain many facets of human cognition. Do infants and animals also have a LoT? While the existence of a LoT in the absence of language has been questioned for centuries by philosophers, psychologists and linguists alike, little direct behavioral evidence has been offered for it and these investigations have mainly been confined to close relatives of humans (i.e., great apes).

The overarching goal of this project is to adopt a broad comparative approach to study the developmental and evolutionary origins of the LoT. Our approach is at the intersection of linguistics and psychology: we identify

the primitive operations of thought from formal semantic principles and operations realized in language, and empirically test them in human adults and infants, baboons (*Papio papio*), and honeybees (*Apis mellifera*). We study the computational architecture of the LoT of infants and animals, starting from their ability to perform simple computations using only a few symbols to the more complex abilities to use functional operators, such as logical connectives, quantifiers and modals and to apply pragmatic operations.

The outcome of this project will be an unprecedented cartography of possible LoT primitives, and of where they are found in human ontogeny and animal phylogeny.



## SYNAPOE

Unravelling ApoE4 contribution to tau-mediated synaptic degeneration in AD by combining advanced proteomics and super resolution microscopy

After completing her doctoral thesis (2013-2017) at Laval University in Quebec City (Canada), she joined David M. Holtzman's team at Washington University in St. Louis (St. Louis, USA) as a postdoctoral researcher. There, she studies how certain genetic risk factors for Alzheimer's disease (TREM2 and APOE) involved in gliosis affect tau pathology and neurodegeneration. As the recipient of ATIP-Avenir funding, Maud Gratuze created the "SynapTau - Synaptic Degeneration and Gliosis" team at the Institute of Neurophysiopathology in Marseille in 2023. Her team combines advanced proteomic approaches and super-resolution microscopy to study the role of astrocytes and microglia in synaptic degeneration associated with tau pathology in Alzheimer's disease, which is responsible for memory loss. Maud Gratuze was recruited by the CNRS as a research fellow the following year.

UNIT  
Institute of  
NeuroPhysiopathology

GRANT  
ERC-2024-STG

**A**lzheimer's disease (AD) is one of the biggest scientific and socio-economic challenges of the 21st century. Currently, there is no cure. Aggregates of amyloid- and tau protein, along with neuroinflammation/gliosis, are hallmarks of AD that lead to synaptic and neuronal loss as the basis for cognitive decline. The latter correlates closely with the brain distribution of tau aggregates, providing a strong incentive to investigate a link between tau accumulation and synaptic degeneration.

Brain apolipoprotein E (ApoE), mainly produced by astrocytes, is essential for lipid transport to neurons and synaptic functions. ApoE4 isoform is the strongest genetic risk factor for AD and contributes to tau-mediated neurodegeneration. Determining how ApoE4 controls tau-mediated synaptic degeneration is thus essential to understand AD and develop efficient treatments, yet this requires fine characterization of ApoE4 functions at tau-damaged synapses with a synaptic resolution.

SynApoE will test in 3 work packages the hypothesis that ApoE4 worsens tau-mediated synaptic degeneration by altering the astrocyte/neuron interactions at the synapse: 1: SYNAPTIC CHANGES. Identify directly at tau-damaged synapses the ApoE4-mediated structural and functional synaptic changes; 2: PROTEIN PLAYERS. Identify the protein players underlying these structural and functional synaptic changes; 3: MECHANISMS. Discover the mechanisms through which ApoE4 promotes tau-associated synaptic degeneration, based on the protein players identified in WP2.

SynApoE aims to decipher how ApoE4 drives tau-mediated synaptic degeneration, providing a deeper understanding of AD pathophysiology. SynApoE achieves unprecedented synaptic resolution by combining advanced proteomics, super resolution microscopy at synapses, electrophysiology and behavioral testing. This will help unravel the mechanisms leading to synaptic loss and subsequent cognitive decline, providing new targets for drug design to protect synapses.



*Hugo Bisio's research combines molecular biology and cell biology to understand the functions of numerous genes and the evolution of giant virus genomes.*

*After completing his master's degree in Uruguay, Hugo obtained his PhD at the University of Geneva (2015-2020) under the supervision of Prof. Dominique Soldati-Favre. He then joined the IGS, headed by Chantal Abergel, as a postdoctoral researcher. During this period, he developed tools for the genetic manipulation of giant viruses and their amoebic hosts.*

*Recruited by the CNRS and Aix-Marseille University to a junior professorship, he is starting his own independent research team within the same laboratory.*

## ViDaMA

Proving causality of liquid-liquid phase separation for the acquisition of nuclear-like functions by Giant Viruses Viral Factories

### UNIT

Information génomique et structural / Institut de Microbiologie de la Méditerranée

### GRANT

ERC-2024-STG

**G**iant Viruses (GVs) encode thousands of ORFan genes but their study has been nearly impossible due to the lack of genetic tools for reverse genetics. The aims of ViDaMa and the tools I designed will shed light into this Viral protein Dark Matter. Particularly, I will study how new genes from Mimivirus were engineered during evolution to acquire nuclear-like function for their Viral Factories (VFs).

VFs physically separate viral DNA replication and transcription from translation and likely segregate DNA into active and silent. How these functions are accomplished remains elusive. I will demonstrate causality of liquid-liquid phase separation (LLPS) for the acquisition of nuclear-like functions of the Viral Factories (VFs) of Mimivirus. To do so, I will:

- 1) Generate genome-wide loss-of-function screens for the identification of gene function and proteome-wide localization of virtually all Mimivirus and its host *Acanthamoeba* proteins.
- 2) Combine biochemistry

and cell biology to dissect the nature, functions and components of the VFs of Mimivirus.3) Strip down VFs to their minimal components in order to utilize them to improve production efficiency and purity of mRNA during in vitro transcription.

ViDaMa will empower the GV scientific community with genome-wide and proteome-wide data of gene function and protein localization. It will transform the field from mostly descriptive to allow the dissection of the molecular mechanisms behind viral phenotypes. ViDaMa will also address the molecular mechanisms that allow the VFs to acquire nuclear-like functions, directly tackling the viral eukaryogenesis theory. The new classification of VFs as membrane-less organelles and the study of the molecular mechanism behind their biogenesis and functions will shed light into general mechanism of LLPS. The generation of in vitro VFs promises an optimization of in vitro transcription systems with tremendous impact on mRNA therapeutics at the development and production level.



*Fanny Cazettes is a neuroscientist whose research focuses on understanding the neural networks and processes that enable flexible behavior, helping us adapt and make decisions in a constantly changing environment. After earning her engineering degree in Paris, she joined Antonio Convit's laboratory at New York University as a research assistant. She then pursued her doctoral studies in neuroscience at the Albert Einstein College of Medicine, under the supervision of Jose L. Pena. In 2016, she joined the Champalimaud Foundation in Lisbon for a postdoctoral fellowship in Zach Mainen's team. During this period, she also became a member of the International Brain Laboratory, an international collaboration that uses standardized experiments and the principles of open science to advance our understanding of complex brain functions. In 2022, Fanny Cazettes was recruited as a research fellow at the CNRS.*

## DIVERSE

Understanding diversity in decision strategy: from neural circuits to behavior

### UNIT

Institut de Neurosciences  
de la Timone

### GRANT

ERC-2024-STG

**T**he brain has the remarkable ability to imagine diverse solutions to complex problems and to rapidly switch between them to adapt to new situations. Such properties are essential for adaptive behavior but remain poorly understood, partly due to the prevalent focus in previous studies on stereotypical behaviors. Here, we will adopt a fundamentally different approach by exploring the neural properties underlying diversity in decision strategy, aiming to provide greater insights into how the brain operates in natural conditions.

By leveraging novel computational methods that identify changes in behavioral strategy combined with the latest advances in electrophysiological recording and optical manipulation in mice, the overarching goal of the project is to understand how the brain switches between different decision strategies. We hypothesize that the brain achieves remarkable flexibility by running multiple decision processes in parallel, allowing animals to select one decision strategy while their brains maintain several alternative solutions readily available for quick adaptation. We will test this

hypothesis through a series of experiments that aim at determining:

- (1) Which neural circuits are involved in strategy selection?
- (2) What neural mechanisms control changes in strategy?
- (3) How to trigger a strategy in neural circuits and behaviors?

We will address these questions using mice in the context of foraging, a fundamental survival behavior shared among all animals, involving the search for resources in dynamic environments. The project will deliver a rich and unique neural and behavioral dataset, enabling the development of a novel conceptual framework for behavioral flexibility as an adaptive selection mechanism of parallel decision computations. Ultimately, this research will contribute to solving various aspects of the decision-making puzzle and provide a foundation for explaining the diversity in behaviors, including those that deviate from the norm.



## Deep-C Deep-sea carbonates under pressure: mechanisms of dissolution and climate feedbacks

*Olivier Sulpis obtained his PhD in aquatic geochemistry at McGill University in Montreal. He then worked in the Netherlands at Utrecht University as a research associate. He is a specialist in the dissolution of marine sediments in the Anthropocene. This dissolution will be the main sink for human-generated CO<sub>2</sub> over the next 100 to 1,000 years. His work has helped us understand and anticipate the link between sediments and CO<sub>2</sub> and has accompanied the explosion of interest in CO<sub>2</sub> capture methods based on accelerating natural carbon sinks. In parallel with his fundamental research, Olivier Sulpis has worked with several international organizations implementing ocean alkalization methods to increase its capacity to capture CO<sub>2</sub>, as well as new sources of renewable energy at sea. Olivier Sulpis teaches at Aix-Marseille University, providing younger generations with the tools they need to accelerate the energy and environmental transition. Alongside the Deep-C project, Olivier Sulpis is co-leader of a working group at the Center for Synthesis and Analysis of Biodiversity focusing on marine gastropods, as well as a working group at the European Maritime Council focusing on the assessment of ocean CO<sub>2</sub> capture techniques.*

### UNIT

Centre de recherche et d'enseignement  
des géosciences de l'environnement

### GRANT

ERC-2024-STG

**A**s humanity grapples with the escalating crisis of climate change, understanding and mitigating the sources of carbon dioxide (CO<sub>2</sub>) emissions is imperative. A lesser-known yet significant aspect of this crisis lies in the vast expanses of marine sediments which encompass two-thirds of the Earth's surface. A key component of these sediments is calcium carbonate (CaCO<sub>3</sub>), a family of minerals that makes up the shells and skeletons of marine organisms. CO<sub>2</sub> emissions lead to ocean acidification, triggering CaCO<sub>3</sub> dissolution, which in turn neutralizes CO<sub>2</sub>, acting as a crucial CO<sub>2</sub> sink over millennial timescales. However, the mechanisms and rate of this dissolution remain unknown due to the challenges posed by the deep ocean's high pressures and the elusive bacterial communities mediating the dissolution process. Proposed here is an ambitious five-year research initiative aimed at understanding deep-sea CaCO<sub>3</sub> dissolution, thereby paving the way

towards a more thorough understanding and potential mitigation of climate change impacts. By focusing on the abyssal and hadal realms, this groundbreaking research seeks to unveil the nature and rate of CaCO<sub>3</sub> dissolution through high pressure reactors. These reactors, which mimic the pressure and temperature of deep-sea environments, present a robust alternative to in-field studies. With the integration of cutting-edge sensors and the use of advanced CaCO<sub>3</sub> imaging techniques, we anticipate generating precise and continuous data on the unfolding biogeochemical processes. By housing bacterial cultures within the reactors, alongside natural CaCO<sub>3</sub> grains, this project will delve into the mechanisms driving dissolution. The insights will be instrumental in refining a global biogeochemical model, thereby promoting a deeper comprehension of the ocean's role in carbon sequestration and propelling forward the global efforts towards effective climate change mitigation.



## OPENFMLAB Open Force Microscopy for Biology and Biomedicine

*Felix Rico is an associate Professor in the department of Physics of Aix-Marseille University since 2013. His research in the field of force microscopy is developed at the LAI, a joined Aix-Marseille University, CNRS & Inserm laboratory.*

*He studied Physics at the University Autònoma of Barcelona and received his PhD in Biophysics from the University of Barcelona. Before moving to Marseille, he was postdoc at the University of Miami (FL) and then at Institut Curie (Paris). He has been working in force measurements with atomic force microscopy (AFM) since 2001. His research track is focused on the mechanics and adhesion properties of biological systems.*

*He has developed various AFM based approaches to investigate the mechanical response of single molecules, membranes and cells.*

**UNIT**  
Dynamics and nanoenvironment  
of biological membranes

**GRANT**  
ERC-2024-POC

**T**he emergence and establishment of mechanobiology has led to a growing demand for the mechanical characterization of biological samples.

Moreover, nanomechanical tests for diagnosis and prognosis of diseases are now being applied in clinical trials. Atomic force microscopy (AFM) is likely the most versatile, robust, and standardized tool for nanomechanical tests of biological systems. However, commercial AFM systems are expensive, not dedicated to mechanical tests, and difficult to use and customize. To solve these problems, we propose to develop and build an open-source force microscopy prototype: openFMLab. Built on the instrumentation developed during ERC Consolidator project MechaDynA, the openFMLab system will be affordable, customizable, user-friendly, and dedicated to mechanical tests in biology.

Cost reduction will be assured by using open-source design, hardware and software and a function exclusively dedicated to mechanical measurements. The development of robust protocols and algorithms for calibration, data acquisition and data processing will provide ease-of-use.

Finally, the system will be modular and adaptable to any optical microscope and experimental setup. During the openFMLab project, we will design, build, implement, and test the system in-house and with external end-users at biology and biomedical laboratories and industrial partners.

We will explore cost reduction and create collaborations to add value to the system and define licensing and knowledge transfer and commercialization strategies. The final goal of openFMLab is to make AFM for nanomechanical testing a common tool in any laboratory.



*Christian Henriot is a professor of contemporary history at Aix-Marseille University, Department of Asian Studies. He graduated from Stanford University in the United States (M.A., History, 1982), Sorbonne Nouvelle University (Ph.D., 1983), and EHESS (Doctorate in Literature, 1992). He studied Oriental languages in Lyon, then at INALCO in Paris (Chinese, 1978; Vietnamese, 1984), which he supplemented at the Chinese University of Hong Kong and Cheng-chi University in Taiwan. He is the co-founder of the European Journal of East Asian Studies, for which he edited the first seven volumes (2001-2008).*

## HistText

An Application for leveraging large-scale historical textbases

UNIT  
Institut de Recherches Asiatiques

GRANT  
ERC-2024-POC

**H**istText is a groundbreaking application developed to address the complex challenges of large-scale data mining in textual corpora, with a particular focus on historical documents. Created in the context of the ERC-funded ENP-China project, which aims to study the evolution of Chinese elites from the 19th century to 1949, HistText is the result of a synergistic collaboration between historians and computer scientists exploring machine learning applications for extensive text archives. Designed to manage databases containing billions of words across millions of multilingual documents, HistText offers a robust and versatile platform that streamlines the process of extracting and visualizing valuable insights.

The application features a user-friendly interface, advanced text analysis techniques, and powerful data visualization capabilities. It provides a simplified approach for novice users to conduct complex data queries and analyses, while also offering a comprehensive R-library for more expert users. The main challenge that the proof of concept aims to

tackle is to make HistText a fully packageable and transferable tool that can cater to the specialized needs of scholars and institutions holding vast digital repositories.

With its focus on advanced text analysis and user accessibility, HistText stands as an invaluable resource not only for academics in the digital humanities but also for students and the general public. In terms of broader applications, HistText has the potential to be integrated into a wide range of institutions (libraries, digital content providers, etc.). The platform is exceptionally well-suited for analyzing a wide range of text genres, including newspapers, periodicals, directories, and diaries, among others. By offering a scalable, user-friendly, and methodologically rigorous tool, HistText aims to revolutionize how we approach large-scale textual analysis, providing a new pathway for understanding historical documents.

# 3

# More information and contacts

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**CERCle website, linking to all the resources and centralizing the news regarding the activities :** <https://www.univ-amu.fr/fr/public/le-cercle-club-des-erc-du-site-daix-marseille>

**Collection HAL CERCle, with all the publications of ERC laureates :** <https://hal-amu.archives-ouvertes.fr/CERCLE/>

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