

# SEARCH, FIND, CURE...

2021  
Annual  
Report



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# ...FOR YOU AND WITH YOU



How does the brain develop? What happens in the brain when we learn or make decisions? What makes us individual? How can we treat epilepsy, Parkinson's disease or multiple sclerosis? All these questions, and many more, are the daily life of the Paris Brain Institute. It is above all a human adventure, a community of experts who participate passionately, on a daily basis, in the understanding of the brain and the fight against diseases of the nervous system. A multicultural and multidisciplinary environment, a successful convergence of private and public cultures for optimal efficiency.

**“These past two years we have clearly been in the midst of a health crisis, and it is equally clear that despite this crisis, the Paris Brain Institute has continued to progress, work and achieve outstanding results.”**

**PROF. GÉRARD SAILLANT**  
PRÉSIDENT DE L'INSTITUT DU CERVEAU



It is customary to proclaim that each new year will be better than the last. These past two years we have clearly been in the midst of a health crisis, and it is equally clear that despite this crisis, the Paris Brain Institute has continued to progress, work and achieve outstanding scientific, medical and organizational results. This has all been possible thanks to the unfailing commitment our staff has shown to the Institute and also, most importantly, to its mission of benefiting patients. In direct link with current events, we must recall the mobilization of researchers and clinicians against the pandemic and particularly to better understand the effects

of Covid-19 on the brain. 2021 was a year of change and reorganization for the Institute. In particular, we created a fifth research field focused on computational modeling in neuroscience. Our clinical research has been reorganized to speed up the implementation of innovative trials. This year also saw the opening of our new incubation facility in the heart of Paris' 13<sup>th</sup> arrondissement for artificial intelligence and medical technology startups. Without forgetting the always brilliant results of our scientists, who allow us to know every day a little more about the brain and the pathologies which affect it. These successes encourage us to go further, all together.

Thanks to our partners and donors, ever more numerous and committed, the Institute is more solid than ever, both scientifically and medically as well as financially. The advances of the Paris Brain Institute are also theirs and I thank them warmly for their mobilization, which will benefit the whole society.



**“The Paris Brain Institute’s unfailing commitment has enabled incredible momentum to be maintained in 2021.”**

**PROF. ALEXIS BRICE**  
EXECUTIVE DIRECTOR  
OF THE PARIS BRAIN  
INSTITUTE

Having impacted our lives for a second year in 2021, the COVID-19 pandemic, with all its fake news, media controversies, opinions and misrepresentation, has revealed the imperative of universal access to science as a civic tool improving people’s understanding of our times. This is not just about presenting discoveries to non-specialists, but also about explaining scientific methodology, presenting established facts as the limits of our knowledge, and developing critical thinking. Finally, people should be shown the

collaborations, funding and laboratory life that underpin scientific activity. The Paris Brain Institute’s unfailing commitment to these areas has enabled incredible momentum to be maintained in 2021. In addition to our outstanding publication rate, we should also pay tribute to our scientific teams’ performance in the French National Research Agency’s generic call for proposals, with a remarkable success rate of 38%, and the European Research Council (ERC) grants awarded to two of our young female researchers.

In 2021, we also issued an international call for proposals to establish three new research teams which will join the Institute in 2023. The future is already in motion at the Institute and we will continue our efforts to ensure that it delivers on its promises.



**“Efforts to transform the Institute are also underpinned by a desire to support our scientific strategy through a platform development policy.”**

**CORINNE FORTIN**  
SECRETARY GENERAL OF THE PARIS BRAIN INSTITUTE

To further the Institute’s scientific and medical goals, we implemented some strong measures in 2021, including a substantial increase in funding allocated to teams which provided major support to help researchers test innovative and high-risk theories. Efforts to

transform the Institute are also underpinned by a desire to support our scientific strategy through a platform development policy. We decided to adopt an extensive equipment replacement plan and continue to support research and development projects between

platforms and scientific teams. In 2021, we also focused on supporting teams with regulatory matters as promised. This means helping researchers to develop research projects that are not only compliant with regulations, but also simpler to implement.

# The Paris Brain Institute in 2021

The Paris Brain Institute founded in 2010 is an international center for excellence in scientific and medical research based at Pitié-Salpêtrière Hospital in Paris. Under its innovative model, patients, doctors, researchers and businesses are brought together on one site with the shared objective of understanding the brain and speeding up the discovery of new treatments for nervous system diseases.

The Institute comprises a network of over **760 experts in 25 research teams, 10 cutting-edge technological platforms, a clinical investigation center, a training organization, and over 2,000 sq meters of incubator space.** The Paris Brain Institute's original model is based on a partnership between a public joint research unit (AP-HP Paris Public Hospital Network, Sorbonne University, Inserm and CNRS) and a private foundation with recognized charitable status.



**762**  
EMPLOYEES,  
73% of whom are scientific staff



**41**  
NATIONALITIES



**25**  
RESEARCH TEAMS  
selected by an International  
Scientific Advisory Board



MORE THAN **600**  
PUBLICATIONS  
in international  
scientific journals  
in 2021



**10**  
TECHNOLOGICAL  
PLATFORMS  
and biobanks including  
over 55,000 patients,  
10,000 tumors and 330 brains



**4**  
NEW RESEARCH  
ASSOCIATES IN 2021

**13**  
CLINICAL RESEARCH  
INFRASTRUCTURES  
(iCRIN)



**155**  
CLINICAL TRIALS  
IN PROGRESS



**25**  
STARTUPS INCUBATED  
at 3 incubation sites



**7**  
PATENTS FILED  
IN 2021

**12**  
TRAINING PROGRAMS  
at the Open Brain School  
with over 1,500 participants



**277,242**  
DONORS



# 2021

in review

## JANUARY

### THE PARIS BRAIN INSTITUTE SIGNS THE ALBA DECLARATION ON EQUITY AND INCLUSION

The Paris Brain Institute thus joins over 150 neuroscience organizations committed to building fair and inclusive scientific communities. Read more p. 43



## FEBRUARY

### IT'S POSSIBLE TO COMMUNICATE WHILE DREAMING!

A collaboration between a Paris Brain Institute team and several American, German and Dutch groups revealed that two-way communication is possible between experimenter and subject while the subject is dreaming. Read more p. 19



## MARCH

### THIRD EDITION OF THE FRANCE BRAIN BEE COMPETITION

The Institute held the national France Brain Bee competition online on March 20, 2021. This saw around 50 high school students test their knowledge of neuroscience in a friendly competition. Read more p. 41



## MARCH

### A NEW RESEARCH FIELD AT THE PARIS BRAIN INSTITUTE

In 2021, the Institute inaugurated its fifth research field - computational modeling in neuroscience. The aim was to recognize an interdisciplinary data science-based practice that had previously been applied to other fields, and to create new synergies between teams. Read more p. 23

## MARCH

### PARKINSON'S DISEASE: PATIENTS TAKE AN ACTIVE ROLE IN THEIR DEEP BRAIN STIMULATION TREATMENT

In March, the Paris Brain Institute and AP-HP Pitié Salpêtrière Hospital implanted France's first neurostimulator to record intracerebral signals emitted during the everyday life of a Parkinson's patient. The device enables patients to activate recording when symptoms occur, thus giving them more agency in their treatment. Read more p. 20

Below: Representation of deep brain stimulation electrodes stimulation electrodes in the basal ganglia. © CNRS/Éric Bardinnet



## APRIL

### A NEW INCUBATION FACILITY FOR STARTUPS

The Institute opened a new 1,500 sq meter incubator campus for medical technologies and artificial intelligence in healthcare on Rue du Chevaleret in the heart of Paris' 13<sup>th</sup> arrondissement. Read more p. 36



## MAY

### THIRD EDITION OF THE BIG BRAIN THEORY PROGRAM

The successful internal BBT call for proposals proved a highlight of 2021, with 10 outstanding applications selected, including two that involved collaborations with the Institut Pasteur. The program funds bold and innovative ideas spanning various neuroscience fields.



## JUNE

### THREE NEW TEAMS SOON TO JOIN THE INSTITUTE

In June, the Paris Brain Institute issued a call for proposals to host three new research teams in 2023. They will receive a competitive start-up package and annual funding as well as access to the whole of the Institute's ecosystem.

## JULY

### PARTNERSHIP WITH ARTE EDUCATION

The TV channel Arte and the Paris Brain Institute joined forces to raise young people's awareness of neuroscience by offering flagship Arte documentaries and magazine shows addressing the topic of neuroscience on the educarte.artetv platform aimed at teachers and students.

## SEPTEMBER

### LAUNCH OF THE MGA PROGRAM

The Medtech Generator & Accelerator program developed by the Paris Brain Institute, Imagine Institute and Institut de la Vision provides support to accelerate medtech startup growth and development in the fields of neuroscience and rare diseases.



## SEPTEMBER

### SEVENTH EDITION OF THE BRAIN TO MARKET SUMMER SCHOOL

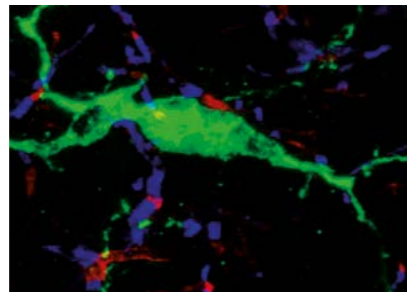
The Brain to Market summer school run by the Paris Brain Institute and the Collège des Ingénieurs took place between September 6 and 10, 2021, this year addressing the topic of adult psychiatry. This meeting of the science and business communities was attended by international students, graduates, entrepreneurs, managers, engineers, designers and developers. The aim was to develop innovative concepts and devise new solutions for patients and healthcare systems. Read more p. 40



## SEPTEMBER

### OUR HEART RATE REVEALS OUR STATE OF CONSCIOUSNESS

An Institute study revealed that our attention is reflected in the interindividual synchronization of our heart rates when we listen to a story. This synchronization may constitute a new biomarker for states of consciousness. Read more p. 23



## SEPTEMBER

### NEURONS AND IMMUNE CELLS COMMUNICATE IN THE BRAIN

A study conducted by the Institute demonstrated for the first time that neurons interact with microglia, immune cells found in the brain. This method of communication may prove crucial to improving our understanding of the brain's repair mechanisms and diseases such as multiple sclerosis. Read more p. 15

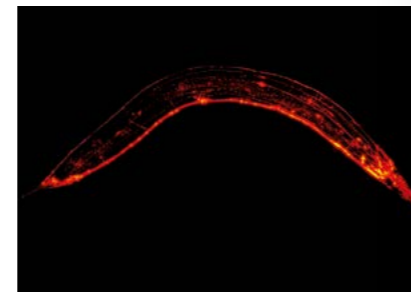
Above : A fixed tissue image of an adult mouse adult mouse cerebellum, with a microglial cell in green contacting nodes of Ranvier in red, with the paranodes (anchoring zone of the end of the myelin layers, on either side of the node) in blue. © Inserm/Desmazieres Anne

## OCTOBER

### A NEW MODEL FOR THERAPEUTIC RESEARCH IN CREUTZFELDT-JAKOB DISEASE

What if a worm held the key to a major breakthrough in research on prion diseases such as Creutzfeldt-Jakob disease? A Paris Brain Institute project indicated the potential of this model for therapeutic research and identified five promising molecules for these diseases. Read more p. 14

Below: Image of the neural system of the nematode *C. elegans* © Université of Paris/Nicolas Bizat



## NOVEMBER

### INTERGLITCHES: THE VIDEO GAME MARATHON SUPPORTS THE INSTITUTE

Between November 12 and 14, 2021, the Paris Brain Institute hosted the Interglitches charity video game marathon. This event organized by Le French Restream brought together 66 high-level competitors and tens of thousands of online viewers on the Twitch platform. A total of €23,100 was raised for the Institute. Read more p. 44



## Commendations

### Honors and Prizes



#### Prof. Lionel Naccache (AP-HP/Sorbonne University)

Joint Head of the "PICNIC - Neuropsychology and Functional Neuroimaging" team

- 2021 Eloi Collery Prize from the French National Academy of Medicine
- City of Paris' Grand Prix Claude Bernard



#### Prof. Catherine Lubetzki (AP-HP/Sorbonne University)

Medical Director of the Paris Brain Institute and joint head of the "Remyelination in Multiple Sclerosis: from Biology to Clinical Translation" team

- 2021 Pasteur-Weizmann/Servier Prize



#### Prof. Marie Vidailhet (AP-HP/Sorbonne University)

Joint Head of the "Mov'it: Movement, Investigation, Therapeutics. Normal and Abnormal Motor Control: Movement Disorders and Experimental Therapeutics" team.

- Mémain-Pelletier - Institut de France Foundation Award

### Grants, Funding and Calls for Proposals



#### ERC STARTING GRANT Léonie Koban (CNRS)

"CIA: Cognitive Control - Interoception - Attention" team

#### Julia Sliwa (CNRS)

"Mov'it: Movement, Investigation, Therapeutics. Normal and Abnormal Motor Control: Movement Disorders and Experimental Therapeutics" team



#### MARIE SKŁODOWSKA-CURIE ACTIONS Alizée Lopez-Persem (Inserm)

"FRONTLAB: Frontal Functions and Pathology" team

#### Kathleen Cho (Inserm)

"Cellular Physiology of Cortical Microcircuits" team

#### Sara Bizzotto (ICM Foundation)

"Genetics and Pathophysiology of Epilepsy" team

The Paris Brain Institute's success rate in Marie Skłodowska-Curie calls for proposals is 27% (the European average for the life sciences sector is 13%)



#### PARIS REGION FELLOWSHIP PROGRAM Alizée Lopez-Persem (Inserm)

"FRONTLAB: Frontal Functions and Pathology" team

#### Sara Bizzotto (ICM Foundation)

"Genetics and Pathophysiology of Epilepsy" team



#### FONDATION DES TREILLES YOUNG RESEARCHER AWARD Alizée Lopez-Persem (Inserm)

"FRONTLAB: Frontal Functions and Pathology" team

#### Federica Cacciamani (ICM Foundation)

"ARAMIS - Algorithms, Models and Methods for Images and Signals of the Human Brain" team



## IHU – Paris Brain Institute

Initiatives funded by the IHU program since 2012 have had a significant scientific, clinical and economic impact on the Paris Brain Institute’s activity and output.

Hospital-University Institutes (IHUs), which were introduced through the Investing in the Future program in 2012, are centers of scientific and medical excellence in which researchers, healthcare workers and companies focus on a single clinical area to forge the future of medicine through

innovative patient-oriented research. In 2012, the Paris Brain Institute was one of six organizations to be awarded this accreditation. On January 1, 2018, the Paris Brain Institute and the IHU merged. The IHU is now incorporated within the Institute. Operating budgets, work, teams, successes and hopes are

now pooled to improve consistency and enhance the scientific and medical program. In 2019, the Paris Brain Institute’s program was renewed with awarded funding of €17 million, proving the efficiency of the «IHU model».



**A WORD FROM  
PROF. ALEXIS BRICE**  
EXECUTIVE DIRECTOR  
OF THE PARIS BRAIN  
INSTITUTE

The ecosystem designed and developed by the Paris Brain Institute is designed to implement multidisciplinary and multi-scale approaches to generate usable knowledge about brain functions at all life stages, paving the way for earlier, individualized diagnostics, more effective therapies and treatments, preventive or rehabilitative approaches, and cognitive neuroscience-based educational programs.

Patients are encouraged to play an active role in the innovation process. The Paris Brain Institute’s total integration within the hospital, constant interaction between the patient bedside and laboratory bench, and access to unique patient cohorts are key strengths that drive innovation

## Successes in 2021

Like the previous year, 2021 was dominated by the COVID-19 pandemic. However, measures taken by the Paris Brain Institute management team ensured staff safety, contributed to collective global efforts, and maintained significant research momentum.

Over **600 ARTICLES** – a third of which in journals with an impact factor above 7.

**2 NEW, HIGHLY**, prestigious European Research Council (ERC) grants. These are the Institute’s 16<sup>th</sup> and 17<sup>th</sup> grants since it was founded.

**155 CLINICAL TRIALS** in progress at the Clinical Investigation Center and clinical research infrastructures (ICRIN).

**FIRST PATIENTS** enrolled in the ACUITY trial conducted by the Neurotrials early clinical development unit to assess a molecule for optic neuritis.

**TWO TRIALS** for two major European pharmaceutical companies are currently being developed with Neurotrials.

**NEUROTRIALS** successfully implemented its quality assurance system.

**53 NEW INDUSTRIAL** agreements with biotech, pharma and medtech companies representing a similar financial volume to 2020.

**3 JOINT LABORATORIES** set up with manufacturers in the fields of Parkinson’s disease, epilepsy and traumatic brain injury.

**10 NEW STARTUPS** incubated at iPEPS – the Healthtech Hub

**3 FAST-TRACK PROGRAMS** conducted with companies including Janssen and AstraZeneca.

**CONTINUED INVESTMENT** in digital technology, particularly in virtual reality learning materials for the Institute’s platforms.

### FUTURE AMBITIONS FOR THE IHU

IHUs are now rooted in the French biomedical research landscape and the unique way they operate is the envy of the world. The IHU France alliance of six IHUs was formed to capitalize on each institute’s experience, thus consolidating and improving the model, while also ensuring the reproducibility of its success. IHUs, which are selected and regularly assessed by independent international panels, have demonstrated the power of a model of excellence that brings all experts capable of transforming and accelerating medical research together on one site. Like most research institutes throughout the world, IHUs seek financial independence and socio-economic integration, and thus require recurrent government support to maintain ties with the national science and healthcare network, backed by research funding to enhance competitiveness and innovation revenue to deliver the acceleration needed. This synergy and the quality of IHU accreditation is dependent on stringent international assessment.

# RESEARCH

In 2021, the Institute's teams were at the origin of important scientific breakthroughs, with the indispensable support of the technological platforms, whose restructuring has made it possible to meet everyone's needs as well as possible.

Over the past 5 years, there was a significant jump in technological innovation in biology, allowing us to see things at higher resolution, at almost all levels of brain functions and diseases. We are at a pivotal moment where there is a challenge of better theoretical work to make sense out of data, both for understanding the brain and its diseases. In this spirit, the institute created a 5<sup>th</sup> domain of research dedicated to computational modelling, both in recognition of the existing community and because it is a field to be extended to meet the challenge of our society. To rise to this challenge, our strategy is to foster greater autonomy and synergy among teams, as reflected in our initiative to increase the teams' core funding. We want to empower our researchers to plan for the long term by providing them with strong and stable financial support over 5 years.

Another highlight of 2021 is the launch of call for new team leaders. We received about 260 applications from all over the world

and from top-notch candidates. The process is still ongoing, but it was a confirmation that, thanks to the effort of all the teams, publishing high quality science, our global reputation is on the rise.

This year we also started expanding the FABLAB to a full-fledged R&D unit. More broadly, we began planning for a new phase of growth with the creation of innovation teams: creative research teams, but focused on very specific practical and applied problems.

Today, the Paris Brain Institute is a different kind of place than it was even five years ago. We are a more mature, more confident, and more synergistic and unified than we ever were. We are also endowed with greater resources thanks to the success in our fundraising and grants applications. We are now even more equipped to face the biggest challenges in neuroscience.

As a field today, we have a lot of knowledge but not as much understanding. What is missing is the kind of insight that makes sense of it all. A bit like when in the 19<sup>th</sup> century, naturalists collected massive amounts of observations, description of the natural world, until Charles Darwin identified an underlying unity to all this bewildering variety



**A WORD FROM  
PROF. BASSEM HASSAN**  
SCIENTIFIC DIRECTOR OF THE  
PARIS BRAIN INSTITUTE AND  
HEAD OF CORE FACILITIES

of life and proposed a mechanism for it, the Theory of evolution by natural selection. A simple and elegant solution with a huge explanatory power. This is our biggest challenge as neuroscientists: the unifying theory of the brain. And it will only be attained a collective effort from all of us working together on all aspects of the brain to turn information into insight.





# Molecular & Cellular Neurobiology

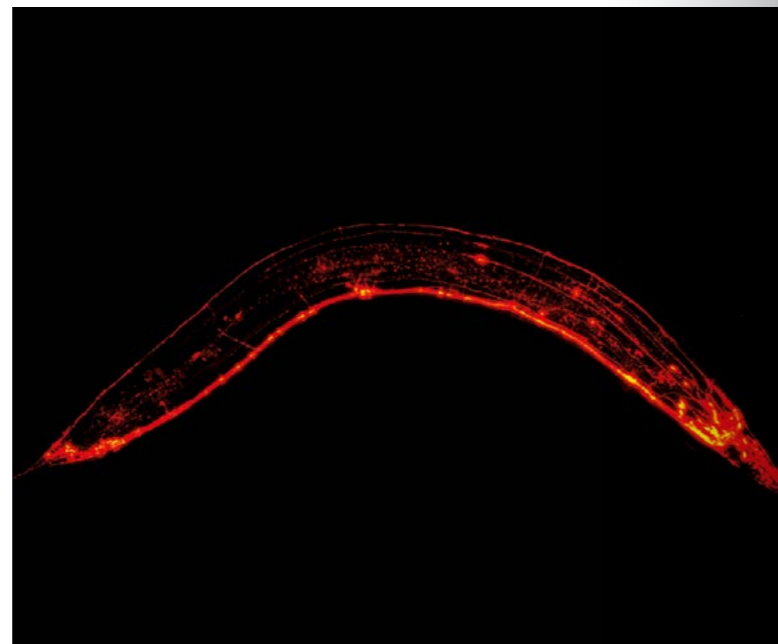
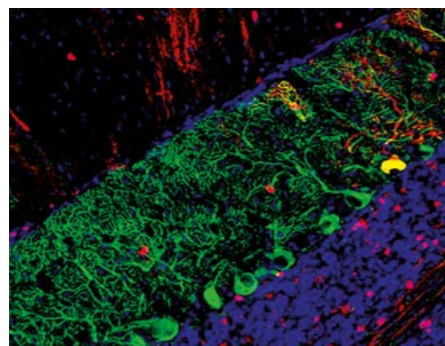
Teams of this domain seek to understand the genetic, molecular, and cellular basis of central nervous system development, functions, and diseases.

## A mystery revealed about the birth of neurons

In 2021, a study by the Institute showed in the cerebellum that, contrary to what was previously known, excitatory neurons, which activate the triggering of nerve impulses, and inhibitory neurons, which inhibit this transmission, were all derived from the same stem cells. The differentiation of these 'mother' progenitor cells is induced by a difference in the expression of the Notch protein. Notch plays a key role in brain development, particularly in the balance between cell proliferation and differentiation and in the development of certain tumours.

**Zhang T, et al. Cell Reports, June 2021**  
"Brain Development" Team. Study led by Ting Ting Zhang and Bassem Hassan (Inserm).

Below: Mouse cerebellum, microscopy. Purkinje cells, the inhibitory neurons of the cerebellum, are marked in green. The nuclei of the granular cells, excitatory cells, are in blue © Zhang Ting Ting & Inserm/Hassan Bassem



Above: Image of the neural system of the nematode *C. elegans*  
© Université de Paris/Nicolas Bizat

## A new model for prion diseases

A key issue in prion diseases such as Creutzfeldt-Jakob disease is to develop new experimental *in vivo* models allowing high-throughput analyses of therapeutic compounds. In 2021, a new genetic model for studying prions was developed at the Institute using the nematode *Caenorhabditis elegans*. Using this new model, the researchers tested the «anti-prion» power of more than 320 compounds already validated for

therapeutic use in humans. They identified 5 promising molecules, which will now be tested on more complex models to confirm their effects.

**Bizat N, et al. Brain. October 2021**  
"Alzheimer's disease, prion diseases" Team. Study led by Nicolas Bizat (Université Paris Cité).

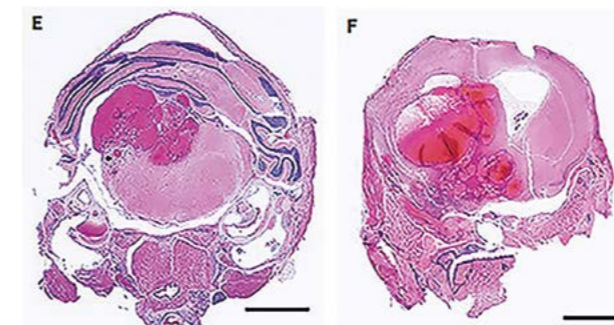
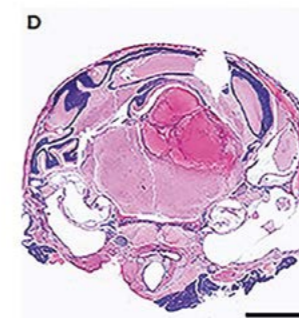
## Sporadic cavernoma: PIK3CA gene in focus

While developing mouse models of meningiomas caused by mutations in the PIK3CA and AKT1 genes, scientists unexpectedly observed that these mice developed cerebral vascular malformations, or cavernomas, identical to human lesions. The researchers then identified 39% mutations in the PIK3CA gene in 88 human sporadic cavernomas. The genetics of sporadic cavernomas, which account for up to 90% of cavernoma cases, is poorly understood. This result opens new

perspectives for the development of targeted therapies for the treatment of PIK3CA-mutated human sporadic cavernomas.

**Peyre M, et al. New England Journal of Medicine. September 2021**  
"Genetics and development of brain tumours" Team. Study led by Mathieu Peyre (Sorbonne University/AP-HP) and Michel Kalamirides (Sorbonne University/AP-HP).

On the right: Cavernous brain malformation in the brainstem of mice carrying a PIK3CA gene mutation, visible in red © AP-HP Sorbonne Université/Peyre Matthieu

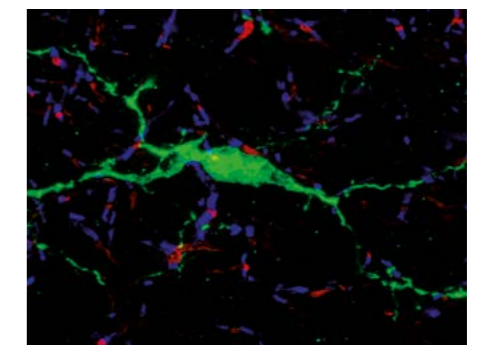


## A new way for brain cells to communicate

In 2021, a team from the Institute demonstrated for the first time an interaction between neurons and microglia, immune cells present in the brain. This mode of communication could be key to a better understanding of brain repair mechanisms and pathologies such as multiple sclerosis. It also raises the question of the impact of neuronal activity on the behaviour of microglia. Indeed, many neurological pathologies, including epilepsy, are associated with alterations in neuronal activity, and the consequences of this alteration on microglial cells are still unknown.

**Ronzano R, et al. Nature Communications. September 2021**  
"Remyelination in multiple sclerosis: from biology to clinical translation" Team. Study led by Anne Desmazières (Inserm), Rémi Ronzano and Thomas Roux.

Below: Microscopy of fixed tissue of adult mouse cerebellum, with a microglial cell in green in contact with the nodes of Ranvier in red, with the paranodes (anchoring zone of the end of the myelin layers, on either side of the node) in blue © Inserm/Desmazières Anne



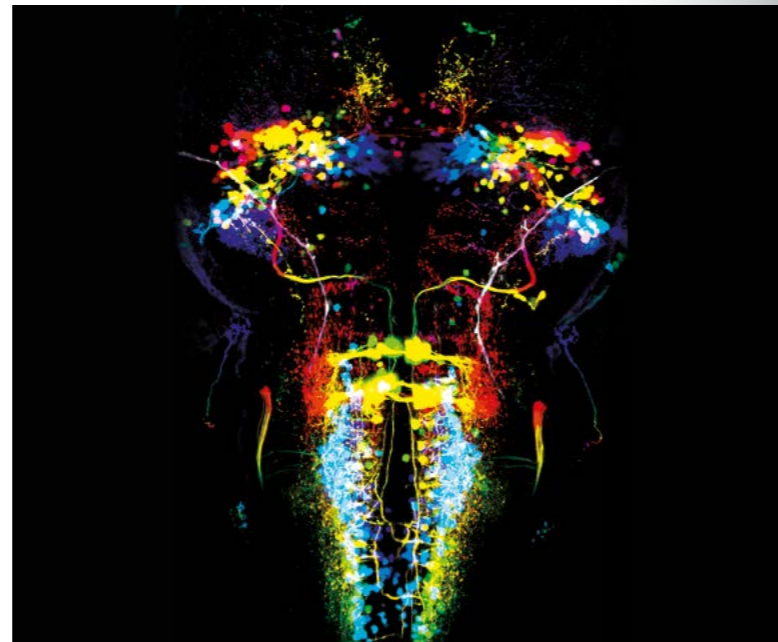
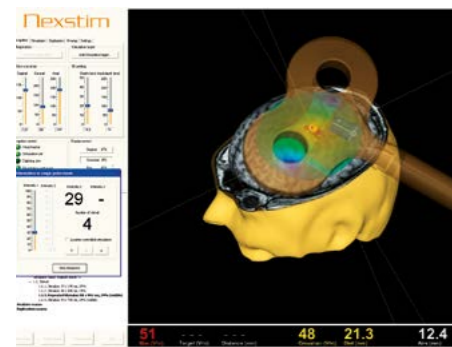
## Integrative Neurophysiology

Teams in this field seek to determine how neural activity underlies behaviour in healthy organisms, and to decipher the mechanisms by which it becomes dysfunctional in neurological disorders such as epilepsy, Parkinson's disease, and obsessive-compulsive disorder (OCD).

### Improvement of visual perception with transcranial magnetic stimulation

Researchers have combined rhythmic transcranial magnetic stimulation (TMS) at a frequency of 30 Hz entraining frequency-specific episodic oscillations on a right frontal cortical area of the human brain during a conscious visual perception task, while electroencephalographic (EEG) recordings measured electrical activity. Their results provide evidence for the causal role of 30 Hz oscillations in modulating the activity of the fronto-parietal dorsal attention network and improving visual perception in healthy subjects. These results open prospects for clinical applications, particularly in patients with stroke and loss of conscious vision.

**Stengel C, et al. *Scientific reports*. February 2021**  
FRONTLAB team. A study conducted by Chloe Stengel and Antoni Valero-Cabré (CNRS)



Above: Dorsal view of zebrafish transgenic larval brain.

### Spinal sensory neurons project onto the hindbrain to stabilize posture and enhance locomotor

In the spinal cord, cerebrospinal fluid-contacting neurons (CSF-cNs) are interoceptive sensory neurons that detect spinal curvature. Rostralmost CSF-cNs send their axons ipsilaterally into the hindbrain, which contains neurons sending descending motor commands to spinal circuits. This study uses functional anatomy and optogenetically assisted mapping to show for the first time that rostral CSF-cNs also synapse onto

cranial motor neurons innervating hypobranchial muscles. Behavioral assays demonstrate that spinal sensory feedback enhances speed and stabilizes posture, revealing a novel spinal gating mechanism acting on the output of descending commands sent from the hindbrain to the spinal cord.

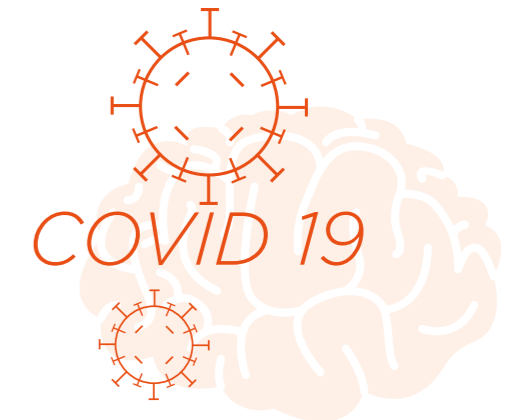
**Wu MY, et al. *Current Biology*. June 2021**  
"Spinal sensory signaling" Team. A study conducted by Ming-Yue Wu and Claire Wyart (Inserm)

### Association of Clinical, Biological, and Brain Magnetic Resonance Imaging Findings with Electroencephalographic Findings for Patients With COVID-19

As part of the Covid Neurosciences Cohort project (CoCo Neurosciences), conducted at the Paris Brain Institute and Pitié-Salpêtrière Hospital (AP-HP), researchers and clinicians analyzed EEG data from 78 patients hospitalized with a Covid-19 infection. The EEG was indicated following significant neurological symptoms such as confusion, epileptic seizures, or delayed recovery in intensive care. Their results highlight the value of combining EEG with clinical, biological, and imaging data

in Covid-19 patients with neurological symptoms. EEG is a valuable tool to distinguish different types of brain damage, including encephalopathies, and thus allow better management of patients.

**Lambreccq V, et al. *JAMA Network Open*. March 2021**  
"Dynamic of epileptic networks and neuronal excitability" team. A study by Virginie Lambrecq (AP-HP) and Vincent Navarro (AP-HP/Sorbonne Université)



### Discovery of a novel role for an elusive brain region in maternal behaviors in mice

Gestation leads to a modification of brain circuits and behaviors such as nesting within the animal kingdom. The underlying mechanisms have been unknown until now. Using light-sheet microscopy as well as *in vitro* and *in vivo* measures of brain activity, a new study identified an unexpected region in the center of the brain, the Edinger-Westphal nucleus, as being involved in maternal preparatory nesting behavior.

This region's activity is modified by progesterone, one of the main hormones of pregnancy. The altered activation of these cells changes the balance of the mouse's behavior between sleep and nest building, increasing nest building time at expense of sleep.

**Topilko T, et al. *Neuron*. December 2021**  
"Structural dynamics of networks" team. A study by Tomek Topilko and Nicolas Renier (Inserm)

Below: Projections of nesting-activated neurons throughout the brain, showing the extent of the regions contacted by these neurons. The image is obtained from 3D light sheet imaging allowing the reconstruction of fibre trajectories in the brain at micrometric resolution. Inserm/Nicolas Renier



# Cognitive Neuroscience

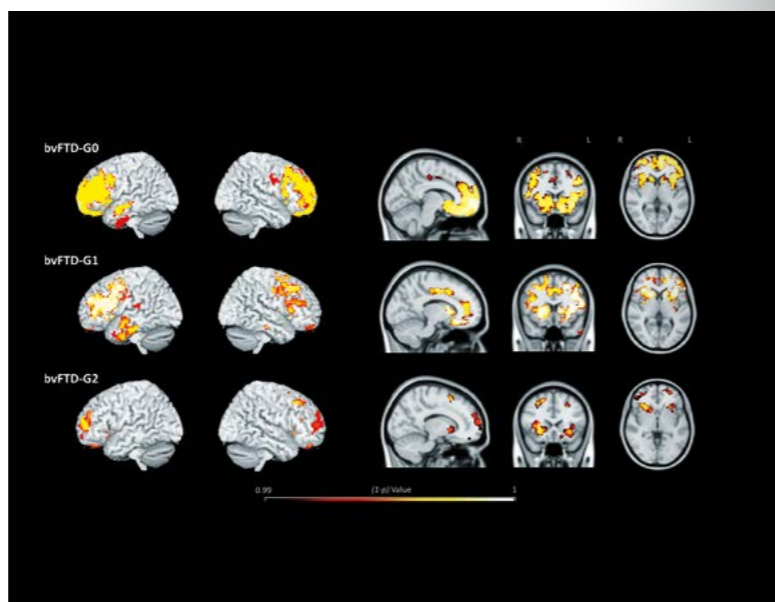
The work of teams in the field of cognitive neuroscience to better understand how whole-brain neural networks underlie cognitive, affective, contextual, and motivational processes and, through this, translate into behaviour.

## Weight loss and the brain's reward system

Obesity is a multifactorial pathology, integrating environmental, hormonal, psychological and physiological dimensions. One dimension that remains little explored is the neurobiological basis and the extent to which it can predict weight variations. In a study published in 2021, researchers from the Paris Brain Institute established for the first time a link between weight loss, the connectivity of the brain's reward system and the hormonal regulation of satiety.

**Schmidt L, et al. Brain Communications, February 2021**

*"Control - Interoception - Attention" Team. Study by Liane Schmidt (Inserm) and Hilke Plassmann (INSEAD's Octapharma Chaired Professor of Decision Neuroscience).*



Above: Mapping of brain atrophy in each form of the behavioural variant of frontotemporal degeneration. Godefroy Valérie

## Definition of new forms of the behavioural variant of frontotemporal degeneration (FTD)

One of the main symptoms of behavioural variant frontotemporal degeneration (FTD) is inhibition deficits, a generalised difficulty in controlling behaviour. This manifests itself in socially inappropriate behaviour, impulsivity, and compulsive actions. In 2021, scientists at the Institute enriched the clinical picture of FTD by identifying two main types of inhibition deficits, automatic compulsive behaviours and socially maladaptive behaviours, and their brain correlates.

This more precise definition of the different forms of the disease is essential for more personalised management.

**Godefroy V, et al. Alzheimers Dementia: Diagnosis, Assessment & Disease Monitoring, April 2021**

*FRONTLAB team. A study by Valérie Godefroy and Lara Migliaccio (Inserm).*

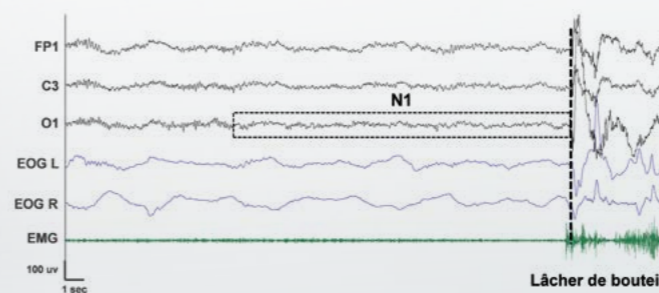
## Mysteries and functions of sleep revealed

When we dream, we are at first sight cut off from the world, unable to receive and respond to information from the environment. For the first time, a collaboration between a team from the Paris Brain Institute and several American, German and Dutch groups shows that two-way communication from the experimenter to the dreamer and vice versa is possible during dreams. Another study by the same group shows that

there is a phase conducive to creativity at the time of falling asleep. To activate it, it is necessary to find the right balance between falling asleep quickly and not sinking into a too deep sleep.

**Konkoly KR, et al. Current Biology, February 2021; Lacaux C, et al. Science Advances, December 2021**  
*MOV'IT team. Two studies led by Delphine Oudiette (Inserm), Isabelle Arnulf (AP-HP/Sorbonne University), Thomas Andrillon (Inserm), Célia Lacaux and Emma Chabani*

Below: Brain activity recorded by electroencephalography. The N1 block represents the first phase of sleep after falling asleep, identified as being conducive to creativity. Inserm/Oudiette Delphine & Célia Lacaux



## Experimental psychology deciphers our checking behaviour

The decisions we make every day include an element of uncertainty. To reduce this uncertainty and thus facilitate our choices, we engage in verification behaviours, such as listening several times to a message on the answering machine when the sound quality is poor. In certain pathologies such as OCD, these behaviours can be exacerbated and greatly disturb the quality of life of patients. One study shows that these checking behaviours are modulated by two cognitive mechanisms: metacognition and beliefs, for example the extent to which a person trusts their own memory.

**Baptista A, et al. Scientific Reports, vSeptember 2021**

*"Neurophysiology of repetitive behaviour" Team. A study led by Axel Baptista (AP-HP/Sorbonne University), Maxime Maheu (UKE Hamburg), Luc Mallet (AP-HP/Université Paris-Est Créteil) and Karim N'Diaye (CNRS).*



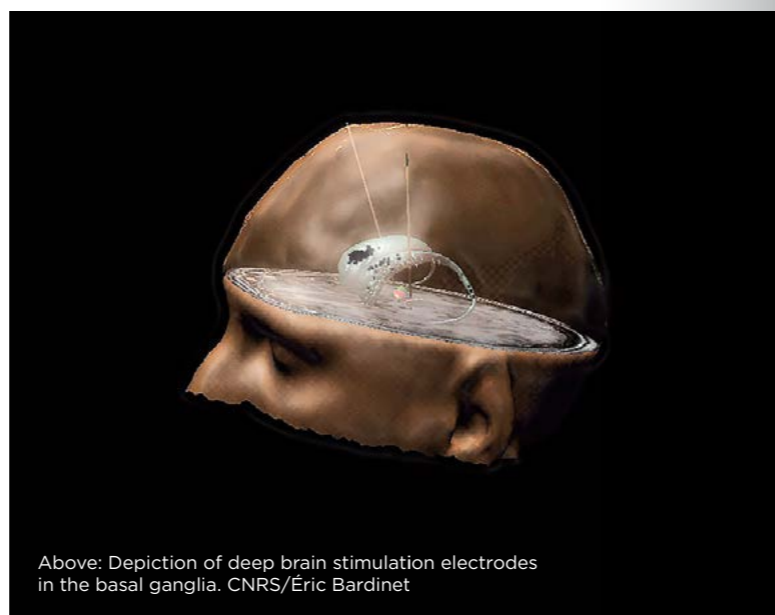
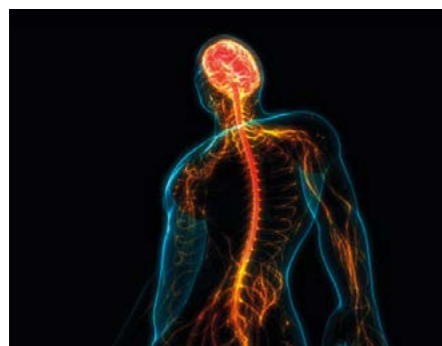
## Clinical and Translational Neuroscience

The aim of clinical and translational research is to enable the development of predictive or progression markers and treatments for neurological and psychiatric diseases, from identification in simple laboratory modelling to clinical trials.

### A new non-invasive therapy for the treatment of primary orthostatic tremor: transmedullary electrical stimulation

Primary orthostatic tremor (POT) manifests itself as a very rapid tremor (not visible to the naked eye) of the legs and trunk, responsible for a feeling of instability. The symptoms appear when standing still and disappear when walking or leaning on a support. A study shows that after a single localized electrical stimulation of the spinal cord through the skin, tremors are reduced and the time patients spend standing without support is increased. This study constitutes a proof of concept of the effect of transmedullary electrical stimulation for future clinical trials.

**Lamy JC, et al. *Movement Disorders*, 2021**  
MOV'IT team. Study led by Jean-Charles Lamy (Brain Institute) and Marie Vidailhet (AP-HP/Sorbonne University)



Above: Depiction of deep brain stimulation electrodes in the basal ganglia. CNRS/Eric Bardinet

### Parkinson's disease: patients become actors of their treatment by deep brain stimulation

For the first time in France, Medtronic's Percept™ PC neurostimulator using BrainSense™ technology was implanted in three Parkinson's disease patients by clinicians and researchers from the Paris Brain Institute and the AP-HP Pitié-Salpêtrière Hospital. With this new device, the patient can trigger the recordings of intracerebral signals and inform his remote control of his symptoms, undesirable effects, etc. This innovation is a first step before the implementation in the

coming years of an adaptive deep brain stimulation system, capable of recording brain activity and adapting the stimulation itself accordingly, using algorithms.

*"Experimental Neurosurgery" Team. Programme led by Carine Karachi (Sorbonne University/AP-HP), Marie-Laure Welter (Rouen University Hospital), and Alexandre Carpentier's neurosurgery team at the Pitié-Salpêtrière Hospital AP-HP.*



### A genetic modifier of the age of onset of frontotemporal degeneration

The C9orf72 gene mutation is a major cause of hereditary frontotemporal degeneration (FTD) and amyotrophic lateral sclerosis (ALS). Carriers of this expansion often present a heterogeneous clinical picture and a variable age of onset of symptoms; the first ones being observed as early as in their thirties and the disease not occurring even at an advanced age. A study by the Paris Brain Institute has helped to explain this polymorphism, identifying a frequent

variation in the DNA sequence on the X chromosome upstream of the SLITRK2 gene, associated with a later age of onset of symptoms.

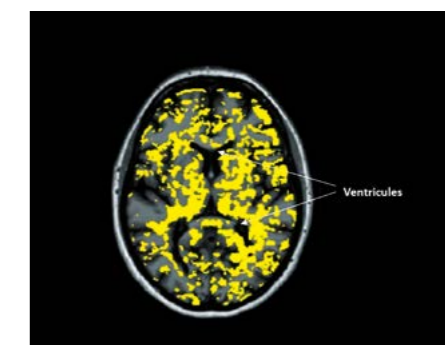
**Barbier M, et al. *Brain*, September 2021.**  
*"Basic and translational neurogenetics" team. Study by Mathieu Barbier and Isabelle Le Ber (AP-HP).*

### Multiple sclerosis: PET-MRI provides information on inflammation

A team from the Institute has identified an increase in volume and inflammation in the cerebral ventricles, the cavities of the brain that produce and store cerebrospinal fluid, in patients with multiple sclerosis. These abnormalities correlate with inflammation in the brain, indicating the progression of the disease. The team also found activation of innate immune cells in these patients, associated with microlesions of the white matter, in a gradient around the cerebral ventricles. It is associated with increased disability. These results suggest that molecules contained in the cerebrospinal fluid could aggravate inflammation and thus favour a deleterious evolution of the disease, making these molecules candidates for future research into treatments.

**Poirion E, et al. *Neurology*, April 2021; Ricigliano VAG, et al. *Radiology*, October 2021**  
*Team "Remyelination in multiple sclerosis: from biology to clinical translation". Two studies led by Emilie Poirion, Vito Ricigliano (AP-HP/Sorbonne University), Bruno Stankoff (AP-HP/Sorbonne University) and Benedetta Bodini (AP-HP/Sorbonne University)*

Below: Gradient of activated innate immune cells in a multiple sclerosis patient observed by PET around the ventricles.



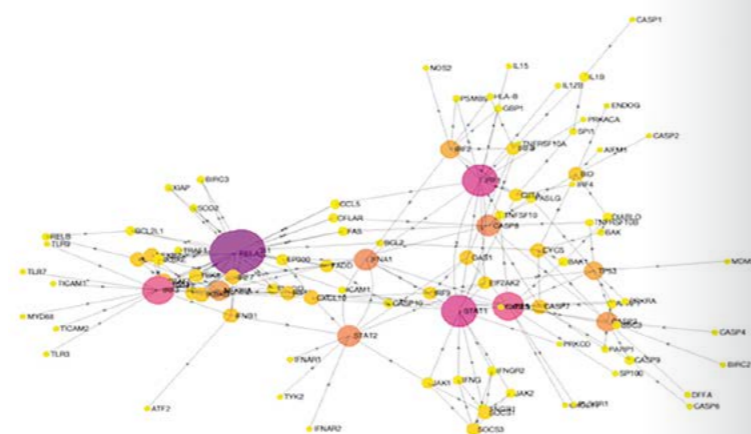
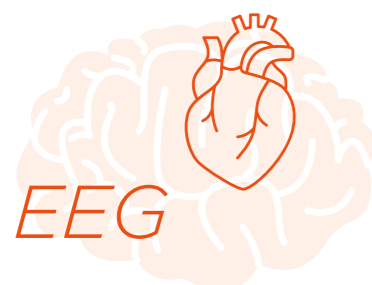
## Computational modelling in neuroscience

The main objectives of the teams in this field are the mathematical modelling of brain mechanisms from molecule to behaviour, the development of data mining methods for the diagnosis and prognosis of neurological and psychiatric diseases, and finally the development of scientific software and engineering tools applied to neuroscience.

### Inter-subject heart rate synchronization: a new sign for monitoring consciousness

A team from the Paris Brain Institute sought to understand if and how awareness of a stimulus could synchronise our body rhythms (EEG, heart rate...). They showed that when healthy individuals listen to a story being told, their heart activities all synchronise with the story. In patients with a state of consciousness disorder, this synchronisation was little or not present. This could therefore be a new biomarker of states of consciousness.

**Pérez P, et al. Cell Reports. September 2021**  
Team "PICNIC- Neuropsychology and functional neuroimaging". A study conducted by the group of Jacobo Sitt (Inserm).



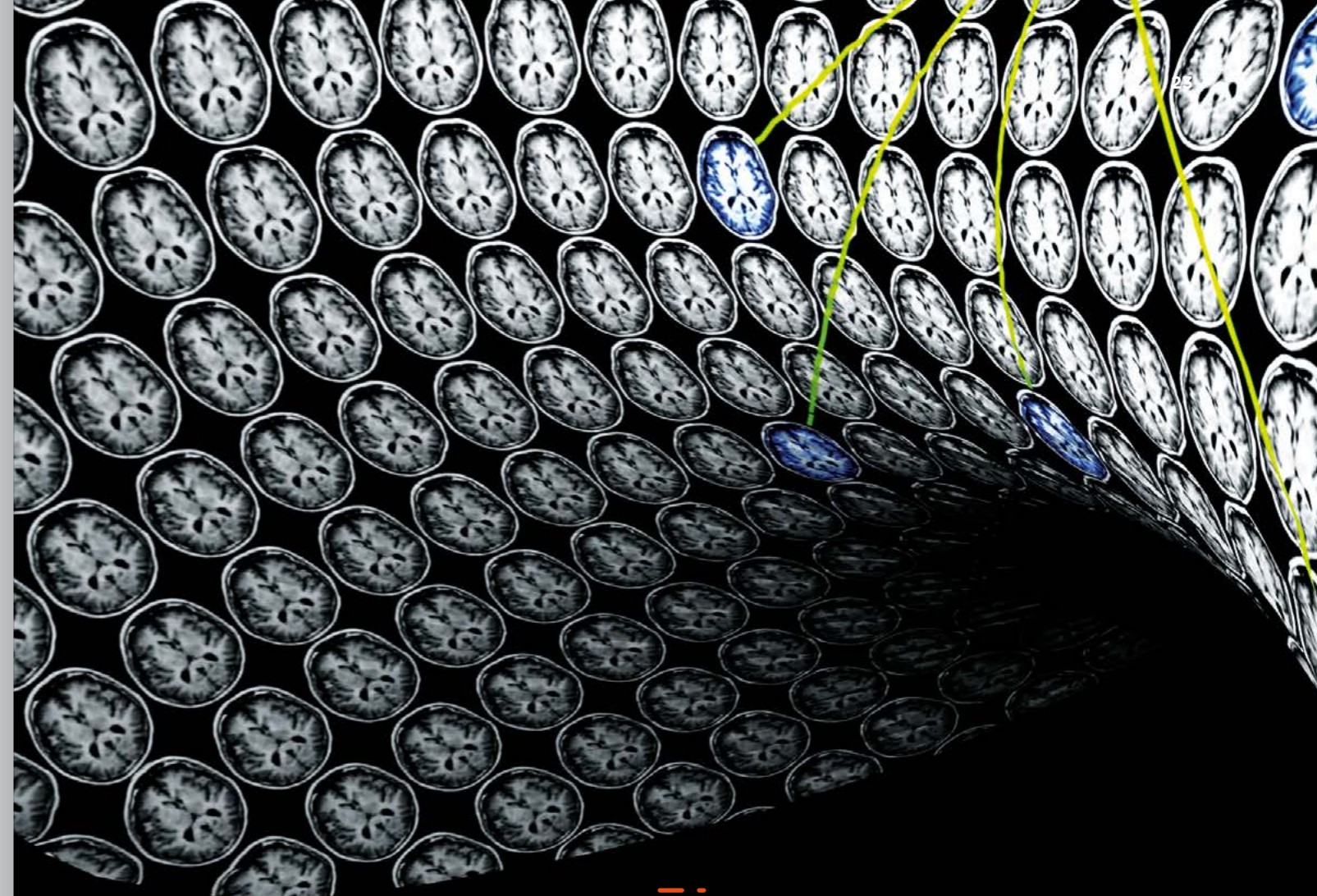
Above: Modelling of the protein network secreted by macrophages in multiple sclerosis patients

### Mathematical modelling of an inflammatory mechanism in multiple sclerosis

A large body of research on multiple sclerosis (MS) attempts to identify the processes that lead to chronic inflammation and neuronal loss. Following an innovative modelling strategy applied to messenger RNA expression data, scientists at the Paris Brain Institute have identified the SOCS1 and SOCS3 genes as key genes in the control of the pro-inflammatory state of macrophages in MS. This work opens promising

avenues for the identification of new therapeutic targets as well as for modelling strategies more adapted to the study of complex biological networks underlying pathological processes.

**Bassighana G, et al. Network Neuroscience, May 2021**  
"Plasticity and regeneration of myelin" team and ARAMIS team. A study led by Violetta Zujovic (Inserm) and Fabrizio De Vico Fallani (Inria)



## Alzheimer

### Mapping the evolutionary trajectories of Alzheimer's disease

One of the challenges of Alzheimer's disease is to better understand its slow progression, over several decades, and the immense variability that can exist between individuals. It is very complicated for doctors to predict how the disease will develop in each patient. The ARAMIS team at the Paris Brain Institute has developed a new algorithm capable of predicting the evolution of different characteristics of Alzheimer's disease,

with a much higher accuracy than any method currently available. This could be a valuable tool for the evaluation of new therapies and better patient management.

**Koval I, et al. Scientific Reports. April 2021**  
ARAMIS team. Study led by Igor Koval and Stanley Durrleman (Inria)

Above: Graphic representation of MRI brain slices © Alexandre Bône

## The Paris Brain Institute's core facilities

The quality of scientific discoveries depends on the performance of technological platforms. In 2021, the ten core facilities of the Paris Brain Institute continued their development to meet the needs of the research teams.



**iGenSeq**  
Next generation RNA and DNA sequencing



**Ephys**  
Electrophysiology, patch-clamp, MEA, EEG



**ICV**  
Screening, cell culture, IPSC, vectorology



**Histomics**  
Histomics research using specific equipment to cut tissue and process samples



**ICMQuant**  
Conventional fluorescence microscopy, confocal laser scanning, multiphoton microscopy, confocal rotating disk microscopy, transmission electron microscopy, light-sheet microscopy



**PhenoPark**  
Preclinical functional exploration, behavioral analysis, surgery, electrophysiology



**DAC**  
Genomics, bioinformatics and biostatistics



**PRISME**  
Cognitive and social assessment in real-life conditions and virtual reality



**Biobanks**  
Biological resource collection, DNA, plasma, cells, brain tissue



**CENIR**  
Center for Neuroimaging Research: 3T MRI, PET-MRI, TMS, MEG-EEG, Gait analysis, Stereotactic imaging

## At the cutting edge of technology

At the Paris Brain Institute, researchers and platform managers work in close collaboration, constantly monitoring technological advances, to provide the most advanced equipment and techniques, operated by highly competent staff, to advance brain research.

### DEEP TIME: A UNIQUE AND TIMELESS EXPERIENCE

In 2021, the PRISME platform, together with CENIR, welcomed the «chrononauts» of the DEEPTIME study led by the explorer Christian Clot. These 15 volunteers experienced living in complete isolation for 40 days in the Lomberives cave, deprived of any time reference. Before, after and during their stay in the cave, they underwent behavioural and cognitive tests developed in collaboration with the Brain Institute's platforms and the scientific teams involved in the project (LNC, ENS Paris; COMETE, University of Caen).

### DEVELOPMENT OF A BRAIN-MACHINE INTERFACE PLATFORM

In 2021, the MEG-EEG (Magneto and Electroencephalography) component of CENIR has obtained internal funding from the Paris Brain Institute to develop a multimodality brain-machine interface platform. The objective is to couple several modalities such as eye movement tracking, augmented reality, and EEG in order to improve the efficiency of brain-machine interfaces. This platform will also allow to study the close link between gaze, movement intention and planning.

### ULTRABRAIN: NON-INVASIVE TREATMENT USING ULTRASOUND

Since September 2020, the Ultrabrain project has made it possible to treat a dozen patients with essential tremor for the first time in France. The therapeutic device is based on sending ultrasound through the skull to reach the dysfunctional area involved in the tremor. Six patients benefited from this treatment in 2021. The CENIR teams used the Exablate device to perform this operation. This technique replaces invasive surgical procedures and reduces side effects such as infections or bleeding. In parallel, and in collaboration with the Physics for Medicine team (Université Paris Science et Lettres), the teams from the Paris Brain Institute were able to demonstrate the neuromodulatory potential of ultrasound during this treatment.

### THE PANAM PLATFORM AT THE PATIENT'S BEDSIDE

Since June 2021, the PANAM component of the Institute's Neuroimaging Centre (CENIR), dedicated to movement analysis and transcranial magnetic stimulation, has relocated part of its activity to the patient's bedside, thanks to a portable transcranial magnetic stimulation trolley that allows the brain to be stimulated non-invasively.

### REORGANISATION OF THE CELL CULTURE ACTIVITY

As part of its optimisation and scientific development strategy, the Institute renewed the organisation and governance of its CELIS, ICMQuant and iVector platforms. The CELIS-Ephys electrophysiology activity thus became independent. Cellular microscopy joined the ICMQuant platform. Finally, the IVECTOR platform joined the scope of the CELIS platform, which was renamed the ICV platform - cell engineering and vectorology.

### ACQUISITION OF A NEW HIGH-SPEED SCANNER

The acquisition of a new Nanozoomer S60 scanner (Hamamatsu) has enabled the Histomics histology platform to increase the throughput of scans performed. Thanks to this new generation of equipment, the platform now has a loader of 6 of 60 slides (compared to 6 slides previously), thus enabling research teams to have access to their images in a considerably reduced timeframe.

## International partnerships

The Paris Brain Institute has significant reach through its vast French, European and international network which encompasses some 300 collaborations throughout the world. By adapting and digitizing its processes, the Institute was able to maintain and step up its collaborative efforts in 2021 despite the severe impact of the health situation on international travel. It continued and initiated numerous cooperations with researchers from various institutes through publications and by securing French, European and international funding. The Paris Brain Institute endeavors to act both as a medical and scientific research hub that attracts high-caliber researchers and a center developing scientific knowledge and innovation within the field of neuroscience at global level. In order to meet this goal, close links must be forged with the top French and international research centers. Such collaborations enable research efforts to be pooled and faster progress to be made. Exchange programs are also set up to promote training initiatives and share expertise. This international requirement is also applied internally to core operations, with research conducted at the Paris Brain Institute assessed by an International Scientific Advisory Board of renowned specialists from around the world.

1

### Yale University (New Haven, USA)

In 2015, the Paris Brain Institute signed an agreement with Yale University to establish a permanent exchange program for clinicians. This seeks to give interns and chief residents the opportunity to develop their clinical practice through an experience at the prestigious American university. The agreement was renewed in 2021. Regular workshops with Yale University provide a forum for sharing the respective institutes' latest scientific advances and methodological developments and laying the foundations for new collaborations. The 2021 workshop addressed the subject of neuro-oncology. The clinical collaboration with Yale was extended in 2021 with the launch of clinical rounds in neurology. Three editions were held on epilepsy, multiple sclerosis and neurogenetics. In parallel to this, the COVID-19 pandemic provided an opportunity for the Institute's researchers to collaborate on the biology of coronavirus infection. Their initial findings were published in the March 2021 issue of the *Journal of Experimental Medicine*.

2

### Columbia University (New-York, USA)

The "Hands-on Consciousness" summer program, a new teaching program addressing the subject of consciousness, was launched as part of a new collaboration with Columbia University. The program set up jointly with the Columbia University Center for Undergraduate Global Engagement in collaboration with the psychology department involves research-based learning through an internship in a Paris Brain Institute laboratory, which will host 12 students in Paris from May 22 to July 3, 2022.

3

### MNI (Montreal Neurological Institute, Canada)

Following the renewal of the cooperation agreement with the MNI, collaboration continued in 2021 with a workshop on single cell approaches. Three working groups on bioinformatics, cell line tracing and organoids were set up.

4

### CURE-ND (France, Germany, United Kingdom, Belgium)

The Cure ND (Catalysing a United Response in Europe to Neurodegenerative Diseases) consortium formed in 2020 seeks to coordinate European research efforts on neurodegenerative diseases. Having noted historic underfunding of this field in the new Horizon Europe program launched in 2021, it decided to alert politicians to the issue. In 2021, lobbying was initiated with the European Commission. The consortium also decided to share access to Wikitool, a knowledge-pooling portal developed by the UK Dementia Research Institute (UK DRI). Content for this tool is provided by the scientific community, enabling sharing of protocols, lists of cell lines, and databases. The Paris Brain Institute's IT department worked with the UK DRI to activate access to the platform for the Institute's scientific community. Several events were also scheduled for 2022, including a workshop for early-career researchers from the four partner institutes and a meeting at the Federation of European Neuroscience Societies (FENS) Forum.

5

### Weizmann Institute (Israel)

A cooperation agreement is being signed with the Weizmann Institute. Early-career researchers associations are currently in talks to organize a joint retreat for PhD students and postdoctoral fellows.

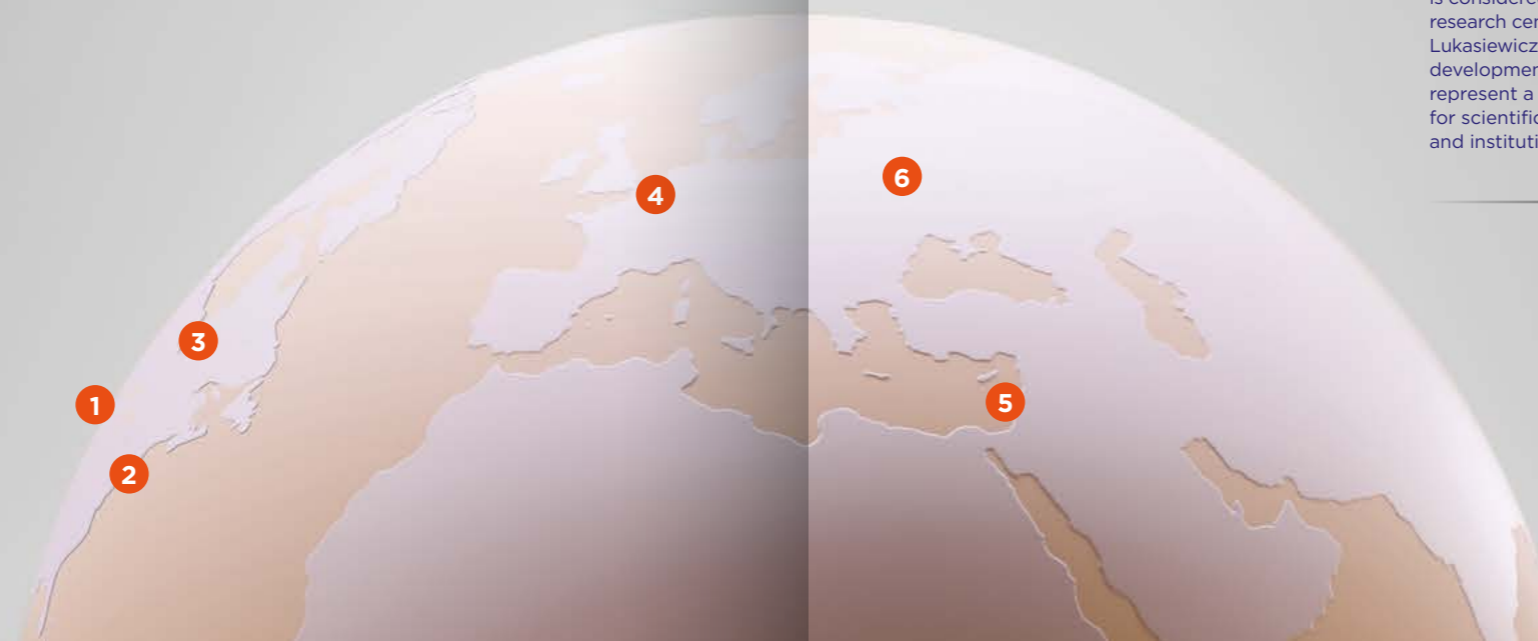
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### Lukasiewicz PORT - Polish Center for Technology Development (Wroclaw, Poland)

Lukasiewicz PORT is a relatively new scientific research institute whose campus is in Wroclaw, Poland. Its recently established Life Sciences and Biotechnology Center is used for basic research and applied technological development activities, with a focus on three fields: neurobiology, oncology and biotechnology. Lukasiewicz PORT is seeking to forge links with the Paris Brain Institute, which is considered a model translational research center in Europe. In return, Lukasiewicz PORT's biotechnology development expertise could represent a unique opportunity for scientific collaboration and institutional cooperation.

### EU Twinning Call for Proposals

Lukasiewicz PORT coordinated the submission of a European Twinning project application in consortium with the Paris Brain Institute, Erasmus University Medical Center (Netherlands) and the Max Planck Institute of Psychiatry (Germany). Its aim is to promote excellence in science and management through knowledge transfer and sharing of best research practices among European countries. These network coordination projects provide a means of supporting the development of research institutions in countries where research and innovation activities are undergoing improvement. This is achieved through collaboration on scientific projects, education programs and research application initiatives. The results of this call for proposals are due to be announced in the summer of 2022.



# The 25 research teams of the Paris Brain Institute

The Paris Brain Institute currently has 25 research teams. In 2021, an international call for applications has been launched to recruit three new teams by 2023. Find here all our teams, their names, their leaders, and the competitive funding they have obtained in 2021.

**ALS: CAUSES AND MECHANISMS OF MOTOR NEURON DEGENERATION**  
**Séverine Boillée** (Inserm)  
 FRM

**BASIC TO TRANSLATIONAL NEUROGENETICS**  
**Giovanni Stevanin** (Inserm/EPHE) and **Alexandra Durr** (AP-HP/Sorbonne University)  
 National Foundation for Ataxia, ANR - ERA NET E-RARE, ANR - JPND, FRM

**MOLECULAR PATHOPHYSIOLOGY OF PARKINSON'S DISEASE**  
**Olga Corti** (Inserm) and **Jean-Christophe Corvol** (AP-HP/Sorbonne University)  
 Fondation de France, Cancéropôle Île-de-France, ANR - PRCI, ANR - PRC, Fondation de l'avenir, FRM

**ALZHEIMER'S DISEASE AND PRION DISEASES**  
**Marie-Claude Potier** (CNRS) and **Stéphane Haïk** (Inserm)  
 Fondation des Treilles, Fondation Jérôme Lejeune, Fondation pour la Recherche sur Alzheimer, NeurATRIS

**EXPERIMENTAL THERAPEUTICS OF PARKINSON'S DISEASE**  
**Étienne Hirsch** (CNRS) and **Stéphane Hunot** (CNRS)  
 ANR - Franco-Allemand IA, Fondation pour la Recherche sur Alzheimer, Université Saclay

**MOV'IT: MOVEMENT, INVESTIGATION, THERAPEUTICS. NORMAL AND ABNORMAL MOTOR CONTROL: MOVEMENT DISORDERS AND EXPERIMENTAL THERAPEUTICS**  
**Marie Vidailhet** (AP-HP/Sorbonne University) and **Stéphane Lehéricy** (AP-HP/Sorbonne University)  
 DMRF, ANR - PRC, HFSP, ANR - JPND, FRM, ERC - STARTING, Fondation pour la Recherche sur Alzheimer, Sleep Research Society Foundation, FUNDAÇÃO BIAL

**CELLULAR PHYSIOLOGY OF CORTICAL MICROCIRCUITS**  
**Alberto Bacchi** (Inserm)  
 MSCA - IF/GF, Idex Sorbonne université, ANR - PRC, ANR - JCJC, ANR - ERA NET Neuron, T2IRS for Organizing Scientific Event Award

**CELLULAR EXCITABILITY AND NEURAL NETWORK DYNAMICS**  
**Stéphane Charpier** (Sorbonne University), **Mario Chavez** (CNRS) and **Vincent Navarro** (AP-HP/Sorbonne University)  
 ANR - PRCE, FRM

**GENETICS AND PHYSIOPATHOLOGY OF EPILEPSY**  
**Éric Leguern** (AP-HP/Sorbonne University) and **Stéphanie Baulac** (Inserm)  
 MSCA - IF/GF, FMR (maladies rares), ANR - PRC, ANR - ERA NET Neuron

**SENSORY SPINAL SIGNALING**  
**Claire Wyart** (Inserm)  
 ANR - JCJC, ANR - PRC

**GENETICS AND DEVELOPMENT OF NERVOUS SYSTEM TUMORS**  
**Emmanuelle Huillard** (CNRS) and **Marc Sanson** (AP-HP/Sorbonne University)  
 La Ligue nationale contre le Cancer, Cancéropôle Île-de-France, RIF - Région Île-de-France, Fondation de France, INCA, FRM, BMS, ARTC, Fondation de l'avenir

**REMYELINATION IN MULTIPLE SCLEROSIS: FROM BIOLOGY TO CLINICAL TRANSLATION**  
**Catherine Lubetzki** (AP-HP/Sorbonne University) and **Bruno Stankoff** (AP-HP/Sorbonne University)  
 NMSS, ANR - IA - RHU, NeurATRIS

**MYELINE PLASTICITY AND REGENERATION**  
**Brahim Nait-Oumesmar** (Inserm) and **Violetta Zujovic** (Inserm)  
 ANR - PRC, Fondation Jérôme Lejeune, ARSEP

## Supporting research and its need for funding

Research institutes have developed a dynamic financial strategy to cope with the ever-changing regulations of public financial support and to adapt to the industrial environment, where new trends and new needs arise almost daily. The Department of Medical and Scientific Affairs at Paris Brain Institute (DAMS) is home to a grants office that offers numerous services to the Paris Brain Institute community and is available to assist in developing new external collaborations with the Paris Brain Institute. With a wide range of skills, DAMS offers sourcing and engineering assistance to obtain competitive research grants on a national, European and international level.

**18,6 M€**

OF EXTERNAL COMPETITIVE GRANT INCOME IN 2021

**2**

ERC STARTING GRANT I.E 17 GRANTS FROM THE EUROPEAN BRAIN COUNCIL SINCE THE CREATION OF THE INSTITUTE

**38%**

THE SUCCESS RATE FOR THE GENERIC CALL FOR PROJECTS OF THE FRENCH NATIONAL RESEARCH AGENCY (ANR), MORE THAN TWICE THE NATIONAL RATE

**PICNIC- PHYSIOLOGICAL INVESTIGATION OF CLINICALLY NORMAL AND IMPAIRED COGNITION - NEUROPSYCHOLOGY AND FUNCTIONAL NEUROIMAGING**  
**Laurent Cohen** (AP-HP/Sorbonne University), **Lionel Naccache** (AP-HP/Sorbonne University) and **Paolo Bartolomeo** (Inserm)  
 ANR - MRSEI, HAS - Haute Autorité de Santé, FRM, ANR - ERA JTC, Fondation de l'avenir, Fondation des Gueules Cassées

**FRONTLAB: FRONTAL FUNCTIONS AND PATHOLOGY**  
**Richard Lévy** (AP-HP/Sorbonne University)  
 Fondation pour la Recherche sur Alzheimer, MSCA - IF/GF, RIF - Région Île-de-France, Fondation des Treilles, INCA, ARS, FRM, Fondation pour la Recherche sur Alzheimer

**CIA: COGNITIVE CONTROL - INTERCEPTION - ATTENTION**  
**Philippe Fossati** (AP-HP/Sorbonne University) and **Liane Schmidt** (Inserm)  
 ANR - JCJC, ERC - STARTING

**NEUROPHYSIOLOGY OF REPETITIVE BEHAVIORS**  
**Éric Burguière** (CNRS)  
 ANR - JCJC, ANR - PRC, INCA, Congrès Français de Psychiatrie, ARS

**MOTIVATION, BRAIN AND BEHAVIOR**  
**Mathias Pessiglione** (Inserm), **Sébastien Bouret** (CNRS) and **Jean Daunizeau** (Inserm)  
 ANR - PRC, FRM, Fondation des Gueules Cassées

**ARAMIS: ALGORITHMS, MODELS AND METHODS FOR IMAGES AND SIGNALS OF THE HUMAN BRAIN**  
**Olivier Colliot** (CNRS) and **Stanley Durrleman** (Inria)  
 ANR - JPND, Idex Sorbonne université

**EXPERIMENTAL NEUROSURGERY**  
**Brian Lau** (CNRS) and **Carine Karachi** (AP-HP/Sorbonne University)  
 Fondation de France

**BRAIN DEVELOPMENT**  
**Bassem Hassan** (Inserm)  
 NIH, ANR - PRC, France Alzheimer

**STRUCTURAL DYNAMICS OF NEURAL NETWORKS**  
**Nicolas Renier** (Inserm)  
 ANR-PRC, Wyss Center for Bio and Neuroengineering

**CELLULAR MECHANISMS OF SENSORY PROCESSING**  
**Nelson Rebola** (CNRS)  
 ANR-PRC

**GENE THERAPY**  
**Nathalie Cartier** (Inserm)  
 ANR - PRC

**DIANE BARRIÈRE CHAIR: "MOLECULAR PHYSIOLOGY OF SYNAPTIC BIOENERGETICS"**  
**Jaime de Juan-Sanz** (CNRS)

LEXIQUE		
<b>ANR - IA RHU</b> : National Research Agency - Investissement d'Avenir University Hospital Research	collaborative research projects	<b>INCA</b> : Cancer National Institute
<b>ANR-JCJC</b> : Young Researcher	<b>ARDRM</b> : Robert Debré Association for Medical Research	<b>MSCA-IF/GF</b> : Marie Skłodowska-Curie actions — Individual and Global Fellowships (Europe)
<b>ANR - JPND</b> : Joint programme neurodegenerative diseases	<b>ARSEP</b> : Association for Research on Multiple Sclerosis	<b>NIH</b> : National Institutes of Health (États-Unis)
<b>ANR - JTC</b> : Joint transnational call	<b>ARTC</b> : Association for Research on Brain Tumors	<b>NMSS</b> : National Multiple sclerosis Society
<b>ANR - PRC</b> : Collaborative research projects	<b>DMRF</b> : Dystonia medical research foundation	
<b>ANR - PRCE</b> : Industrial collaborative research projects	<b>ERC</b> : European Research Council	
<b>ANR-PRCI</b> : international	<b>FRM</b> : Fondation for Medical Research	
	<b>HFSP</b> : Human Frontier Science Program	



# CLINICAL RESEARCH AND CARE

2021 saw the Paris Brain Institute continue its innovative clinical trials, and advance in the way clinical research is organized and in terms of its medical strategy.

## Paris Brain Institute: a patient-focused organization

The Paris Brain Institute has developed effective synergy between clinical and research staff, working closely with the clinical investigation center and the AP-HP/Sorbonne University hospital group. Major structuring work was carried out through the IHU program to provide Paris Brain Institute support for clinical research conducted in hospital departments, particularly through the launch of clinical research infrastructures (iCRIN). Within the space of just a few years, the Institute has become the driving force of neuroscience clinical research at the Pitié-Salpêtrière site.

### A facility dedicated to clinical trials

The Neuroscience Clinical Investigation Center (CIC) is a clinical research core facility that coordinates and organizes clinical trials resulting from collaborations between Paris Brain Institute researchers and clinicians in the Neuroscience Medical-University Unit (DMU) at AP-HP Pitié-Salpêtrière Hospital. It acts as a special link between research and care, each year hosting numerous patients with neurological and psychiatric disorders at the Institute, where they take part in trials and benefit from innovative treatments. The CIC is also actively involved in national and international clinical research networks. In 2021, Céline Louapre was appointed as its director, taking the reins from Jean-Christophe Corvol.

### Approval of three iCRIN

The Paris Brain Institute's clinical research infrastructures (iCRIN) seek to develop interaction and sharing of expertise between Pitié-Salpêtrière Hospital's Neuroscience Medical-University Unit stakeholders and Paris Brain Institute research teams. In 2021, the iCRIN for orthopedics and amyotrophic lateral sclerosis were approved for an additional 3-year period and awarded full iCRIN status. The iCRIN for head trauma was also renewed for 3 years, retaining its emerging status. The 9 other iCRIN continued their development and have already achieved some positive results.

### Rapid expansion of Neurotrials, the early clinical development unit

Neurotrials is the unit of the Paris Brain Institute dedicated to the management and development of early clinical trials in neuroscience through scientific consulting and clinical trial management activities. In 2021, the first clinical trial managed by Neurotrials on behalf of an industry sponsor (Spanish biotech), the ACUITY study in optic neuritis and multiple sclerosis, started with several patients included and this study is expanding to a multicenter study, thereby now making Neurotrials a national player in neuroscience clinical research. Apart from a variety of consulting activities with start-ups and biotech firms, Neurotrials has handled the preparation, submission to regulatory authorities and set-up of two additional clinical trials, for a large European pharma company in Parkinson's disease and a US biotech in Huntington's disease respectively, with inclusion of the first patients planned in Q3-2022 for each trial. In this expansion process the Neurotrials unit has grown and now comprises a Medical Lead, a Regulatory Officer, a QA Manager, a Clinical operation team (1 Manager, 2 Clinical project managers, 2 Clinical research associates) and a Business Developer. Neurotrials has successfully implemented a quality assurance system compliant with regulatory requirements and has passed the first external audit of its quality management system.

# Trials at the Neuroscience CIC

In 2021, several promising clinical trials, coordinated by the Clinical Investigation Center, were initiated and patients enrolled.

## An innovative therapy for essential tremor

The Ultrabrain project conducted in collaboration between the Paris Brain Institute's Neuroimaging Center (CENIR) and the Hospital's Neurology and Neurosurgery departments seeks to assess the efficacy of focused ultrasound treatment for essential tremor. The protocol is in progress. Nine patients were enrolled in 2021.

## COVID-19

The CIC is involved in three protocols concerning COVID-19 vaccination follow-up of multiple sclerosis patients (COV-POPART, COVIVAC and Bio-COCO-Neuroscience).

## Multiple sclerosis

In 2021, scientific research carried out by Bruno Stankoff and Catherine Lubetzki's team revealed that Bruton's tyrosine kinase (BTK) inhibitors have a positive effect on remyelination. A clinical trial was set up for patients with relapsing-remitting and progressive forms of multiple sclerosis. The first patients were enrolled in three of these trials in 2021.

## Antisense therapy

Numerous promising therapeutic innovations are based on the technology of antisense oligonucleotides, fragments of genetic material capable of interfering with messenger RNA, thus modulating the expression of certain proteins in the central nervous system in a targeted manner. With promising results already achieved in amyotrophic lateral sclerosis (ALS), a new trial (the Atlas study) will be conducted on asymptomatic patients at risk of developing the disease due to them carrying the SOD gene mutation. They will be monitored for the emergence of any neurofilaments characteristic of the disease.

**155 TRIALS IN PROGRESS**, including  
 - 76 trials at the CIC, with 15 new trials in 2021, 33 industry trials and 43 clinical trials at the CIC  
 - 79 trials in progress within the iCRIN.

**1,851 NEW PATIENTS** enrolled in these trials in 2021 with 2,070 consultations and 1,078 same-day hospitalizations

## CLINICAL TRIALS IN 2021 BY PATHOLOGY

DEMENTIA <b>14</b>	NEURO-ONCOLOGY <b>22</b>
NEUROVASCULAR <b>11</b>	MULTIPLE SCLEROSIS <b>25</b>
ABNORMAL MOVEMENTS <b>34</b>	NEUROLOGICAL RESUSCITATION <b>10</b>
NEUROGENETICS <b>16</b>	AMYOTROPHIC LATERAL SCLEROSIS <b>10</b>
EPILEPSY <b>1</b>	COVID-19 <b>3</b>
SLEEP <b>3</b>	NEUROPSYCHIATRY <b>1</b>
HEAD TRAUMA <b>2</b>	NEUROSURGERY <b>2</b>
NEUROPATHY <b>1</b>	



**A WORD FROM DR. CÉLINE LOUAPRE**  
 DIRECTOR OF THE NEUROSCIENCE CLINICAL INVESTIGATION CENTER AT THE PARIS BRAIN INSTITUTE

## Changes within the CIC in 2021

In 2021, work on structuring the Clinical Investigation Center team was stepped up with the onboarding of a management team to approve all activities carried out at the CIC from both a medical and scientific perspective, and also administrative and financial aspects. The team is composed of two thirds AP-HP personnel and one third paid by the ICM Foundation. The CIC's database was formalized through the REDCap tool implemented by the Paris Brain Institute teams. It has therefore been possible to open it up to the Institute's entire clinical research sponsorship unit and extend it to the hospital's Neuroscience Medical-University Unit. Finally, the CIC has become a training center for pharmacology and therapeutics interns, and we host interns within our

team. In terms of clinical trials, we are aiming to step up early-phase and therapeutic innovation trials, while also implementing trials specifically targeting pre-symptomatic forms of neurological disorders, with a view to preventing neurodegeneration and promoting repair and neuroprotection. With regard to administrative matters, we are implementing a quality management system, which entails structuring and defining the entire way in which our activity is organized, with a view to gaining ISO 9001 certification. Steps taken to meet these requirements form part of overall efforts to improve our services for the benefit of patients and in relation to our academic and industry partners.



# RESEARCH APPLICATIONS

Research provides a pool of discoveries and ideas that innovation transforms into solutions.

## Research applications: 2021 highlights

In order to take a structured approach to innovation in a field as wide-ranging and complex as the nervous system, the broadest possible network of partners is needed to interact with researchers and clinicians. The Paris Brain Institute thus draws on a strong combination of three components – industrial collaborators in the drugs and medical technology sector; an innovation team consisting of engineers and designers who initiate the development of products “made at the Paris Brain Institute”; and an incubator of innovative startups supporting fledgling companies with their growth.

### Commercializing research output

In 2021, the Institute filed seven new patent applications and provided protection for a new software program. One of the patents relates to a novel and unforeseen multiple sclerosis drug target, for which positive results have been achieved with several compounds. Two other repurposed compounds have shown promise for Creutzfeldt-Jakob disease and have been patented, along with a neurosurgical device designed to facilitate the insertion of deep brain stimulation electrodes such as those used in Parkinson’s disease.



### Partnership between Carnot institutes

The Paris Brain Institute coordinates the FINDMED program involving around fifteen Carnot institutes that play an active role in the health sector.

### Fast-track programs

In 2021, the incubator managed three startup fast-track programs, the first of which was Inno’Vaccins with participants including Janssen, AstraZeneca, La Poste and AG2R. Its main aim is to identify and test emerging solutions for drug/vaccine distribution logistics. The second program, Impact, focuses on digital solutions for mental health. Its participants include Janssen, Eisai, Otsuka, Axa, France Assureurs, France Biotech, ARIIS and Université de Paris. Lastly, Realize with AstraZeneca focuses on field trials of startups’ digital solutions aimed at facilitating patients’ care pathways. In total, 25 digital health startups have received support from the incubator and living lab, while also benefiting from the expertise of pharmaceutical and health insurance industry leaders.

### New partnerships and contractual relationships

In 2021, the Paris Brain Institute signed 53 new collaboration agreements with biotech, pharma and medtech companies, representing a financial volume on a par with 2020 figures. A transatlantic collaboration on frontotemporal dementia biomarkers with Pfizer and

a European collaboration with Askbio on a gene therapy program for Parkinson’s disease were further highlights of the year. Three new joint laboratories were set up with French industrial medtech stakeholders (see below). Moreover, the “Sleeping Beauties»

project yielded the first new patents for small molecules with therapeutic potential. Talks were thus initiated with early-stage investors and work commenced on building a convincing “data set” for these assets.

## Medical technologies leading the vanguard

In 2021, the Paris Brain Institute had plenty to report in terms of medtech innovations.



### Launch of a new startup incubation facility

In spite of the health crisis, the Paris Brain Institute launched its third business incubation facility. This new 1,500 sq meter facility in Rue du Chevaleret midway between the Paris Brain Institute and the Station F campus is a business accelerator specializing in medical technologies and artificial intelligence in healthcare. April 2021 saw the arrival of the first startups. The incubator will support the development of healthcare technology that is socially responsible, affordable and promotes prevention and patient autonomy. Through supported projects, the Institute will ultimately help offer new diagnostic and imaging tools and therapeutic solutions to patients with neurodegenerative and psychiatric disorders, as well as help develop new tools designed to improve quality of life and patient autonomy. This project was funded by the City of Paris, the Greater Paris region and a CDC loan.



### Three new joint laboratories specializing in medical technologies

Joint laboratories, or LabComs, allow Paris Brain Institute research teams to work in partnership with companies to develop innovative technologies. Three joint laboratories were set up in 2021. The first involves **Humans Matter**, France's leading company for cognitive assessment and rehabilitation, research teams from the Paris Brain Institute and the Institute's Care Lab, and care teams

from AP-HP Pitié Salpêtrière Hospital. It is working on several next-generation digital therapy projects for brain damage victims. These solutions are aimed at improving neuropsychological care for these patients by supporting them in hospital and when they return home. Four projects are already being trialed. **BrainCare Plan**, the second joint laboratory involving the Paris Brain Institute

and the startup Bioserenity aims to set up a national tele-expertise center to optimize care pathways for epilepsy. Under the medical coordination of Prof. Vincent Navarro, it combines France's top expertise on electroencephalographic (EEG) analysis with the ability to analyze complex signals offered by teams from Bioserenity and the Institute, to help hospitals optimize management of their care program.

Lastly, the third LabCom, with **Diampark**, develops new digital biomarkers to stratify Parkinson's patients. These technology-based biomarkers involve a combination of typing pattern technology, artificial intelligence, and an EEG headset. The aim of the solutions is to monitor the evolution of symptoms and thus to help pharmaceutical companies assess the efficacy of their drugs and help neurologists treat their patients.

## A new intake of startups

In 2021, nine new startups joined the Paris Brain Institute's iPEPS incubator. Each of them is involved in developing unique and promising technologies in the fields of biotechnology, medtech and digital health.

- **Holicare**, which develops new digital cognitive assessment solutions;
- **MyPL**, a solution for managing multidisciplinary clinical meetings;
- **Ceres Brain Therapeutics**, which combines an innovative drug administration device with a drug candidate for Parkinson's disease;
- **Diampark**, which offers digital tools for managing Parkinson's disease;
- **Imageens**, which provides carotid vascular imaging for monitoring strokes;
- **Okomera**, with its device for 3D cell cultures;
- **Dextrain**, with a novel tool allowing precision measurement of finger movements;
- **Saber Bio**, with technology combining microfluidics and single-cell sequencing;
- **Coave therapeutics**, which develops new vectors for gene therapy.



### SCIPIO BIOSCIENCE'S SUCCESS STORY AFTER 4 YEARS OF INCUBATION AT THE PARIS BRAIN INSTITUTE

After 4 years at the iPEPS - The Healthtech Hub incubator of the Paris Brain Institute, the Scipio bioscience team announced the European launch of Asteria®, a sequencing kit developed during the start-up's incubation at the Institute, which allows all researchers to analyze RNA from a single cell. Scipio bioscience's collaboration with the scientific teams and technological platforms of the Paris Brain Institute has yielded very promising results, particularly in understanding the development of Alzheimer's disease.

# TEACHING AND TRAINING

The Paris Brain Institute set up the Open Brain School training center to share and transfer knowledge. Its goal is to become an international leader in neuroscience training.

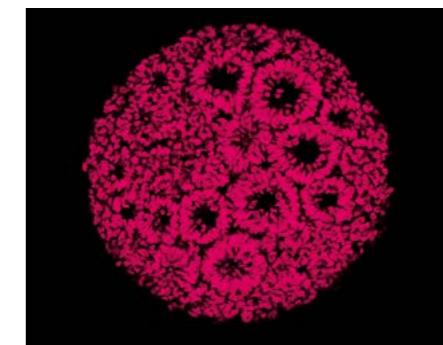
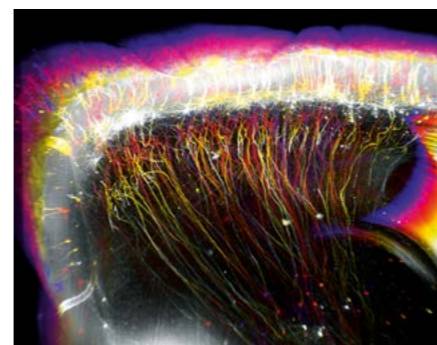
## The Open Brain School, a dedicated training organization

The main focus of 2021 for the Open Brain School was a gradual return to in-person training and continued development of digital solutions, including virtual reality videos, hybrid events and e-learning, to maintain and provide widespread access to Paris Brain Institute discoveries.

### Teaching scientific excellence

#### ● iMIND international master's program

The iMIND master's introduced in 2017 is a two-year international and interdisciplinary program. It arose from a collaboration between the Paris Brain Institute and the Integrative Biology and Physiology - Neuroscience master's program at Sorbonne University, and is the first course of its kind to specialize in neurodegenerative diseases. Links have been established with several foreign universities: KU Leuven, Trinity College Dublin, the University of Vienna and the Technical University of Munich. In 2021, 360-degree training videos were produced for students, allowing them to explore and learn about technologies used by the Paris Brain Institute's platforms. The first student exchanges with partner universities also took place in 2021. Four of the 15 selected candidates were international students (from the US, UK, Romania and Lebanon).



#### ● International PhD program

As part of ongoing efforts to increase its international visibility and attract individuals with high potential and new talent, the Institute is introducing a new international PhD program. This will boost the visibility of young international teams recruited by the Paris Brain Institute by helping them to attract the highest caliber students to ensure effective project kick-off and a successful start to their careers. The program is part of efforts to develop a full international Paris Brain Institute curriculum, from master's to PhD. Every year, the Institute will issue a call for applications for five 3-year grants (with a possible fourth year). A call for applications will be issued in November 2022 and students will be enrolled in September-October 2023.

## Supporting early-career researchers

### Becoming a PI masterclass

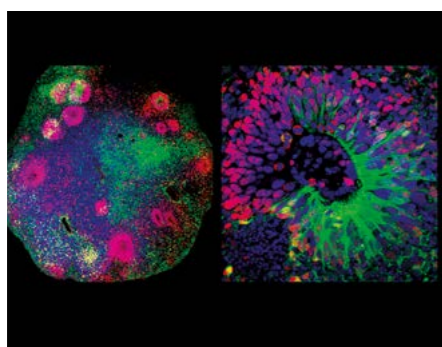
This session is aimed at all early-career Paris Brain Institute researchers applying for the research associates' (CRCN) competitive admission process in the short or long term. Participants will be given a clear overview of the recruitment process and a unique opportunity to talk to jury members and past candidates. In 2021, 34 participants joined the session.

### Two masterclasses supporting candidates applying for competitive grants

The Paris Brain Institute offers courses through the Open Brain School to support and advise scientists applying for highly competitive grants. The two masterclasses available specifically address Marie Skłodowska-Curie Actions Individual Fellowships (MSCA-IF)<sup>1</sup> supporting postdoctoral fellows conducting research in other countries, and grants issued by the European Research Council (ERC)<sup>2</sup> supporting scientists with the development of their research programs. These two courses provide insights on the application process (assessment stages, application components), reviewers' expectations (assessment criteria, Q&A with the Grants Office), and offer unique recommendations helping participants prepare strong applications.

1. This masterclass is aimed at postdoctoral fellows with less than eight years' postdoctoral experience who wish to join a Paris Brain Institute team to conduct their postdoctoral research. 17 participants attended the course in 2021.

2. This masterclass is aimed at beginner or experienced Paris Brain Institute researchers applying for ERC Starting or Consolidator Grants, with priority given to applicants for 2022 or 2023. Twenty-four participants attended the course in 2021.



## Fostering interdisciplinarity

### STARE: research training for tomorrow's doctors

STARE is an educational program providing third-year medical students with an introduction to neuroscience research. The Institute has hosted 60 students since 2017. This success prompted the Sorbonne University Faculty of Medicine to offer STARE as a teaching unit as of 2020. In 2021, 20 new students were hosted for two weeks by the Institute's teams and platforms.

### DECLIC: hands-on experience in clinical departments for researchers

DECLIC is a program designed to meet the need for research staff to learn about nervous system diseases in the Neuroscience Medical-University Unit (DMU). In collaboration with the DMU teams, the Institute developed a hands-on program for researchers, postdoctoral fellows and PhD students, which began in late March 2022.

### Brain to Market Summer School

The Brain to Market summer school is an annual program combining translational neuroscience and business training in an intensive package aimed at nurturing new projects and approaches to neurological diseases. The seventh edition held in 2021 focused on the topic of "stress and addiction". Thirty-eight participants from Sorbonne University and the Collège des Ingénieurs attended (34% of whom were not French nationals).

### Medtech Generator & Accelerator SIA project

The Medtech Generator & Accelerator (MGA) project - with which a consortium comprising the Paris Brain Institute, Imagine Institute and Institut de la Vision won a call for proposals in 2020 - is aimed at accelerating the launch and growth of new startups by offering dedicated innovative support, targeting medical technologies for neurological diseases and genetic/rare diseases. The Open Brain School is involved in the project's "business training" component. Targeted topics were defined for the first six training modules based on initial mapping and needs assessment work performed by the three institutes and the consortium's incubators. An initial masterclass will be included in one of these modules in the first semester of 2022. It will address the subject of funding opportunities for startups and SMEs offered by the new Horizon Europe program.

## Outreach work with school students

### Brain Bee competition

The Brain Bee is an international neuroscience competition for secondary school students founded in the US in 1998. It seeks to help students learn about the brain, its basic functions, neuroscience research, and misconceptions regarding brain disorders. As part of its commitment to train tomorrow's "neuro-stakeholders", the Institute has been the official organizer of the French national component of this competition, France Brain Bee, for the past 4 years. Given the continuing health restrictions, the 2021 edition was held entirely online on March 20, with forty contestants from several French cities. The winner qualified to compete at the international competition also held online between November 5 and 8, with finalists from around the world competing in the final challenge. In preparation for this event, the Paris Brain Institute offered (remote) mentoring from a researcher, a tour of the Institute, and neurohistology training provided with the support of the Histomics platform. In 2022, the International Brain Bee will be held in France for the first time, with the Paris Brain Institute as official host.

### PARTNERSHIP

In its continued efforts to promote neuroscience among young people, in 2021 the Open Brain School forged a partnership with Educ'ARTE, ARTE's on-demand video service for teachers and students. Through this collaboration, a neuroscience-themed educational project was offered to over ten classes, and resources were provided to help middle and high school students prepare for the Brain Bee competition, including an e-learning module on multiple sclerosis. The Open Brain School is working on adapting this module for different topics.



# SUPPORTING RESEARCH

The research support teams do their utmost to limit the administrative constraints of the researchers, so that most of their time is devoted to research.

## 2021 Social Report

**762**

EMPLOYEES at the Institute of whom 355 are employed by the Foundation and 407 are employed by our public partners

**41**  
NATIONALITIES



- 121 administrative staff
- 128 PhD students
- 62 postdoctoral fellows
- 208 engineers and technicians

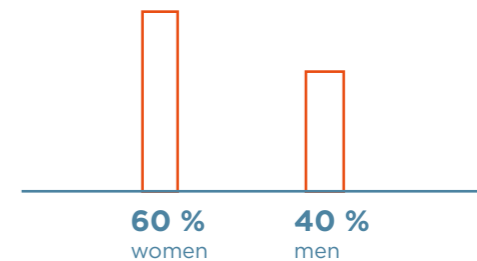
- 29 interns and apprentices
- 129 researchers and associate professors
- 85 medical and paramedical staff



**15,9 %**  
administrative staff

**11,1 %**  
medical staff

**73 %**  
scientific staff



Training figures (employees trained, investment in €, training hours)



PEOPLE TRAINED:  
**273**

- Investment (including contributions): €395,819.86
- Training hours: 3,395.50

### Gender equality action in 2021

In early 2021, the Institute made a commitment to inclusion and equality by signing the ALBA Declaration. The ALBA network of brain scientists from around the world seeks to develop fair and inclusive scientific communities. It focuses on two barriers to equality and inclusion: implicit bias and a culture of workplace discrimination. To implement this initial measure, the Paris Brain Institute management team

and its committee on gender equality published a charter committing the whole Institute to specific actions both internally and at a more general societal level, based on the Paris Brain Institute's scientific expertise drawn from scientific literature addressing inequalities facing women throughout their careers (particularly in the research sector) as well as stereotypes and cognitive bias involved in discriminatory processes.

Moreover, an improvement in the workplace gender equality index was observed. This indicator, which all French companies are legally obliged to publish, is based on several criteria including the gender gap in terms of remuneration, pay rises and promotions. The Foundation's score rose from 75/100 in 2020 to 91/100 in 2021.

## Sharing and transferring knowledge about the brain and brain diseases

The Paris Brain Institute's main communication goals are to share advances in its research with various target groups, while also developing its image and appeal both in France and abroad. To that end, it has forged strong links with the media, established partnerships, launched communication campaigns, and organized events and joint activities with its academic partners (Inserm, CNRS, AP-HP, Sorbonne University, Inria, etc.).

### Open Brain Bar events resumed

Open Brain Bar sessions are informal events open to all active citizens curious to learn about the role science plays in their everyday lives. These meetings featuring one or two speakers from the Institute address issues related to neuroscience research, medical innovation, and the future of health. They are held in the early evening at venues around Paris. The events are streamed online and available for replay. Open Brain Bar sessions help attract a younger target audience to the Institute and raise awareness of major societal issues of neurological diseases. This highlight in the Institute's events calendar returned on November 2, 2021 with an Open Brain Bar session in partnership with Pariscience. Its theme was "Sleep in all its states".



### Interglitches, a charity video game marathon to raise funds for the Institute

On November 12, 13 and 14, 2021, the Paris Brain Institute was delighted to host the Interglitches charity video game marathon. The event organized by Le French Restream lasted almost 3 days with 66 high-level competitors, some 30 volunteers and 200 visitors enjoying a fun,

sociable and family-friendly atmosphere. It was also attended online by tens of thousands of people who streamed Interglitches on the Twitch platform. A total of €23,100 was raised over the weekend for the Institute's research on nervous system diseases.

### "Science, Art and Culture" lectures

The "Science, Art and Culture" lectures held monthly by the Institute were streamed online due to pandemic restrictions. The program was able to offer nine of these meetings, the replay of which is accessible to all on the Paris Brain Institute's Youtube channel.

- Bruno Abraham Kremer/ *About Romain Gary - Talent, humor and brain*
- Jean-Gabriel Ganascia/ *Artificial intelligence and creativity*
- Catherine Diran, Vincent Navarro et Stéphane Charpier/ *Experiencing epilepsy from the inside by the singer of "Voyage en Italie"*
- Joël Doré/ *The microbiota*
- Stéphane Charpier/ *The science of resurrection - They pushed the boundaries of death*
- Patrick Couvreur/ *Nanodrugs for treating nervous system diseases*
- Alim Louis Benabid/ *Brain-machine interfaces: realities, prospects and relevance*

### Braincast podcast in partnership with Cerveau & Psycho

For the second year running, the Paris Brain Institute joined up with the magazine Cerveau & Psycho to raise awareness of brain research issues. Four podcasts were produced for the 2021 season and are available on all streaming platforms:

- Emmanuelle Volle, *"Secrets of the creative brain"*
- Stéphane Epelbaum, *"Alzheimer's disease: future therapies"*
- Liane Schmidt, *"How our brain directs our food choices"*
- Catherine Lubetzki, *"Repairing neurons, the ultimate challenge in multiple sclerosis"*



### Brain Awareness Week

Brain Awareness Week, coordinated by the French Neuroscience Society, is an annual event held in March. The Paris Brain Institute uses this occasion to organize workshops and lectures to foster open discussions with the Institute's researchers, clinicians, engineers and technicians. In 2021, the Paris Brain Institute put together a 100% online program due to the public health situation. This provided insights into neuroscience research conducted by its scientists and clinicians.





## Philanthropy and patronage

The Circle of Friends provides a special interface with major Paris Brain Institute donors, offering its 600 members unique insights into its research teams' scientific excellence.

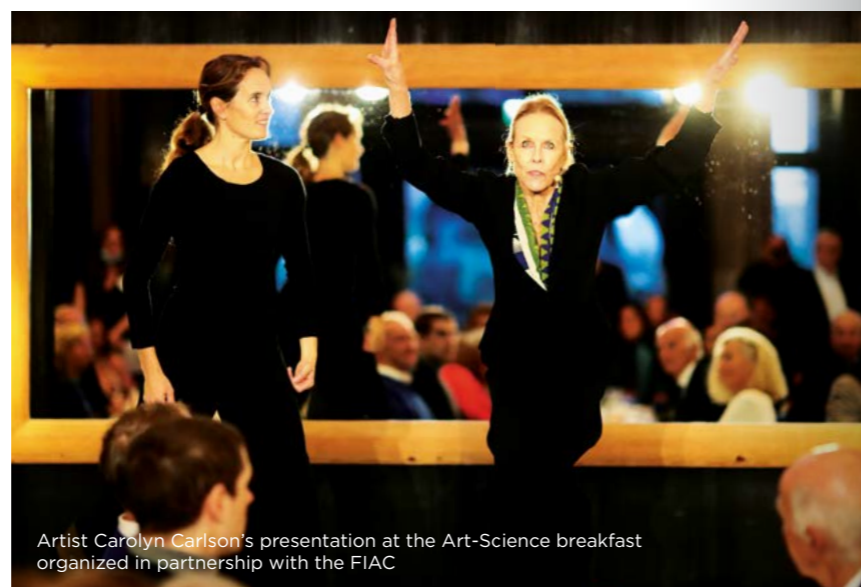
Private visits to laboratories and platforms, scientific and cultural lectures and meetings with researchers are just some of the benefits available to companies, foundations and individuals who support the Institute.

### Financial stability essential to research

The special commitment made by patrons allows researchers to continue their work in the long term and is therefore extremely valuable to the Paris Brain Institute. Multi-annual agreements signed by Bolloré SE, the Sucden Foundation and UNIM reflected a trend for patron loyalty in 2021. Air France, Boston Scientific SA, Crédit Mutuel Nord Europe, Fonds Saint Michel and the Philippe Foundation also renewed their annual support in 2021. Numerous other initiatives by long-standing Institute partners continued to ensure precious stability in terms of fundraising revenue. These include the watchmaker F.P.Journe, through the sale of the Sovereign Centigraph for the benefit of the Institute, and the sharing fund SCPI Pierval Santé led by Crédit Mutuel Nord Europe, La Française and Euryale AM. In addition to this, the Fondation de France funded a research project on the neurological and psychiatric impact of the SARS-CoV-2 virus, particularly in patients with neurodegenerative diseases.

### The Big Brain Theory program

The Big Brain Theory program launched in 2015 is an internal call for tenders aimed at identifying bold, multidisciplinary research projects. With investment of €1.7 million required for the 10 projects selected by the Scientific Advisory Board in 2021, the Circle of Friends launched a dedicated multi-annual campaign due to run until 2022. In 2021, €550,000 was raised for the program thanks to contributions from the Fondation OCIRP – "Agir au cœur des familles", major philanthropists and all members of the Circle of Friends.



### Major fundraising events

2021 saw the resumption of major fundraising events. The Founding Members and members of the Committee of Friends of the Paris Brain Institute hosted the 10<sup>th</sup> edition of the Art-Science Breakfast on October 20, 2021 in partnership with the International Contemporary Art Fair (FIAC) and supported by event director, Jennifer Flay. The event was held at the Café de l'Homme, where guests received an exceptionally warm welcome by the venue's owners, Coco Coupérie-Eiffel and Christophe Bonnat, and was hosted by journalist Natacha Polony. Around 100 people attended, generously donating a record sum of over €500,000. On November 12, 2021, Le Concert d'Astrée, a Baroque

ensemble conducted by Emmanuelle Haïm, the face of the Institute's last public relations campaign, celebrated its 20<sup>th</sup> anniversary at the Théâtre des Champs-Élysées, giving a special concert in support of the Paris Brain Institute to mark the occasion.

### Philanthropy without Borders

Increasing numbers of foreign patrons and donors are choosing to support the Institute's research, reflecting international recognition of the Institute's scientific work. A dedicated post for the Institute's international strategy was created within the patronage team. This led to two agreements establishing the "Friends of Paris Brain Institute" fund hosted by the King Baudouin Foundation United States and the "Paris Brain

Institute Fund" supervised by Give2Asia in Hong Kong. These two funds join Transnational Giving Europe which already enabled donors from 18 European countries to donate to the Institute and benefit from tax incentives in their country of residence.

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Senior Development Officer,  
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marielle.lethrosne@  
icm-institute.org*

### Richard Mille's outstanding contribution

The Richard Mille brand has supported the Paris Brain Institute since 2012, with Richard Mille himself taking an active role in 2019 as a member of the Institute's Committee of Friends. "Supporting an organization that is so cutting edge and holds such great promise as the Institute is a worthy cause. Backing this research means saving lives and improving many others," affirmed Richard Mille. In 2021, the brand reinforced its commitment by founding the Richard Mille Donors' Club, championing the cause of brain diseases and the Institute among Richard Mille watch enthusiasts.

#### PARIS BRAIN INSTITUTE CIRCLE OF FRIENDS



**Lily Safra,**  
Honorary President of  
the Paris Brain Institute  
Association of Friends

**Lindsay Owen-Jones,**  
Honorary Chair of the  
Paris Brain Institute  
Committee of Friends

**Prof. Gérard Saillant,**  
Founding Member and  
President of the Paris  
Brain Institute

**Jean Todt,**  
Founding Member and  
Vice President of the Paris  
Brain Institute

**Martine Assouline and  
Maurice Lévy,**  
Joint Chairs of the Paris  
Brain Institute Committee  
of Friends

**Jean-Luc Allavena,  
Cédric de Baillencourt,  
Natacha et Jean-Charles  
Decaux,  
Alexandre  
Desseigne-Barrière,  
Sylvain Héfès,  
François Henrot,  
Jean-Philippe Hottinguer,  
Véronique de Kepper,  
Richard Mille,  
Eddie Misrahi,  
Margaux Primat,  
Christian Schmidt  
de La Brélie,  
Sophie Seydoux,  
François Thomé,  
Serge Weinberg.**  
*Members of the  
Committee of Friends as  
of December 31, 2021*

**Shannon Bragg,**  
Circle of Friends Office,  
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cercle@icm-institute.org

#### AMBASSADORS

**Michelle Yeoh,  
Jean Reno  
and Guillaume  
de Tonquédec,**  
actors

# Public fundraising

A essential support for the funding of research teams.

A total of €9.162 million was raised through fundraising campaigns organized throughout 2021, due in particular to 29,000 new donors.

A regular direct debit facility has enabled the Institute's donors to sustain their commitment. This option supports growth of both gross fundraising revenue, since income is projected over several months, and also net fundraising revenue, since this donation method helps significantly reduce management and communication costs.

The other major area of development concerns the surge in online fundraising. In 2021, €2.308 M was raised in online donations. Online fundraising currently represents 25% of total annual fundraising revenue, a major increase due largely to 5,000 new donors using this channel.

Finally, to thank its donors and to let them know the impact of their donations on the progress of research, the Institute now offers its quarterly thematic conferences, usually in person, 100% live via our website. The digital retransmission of these conferences, so appreciated by donors, now allows those who cannot come to the Institute to attend our experts' presentations live and to ask their questions live. Immersion in the heart of research guaranteed!



The actor Guillaume de Tonquédec, committed ambassador of the Paris Brain Institute.

In particular, the Paris Brain Institute would like to thank the actor Guillaume de Tonquédec for his commitment and generosity toward the Institute. For over four years, he has contributed directly to boosting fundraising revenue and increasing public awareness of the Institute as the spokesman for the major annual "Discoverers of Hope" campaign. With his support, and thanks to the donors, this appeal held toward the end of the year raised nearly €1.5 M for research on brain diseases.

## FUNDRAISING EVENTS

Throughout the year, the Paris Brain Institute supports and organizes events to help with its fundraising efforts. These landmark charity events are supported by charities, organizations and volunteers who generously give their time to help fund research conducted in its laboratories. We'd like to take this opportunity to sincerely thank them all!

● **Le 20/06**  
Course des héros (Heroes' Race)

● **Du 30/08 au 04/09**  
Tour de France Auto Optic 2000 - Pierre Morel (Motor Racing Competition)

● **Le 25/09**  
Route de la tomate contre la dystonie (Charity Bike Ride for Dystonia)

● **Les 25 et 26/09**  
Fée rarissime (Charity Motor Show)

● **Le 09/10**  
A circuit for the brain

● **Le 10/11**  
Solidair's, Charity Day BGC

● **Les 12, 13 et 14/11**  
Interglitches

● **Le 20/11**  
Amour Amour Amour Christmas Pop-Up Store

● **Le 28/11**  
Un pied devant l'autre (ALS Charity Event)

● **Le 18/12**  
Caissarg'ton cœur (Charity Christmas Market) Lion's clubs Rotary clubs



## BEQUESTS, LIFE INSURANCE AND GIFTS

With growing awareness that the fight against brain diseases is a major public health challenge requiring long-term support, generous donors are increasingly opting to donate all or part of their estate to the Paris Brain Institute by leaving a gift in their will or naming the Institute as a beneficiary in their life insurance policy. In 2021, the Institute raised €2.6 M in bequests, life insurance and gifts, representing a 37% increase compared to 2020. These are strategic resources providing an increasing contribution to scientific research funding year on year. As a non-profit foundation with recognized charitable status, such gifts to the Institute are fully exempt from inheritance tax. Carole Clément, Testator Relations Officer, is happy to speak to anyone considering passing on assets to the Institute and seeking advice on how to proceed or simply wishing to find out more. A meeting can also be arranged with the Institute's legal expert, a notarial law specialist, who can address specific requirements and help people define the details of their support. Any discussions are completely confidential, non-binding, and subject to a rigorous code of ethics and conduct. Testators wishing to learn about how research is organized can also arrange a visit to the Institute. These opportunities for interaction are greatly appreciated by visitors before deciding to gift their assets.

*For any information on giving through bequests, gifts or life insurance, or to receive our information booklet, please contact Carole Clément on +33(0)157 27 41 41 or by email: carole.clement@icm-institute.org*

# Financial report: rigor and transparency central to our action

## Income Statement by Nature and Function (ISNF) and Expenditure Statement (ES)

### 2021 Income by Nature

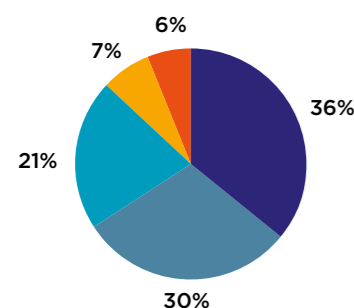
Funding for research projects came from multiple sources, with a resolute focus on the long-term prospect of gaining knowledge and achieving major breakthroughs within the field of neuroscience.

Income for 2021 amounted to €75.1 M, including €56.5 M in income for the fiscal year and €18.6 M in carry-over of resources allocated and not used in previous years. Income for the fiscal year mainly consisted of fundraising revenue (€20.4 M or 36%), which includes donations (€13.1 M or 64%), sponsorship (€4.6 M or 23%), and bequests and gifts (€2.7 M or 13%).

It also includes:

- Income from technological platforms' activities (€8.4 M) and from research collaborations with industrial partners (€3.2 M).
- Public and private competitive funding of research projects (€17.1 M).
- Funding of the «IHU program» (€4.1 M).
- Miscellaneous income (rental, re-invoicing of charges, financial income) (€3.3 M).

### 2021 income by nature



- Fundraising revenue
- Public and private competitive funding of research projects
- Income from technological platforms' activities and from research collaborations with industrial partners
- Funding of the «IHU program»
- Miscellaneous income (rental, re-invoicing of charges, financial income)

### 2021 Expenses by Function

Overall expenses for 2021 amounted to €73.4 M: €52.7 M used in 2021 and €20.7 M to be used subsequently from the allocated resources. Of the 2021 allocations, €44.3 M was allocated to social missions, representing 85% of total ISNF allocations.

Paris Brain Institute social missions include:

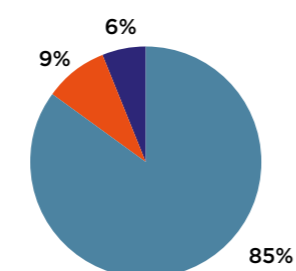
- Research programs.
- Technological platforms.
- Scientific leadership and implementation of international alliances.
- Incubation of innovative businesses.

Funding for research projects is primarily dedicated to nervous system diseases and spinal cord injuries. Technological platforms (neuroimaging, vectorology, genotyping and sequencing, cell culture, histology and bioinformatics) support these projects.

Fundraising and communication costs are expenses incurred to collect funds from individuals (donations and bequests), companies and private foundations (patronage and sponsorship initiatives), as well as communication initiatives. They represent a total of €4.7 M, or 9% of total ISNF allocations.

Operating costs are expenses in support of research (general administration, finance, human resources, legal, IT and logistics) and represent 6% of total ISNF allocations, i.e. €2.9 M.

### 2021 expenses by function



- Social missions
- Fundraising and communication costs
- Operating costs

### Allocation of public fundraising resources

Public fundraising resources used in 2021 amounted to €20.4 M. For every €100 raised from the public, €74.3 was used to finance social missions and investments, €23.1 was used to cover the costs of fundraising and communication and €2.6 to cover Paris Brain Institute operating costs.

### 2021 Balance sheet

Assets (€M)	2020	2021
Net fixed assets	63	60
Realizable and available assets	86	93
<b>Total</b>	<b>149</b>	<b>153</b>

Liabilities (€M)	2020	2021
Association funds	55	53
Fiscal year profit	0,95	1,7
Dedicated funds	20	22
Debt	41	42
Deferred income	32	34
<b>Total</b>	<b>149</b>	<b>153</b>

Total investments made by the Paris Brain Institute since inception amount to €52 M, allocated primarily to the technological platforms supporting research.

Investments for fiscal 2021 amount to €2.8 M (including variation in assets in progress) and include:

- Investments in scientific materials and equipment (€0.9 M including €0.2 M for a scanner).
- Continued construction at the Rue du Chevaleret site (€1 M).

Net fixed assets amount to €60.3 M. As of December 31, 2020, cash holdings amount to €47.3 M, including €19.2 M allocated to earmarked funding. Association funds of the Paris Brain Institute amount to €55 M. They include €34.5 M in equity supplemented by investment grants of €20.5 M. The non-expendable endowment of the Paris Brain Institute totals €1.2 M. At the end of the fiscal year, dedicated funds (funds still to be invested in multi-year programs) amount to €22 M.

### Reserve policy

When it was established in 2006, the Paris Brain Institute Foundation received an endowment of €11.70 M, of which €1.2 M was non-expendable. Thanks to tight budget management, the Foundation has balanced its expenses and income for the past 6 years, thus avoiding drawing on its reserves. Furthermore, the Board of Directors' investment policy is extremely cautious. The Paris Brain Institute's cash holdings are invested in marketable securities (capitalization contract taken out with leading banking institutions, capital-guaranteed and 100% in euro funds).

### Voluntary in-kind contributions

**Volunteering:** The Paris Brain Institute benefited from volunteer hours during the 2021 fiscal year, primarily for communication initiatives. Total volume is evaluated at 0.4 FTE, or on the basis of an hourly minimum wage, a total amount of €11,000.

**In-kind patronage:** In 2021, the Paris Brain Institute Foundation benefited from in-kind patronage in connection with its communication and fundraising activities, namely:

- Media space: France TV, TF1 Publicité, Altice Média Publicité, Next Régie, Canal+ Groupe, M6, Amaury Média, Bein Sport, Radio Classique, Lagardère Active, Radio France, Teads, Seedtag, Bayard Média, Premium Média, NRJ Group, FIA-Fédération Internationale Automobile, Groupe Barrière, JCDecaux, Klesia and Richard Mille.
- Donated products and services: ANACOFI, IDEC, Orrick Rambaud Martel and Publicis Group.

To maintain its standards of excellence, the Paris Brain Institute has internal and external control procedures in place to guarantee effective and efficient management. It holds Trusted Donations Charter Committee certification and uses independent auditors.



### TRUSTED DONATIONS

On November 3, 2010, the Paris Brain Institute was granted certification by the Trusted Donations Charter Committee, which was renewed in October 2019. For over 20 years, this Committee has acted as a regulator: certified organizations must adhere to codes of ethics, implement a stringent policy towards donors, and accept ongoing monitoring of their commitments.

## Income Statement by Nature and Function (in euros)

Income and expenses by nature and function	2021 Fiscal year		2020 Fiscal year	
	Total	Including public support	Total	Including public support
<b>Income by nature</b>				
<b>1. Resources collected from the public</b>	<b>20 440 884</b>	<b>20 440 884</b>	<b>18 355 192</b>	<b>18 355 192</b>
1.1 Donations free of equivalent compensation				
1.2 Patronage, donations and bequests	20 436 071	20 436 071	18 345 385	18 345 385
<i>Personal donations</i>	13 086 411	13 086 411	11 620 122	11 620 122
<i>Bequests and life insurance policies</i>	2 747 569	2 747 569	1 440 408	1 440 408
<i>Patronage</i>	4 602 092	4 602 092	5 284 854	5 284 854
1.3 Other revenue from public support	4 812	4 812	9 807	9 807
<b>2. Resources unrelated to public support</b>	<b>18 801 515</b>		<b>17 381 014</b>	
2.1 Donations free of equivalent compensation				
2.2 Corporate patronage				
2.3 Financial contributions free of equivalent compensation	4 113 912		4 728 491	
2.4 Other revenue unrelated to public support	14 687 603		12 652 523	
<i>Services rendered</i>	8 356 741		6 627 162	
<i>Partnerships</i>	3 193 488		3 388 093	
<i>Other revenue</i>	3 137 374		2 637 268	
<b>3. Grants and other public funding</b>	<b>17 078 077</b>		<b>14 286 154</b>	
<b>4. Reversals of provisions and impairments</b>	<b>214 355</b>		<b>73 402</b>	
<b>5. Use of allocated resources from previous fiscal years</b>	<b>18 603 493</b>	<b>1 887 894</b>	<b>13 078 781</b>	<b>1 502 769</b>
<b>Total</b>	<b>75 138 324</b>	<b>22 328 778</b>	<b>63 174 543</b>	<b>19 857 961</b>
<b>Expenses by function</b>				
<b>1. Social missions</b>	<b>44 290 851</b>	<b>15 128 888</b>	<b>38 181 814</b>	<b>13 002 106</b>
1.1 Carried out in France	44 290 851	15 128 888	38 181 814	13 002 106
<i>Actions directly carried out</i>	44 290 851	15 128 888	38 181 814	13 002 106
<i>Payments to an acting organization in France</i>				
1.2 Carried out abroad				
<i>Actions directly carried out</i>				
<i>Payments to an acting organization in France</i>				
<b>2. Fundraising costs</b>	<b>4 720 344</b>	<b>4 720 344</b>	<b>4 326 986</b>	<b>4 326 986</b>
2.1 Cost of appeals to the generosity of the public	4 305 412	4 305 412	4 010 869	4 010 869
2.2 Costs related to canvassing	414 932	414 932	316 117	316 117
<b>3. Operational costs</b>	<b>2 967 953</b>	<b>523 859</b>	<b>2 738 079</b>	<b>475 146</b>
<b>4. Provisions &amp; impairments</b>	<b>691 535</b>		<b>454 448</b>	
<b>5. Income tax</b>				
<b>6. Carryover of fiscal year allocated resources</b>	<b>20 725 097</b>	<b>1 955 686</b>	<b>16 523 021</b>	<b>2 053 723</b>
<b>Total</b>	<b>73 395 780</b>	<b>22 328 778</b>	<b>62 224 348</b>	<b>19 857 961</b>
<b>Surplus or deficit</b>	<b>1 742 544</b>		<b>950 195</b>	

## 2021 Expenditure Statement (in euros)

Allocations by function	2021 fiscal year	Resources by nature	2021 fiscal year
<b>Allocations for the fiscal year</b>		<b>Resources for the fiscal year</b>	
<b>1. Social missions</b>	<b>15 128 888</b>	<b>1. Resources collected from the public</b>	<b>20 440 884</b>
1.1 Carried out in France	15 128 888	1.1 Donations free of equivalent compensation	
<i>Actions directly carried out</i>	15 128 888	1.2 Patronage, donations and bequests	20 436 071
<i>Payments to an acting organization in France</i>	0	<i>Personal donations</i>	13 086 411
		<i>Bequests and life insurance policies</i>	2 747 569
1.2 Carried out abroad	0	<i>Patronage</i>	4 602 092
<i>Actions directly carried out</i>	0	1.3 Other revenue from public support	4 812
<i>Payments to an acting organization in France</i>	0		
<b>2. Fundraising costs</b>	<b>4 720 344</b>		
2.1 Cost of appeals to the generosity of the public	4 305 412		
2.2 Costs related to canvassing	414 932		
<b>3. Operational costs</b>	<b>523 859</b>		
<b>Total applications</b>	<b>20 373 092</b>	<b>Total resources</b>	<b>20 440 884</b>
<b>4. Provisions &amp; impairments</b>	<b>0</b>	<b>2. Reversals of provisions and impairments</b>	<b>0</b>
<b>5. Carryover of fiscal year allocated resources</b>	<b>1 955 686</b>	<b>3. Use of allocated resources from previous fiscal years</b>	<b>1 887 894</b>
<b>Resource surplus for the year</b>		<b>Deficit of public fundraising for the year</b>	
<b>Total</b>	<b>22 328 778</b>	<b>Total</b>	<b>22 328 778</b>



# Governance

## Board of Directors

The Board of Directors regulates the affairs of the Institute through its deliberations. It decides on the strategic orientations presented by the General Manager, votes on budgets and certifies the accounts.

### COLLEGE OF FOUNDERS AND MEMBERS OF THE BOARD

#### Gérard Saillant

Professor of Orthopaedic and Traumatological Surgery, President of Paris Brain Institute

#### Jean Todt

President of FIA, Vice-President of Paris Brain Institute

#### Serge Weinberg

President of Weinberg Capital Partners, Treasurer of Paris Brain Institute

#### Jean Glavany

Former Minister

#### Jean-Pierre Martel

Attorney

### COLLEGE OF QUALIFIED PERSONS

#### Richard Frackowiak

Emeritus Professor at University College London

#### Philippe Ménasché

Professor of Thoracic and Cardiovascular Surgery

#### Élisabeth Tournier-Lasserre

Professor of medical genetics at Université Paris Diderot

### COLLEGE OF FULL MEMBERS

#### Gilles Bloch

Representative for the National Institute for Health and Medical Research (INSERM)

#### Martin Hirsch

Representative for Paris Hospital Administration (AP-HP)

#### Bernard Poulain

Representative for the National Center for Scientific Research (CNRS)

#### Bruno Riou

Representative for Sorbonne University

### COLLEGE OF FRIENDS OF THE FOUNDATION

#### Martine Assouline

#### Maurice Lévy

#### Christian Schmidt de la Brélie

### PUBLIC COMMISSIONER

#### Jean-Marie Paulot

## Board Committees

The mission of the Scientific Advisory Board (SAB) is to advise the Institute and assist it in defining its general orientations.

### SCIENTIFIC ADVISORY BOARD

#### Prof Dimitri Kullmann

Président, Clinical & Experimental Epilepsy UCL Queen Square Institute of Neurology, United-Kingdom

#### Prof Christian Buchel

Institut für Systemische Neurowissenschaften Universitätsklinikum - Hamburg, Germany

#### Prof Adrienne Fairhall

Washington University, USA

#### Prof Tamas Gabor

University of Szeged, Hungary

#### Prof Magdalena Goetz

Helmholz Center Munich, Institute Stem Cell Research, Germany

#### Pr Masud Husain

University of Oxford, United-Kingdom

#### Prof Sabine Kastner

Princeton Neuroscience Institute, USA

#### Prof Giovanna Malluci

University of Cambridge, United-Kingdom

#### Prof Eve Marder

Victor and Gwendolyn Beinfeld, Brandeis University, USA

#### Prof Carmen Sandi

Brain Mind Institute - EPFL, Switzerland

#### Prof Erin Schuman

Goethe University Frankfurt, Germany

#### Prof Mikael Simons

Institute of Neuronal Cell Biology (TUM-NCB) Technical University Munich German Center for Neurodegenerative Diseases (DZNE), Germany

### AUDIT COMMITTEE & NOMINATIONS AND WAGES COMMITTEE

#### Serge Weinberg

President of the Audit Committee

#### Elli Chatzopoulou

Representative for INSERM

#### Jean Glavany

Former Minister

#### Jean-Pierre Martel

Attorney

### COMMITTEE FOR COORDINATION OF FOUNDATION AND PUBLIC STAKEHOLDER ACTIVITIES

#### Gérard Saillant

President of Paris Brain Institute

#### Elli Chatzopoulou

Representative for INSERM

#### Bernard Poulain

Representative for AP-HP

#### Bruno Riou

Representative for CNRS

#### Erik Domain

Representative for Sorbonne University

## Founding Members

#### Gérard Saillant

Professor of Orthopaedic and Traumatological Surgery, President of Paris Brain Institute

#### Jean Todt

President of FIA, Vice-President of Paris Brain Institute

#### Yves Agid

Honorary Professor of Neurology and Neuroscience

#### Luc Besson

Film Director

#### Louis Camilleri

Former CEO of Ferrari

#### Jean Glavany

Former Minister

#### Maurice Lévy

Chairman of the Executive Board of Publicis Group, Co-Chair of the Paris Brain Institute Friends Committee

#### Olivier Lyon-Caen

Professor of Neurology, former Director of the Nervous System Diseases Centre of Pitié-Salpêtrière University Hospital

#### Jean-Pierre Martel

Attorney

#### Max Mosley

Former President of FIA

#### Lindsay Owen-Jones

Honorary President of L'Oréal, Honorary President of the Paris Brain Institute Friends Committee

#### David de Rothschild

Chairman of the Rothschild Bank & Co Supervisory Board

#### Michael Schumacher

Formula 1 Driver

#### Serge Weinberg

Resident of Weinberg Capital Partners, Treasurer of Paris Brain Institute

## Management Committee

Decisions are made by General Manager on the basis of CODIR recommendations.

#### Prof Alexis Brice

General Director of Paris Brain Institute and the Joint Research Unit (UMR)

#### Prof Catherine Lubetzki

Medical Director

#### Prof Bassem Hassan

Scientific director and Deputy Director of the UMR

#### Corinne Fortin

Secretary General of Paris Brain Institute and the Joint Research Unit (UMR)

#### Jean-Louis Da Costa

Director of Communications and Development

In addition, the Support functions management Committee (CODIS) steers several institutional and transversal projects.

## Friends of Paris Brain Institute Association

#### Lily Safra

Honorary President, President of the Edmond J. Safra Philanthropic Foundation

#### Gérard Saillant

#### Jean Todt

#### Lindsay Owen-Jones

#### Maurice Lévy

#### David de Rothschild

#### Jean-Pierre Martel

#### Serge Weinberg

## Ethics and deontology committee

The mission of the COMETH-ICM is to:

- To lead the reflection on ethical and deontological issues raised by scientific and medical research as it is implemented within the Institute;
- To help all those involved in research at the Paris Brain Institute to act in accordance with ethical and deontological standards, by facilitating reflection on their own practices and by contributing to general reflection based on pioneering experiences.

### 2021 Activity Report of The Paris Brain Institute Ethics and Deontology Committee (COMETH)

In 2021, the COMETH received four requests for advice. One referral came from an engineer with a support function, one from a group of researchers, and two were self-referrals from the COMETH. The referrals concerned the following issues: the creation of a Research Ethics Committee of the Paris Brain Institute; internal and external communication, concerning the use of animal models in research protocols; the management of conflicts of interest at the Institute; and patents claimed by staff of the Institute's Research Applications Directorate. The opinions were presented to the Management Committee of the Paris Brain Institute, which acted on the recommendations made by the COMETH. The COMETH is involved each year in three courses given at the Paris Brain Institute: the "Brain to Market Summer School", on the regulatory and ethical aspects of data sharing; the half-day teaching session of the Master 2 iMIND (Sorbonne University) on the ethical dimension of the research carried out at the Paris Brain Institute in relation to teaching; the training session given each month to the new recruits, on the Paris Brain Institute's ethical and deontological charter.

Find the 2021 report of the COMETH and the charter of ethics and deontology on the website of the Paris Brain Institute.

## 5 Advisory Committees

They issue opinions and recommendations based on their area of expertise.

### The Scientific and Medical Steering Committee

The Scientific and Medical Steering Committee allows researchers to participate in decision-making on scientific and financial issues that impact research.

### Teams Council

The teams' council, made up of the General Manager and all the team leaders (25 in 2021), meets once a month. It is consulted on the scientific policy, budgetary measures, and priorities for the UMR.

### The Social and Economic Committee

The Social and Economic Committee (CSE) represents the Foundation's staff in dealings with the employer and informs him of any individual or collective complaint concerning the application of labour regulations (Labour Code, salaries, working hours, health and safety, etc.).

### Laboratory Committee

The mission of the Laboratory Committee is to advise UMR management on UMR activities, scientific policy, budgetary and human resources policy, and all other questions related to UMR administration. The members of the laboratory council are elected by their college (5 colleges in 2021). The number of representatives is proportional to the number of members in the college (15 members in 2021).

### Gender Equity Committee

The Gender Equity Committee (GEC) monitors and consults with the steering bodies of the Paris Brain Institute and takes action to promote gender equality. The GEC builds on the XX Initiative, a collective of people from the Paris Brain Institute who have come together to raise awareness of gender bias and inequities and to propose actions to address them.

#### 2021 Activity Report of the Gender Equity Committee of the Paris Brain Institute

In 2021, the Institute's management, with the support of the GEC, published a [charter](#) that commits the entire Institute to concrete interventions in-house and in society at large, based on the Paris Brain Institute's scientific expertise from the scientific literature dealing with the inequalities that women face in their careers (particularly in the world of research), but also with the stereotypes and cognitive biases at play in the discrimination processes. The Paris Brain Institute has increased the percentage of women in the Scientific Steering Committee of the Paris Brain Institute, which is now composed of 50% women, and in the International Scientific Assessment Board of the Institute, where 6 out of 11 members are now women (vs. 7 out of 12 in 2017). Other actions were carried out during the year, such as communication on the monitoring of gender equality indicators within the Institute, organisation of colloquia on gender bias, practical workshops, training for female and male students. In addition, an improvement in the Gender Equality Index has been observed. This indicator, which every French company is legally obliged to publish, is based on several parameters including the pay gap and the gap in the rate of increase and promotion of women and men. For the Paris Brain Institute, it has increased from 75 out of 100 in 2020 to 91 out of 100 in 2021.

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