Annual Report 2024

reConnect Institute

reConnect

Healing hearing and speech disorders

FOUNDATION HOSTED BY THE INSTITUT PASTEUR

SUMMARY

reConnect Institute, a new era for hearing and oral communication

The year 2024 marked a turning point for reConnect Institute, with our administrative launch in May followed by our official opening ceremony in November. Our mission is clear: accelerating discovery, intensifying innovation and developing the therapeutic solutions of tomorrow. We aim to preserve and restore hearing and oral communication, to improve patient quality of life significantly.

Through an integrated approach to the ear-brain-speech pathway, we are focusing our efforts on research, care, teaching and the development of industrial partnerships. Our scientific and transverse project groups bring together researchers, clinicians and other actors in the domain to elucidate the mechanisms of the auditory system underlying disease and to integrate associated issues, such as cognitive problems, including Alzheimer's disease, which is now recognized to be closely linked to hearing loss. This strategy aims to transform challenges into major clinical opportunities.

This year, we have laid solid foundations for the future by reinforcing the spirit of collaboration within our community. Together, and thanks to our three hospital partners receiving patients, we aim to transform completely the management of individuals who are deaf, hard-of-hearing or have difficulties with oral communication.

We encourage you to explore this inaugural report, which provides a more detailed view of what we have already achieved and our ambitions for the future.

Dear colleagues and members of the scientific community, and readers professionally or personally concerned by hearing or language problems, your commitment at our side is essential.

Anne-Lise Giraud
Director of reConnect Institute, foundation hosted by the Institut Pasteur
Director of the Hearing Institute

Yasmine Belkaid and Benoît Dubuis, committed to the institute

The launch of reConnect Institute, the first hospital-university institute dedicated to auditory health and cognitive and speech problems, is a major step forward. Acting as a catalyst, it will place these challenges at the heart of scientific priorities, in the true Pasteurian spirit. In 2050, one person in four will be affected by these problems, according to the WHO. By integrating advances in neurosciences, reConnect Institute aims to transform the future of these millions of people.

Working on hearing renders visible a crucial societal issue that would otherwise be invisible: prolonging life in good health and tackling these problems from the start of life, two priorities at the heart of the Institut Pasteur strategic plan for 2030.

The commitment of Institut Pasteur as a founder member of reConnect illustrates this vision. Since the 1960s, through basic research in neurosciences followed by the pioneering discovery of the pathophysiology of DFNB9 deafness and of its causal gene *OTOF* by the team of Christine Petit, we have built a dynamic research ecosystem. Under the direction of Anne-Lise Giraud, this institute bringing talents together and bears witness to our common determination to pursue ambitious, demanding French research with our partners, to lay the foundations for a promising future.

reConnect Institute embodies a vision of collaborative and transdisciplinary innovation. Its translational and clinical research aims to restore the patients' means of interacting, understanding and "reconnecting".

Hearing is an invisible but essential sense that structures our relationship to the world, playing a key role in human development, socialization and safety. Its loss, even if only partial, isolates the individual and affects quality of life, and also constitutes a majorrisk factor for cognitive decline and dependence, particularly in the elderly.

By mobilizing its expertise, reConnect Institute aims to reactivate deep brain circuits, to restore emotional and cognitive functions and to recreate social links. A global approach at the service of the issues of aging and mental vulnerability.

This project echoes my own career path, between science, teaching and business. I find in it the spirit of convergence that drives me: that which brings together researchers, clinicians and innovators to develop solutions that will have a real impact.

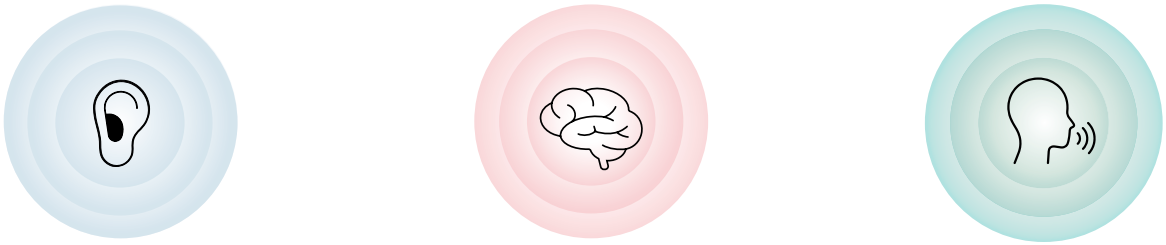
It is with enthusiasm that I join this community of excellence, determined to contribute actively to its success, at the service of patients.

Yasmine Belkaid
President of the Institut Pasteur, foundation overseeing reConnect Institute

Benoît Dubuis
President of the management committee of reConnect Institute
President of the Inartis Foundation
President of the Swiss Academy of Technical Sciences

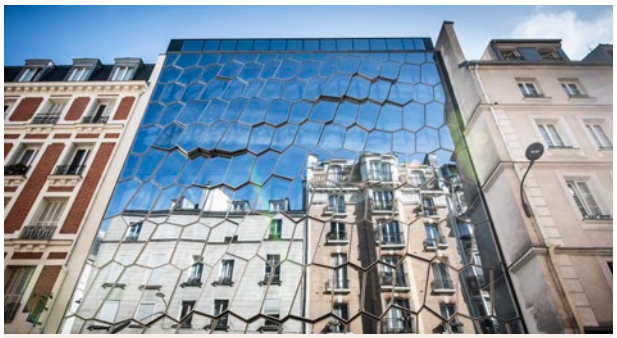
A major project, its actors and precursors

Created in April 2024, reConnect Institute brings together key actors in auditory health and cognitive and speech problems to improve the detection and management of these conditions.



reConnect Institute is a foundation hosted by the Institut Pasteur, supported by the Hearing Institute (an Institut Pasteur center), together with the Fondation Pour l'Audition, AP-HP, Université Paris Cité and Inserm, the founding members of the IHU (university-hospital institute).

As a hub of excellence, it aims to complement compensatory medicine by the addition of reparatory medicine during the next decade, thanks to the scientific discoveries of the last 20 years in the domains of genetics and neurosciences.



The Hearing Institute, the base supporting reConnect Institute

The Hearing Institute, an Institut Pasteur center and the first research center dedicated to hearing in France, was created at the initiative of the Fondation Pour l'Audition and Institut Pasteur in partnership with Inserm and the CNRS*. Its teams work to improve our understanding of the principles and mechanisms governing the development and functioning of the auditory system.
Its domains of research concern auditory perception and cognition, multisensory integration and interactions between the genome and the sound environment. The teams use translational approaches to develop diagnostic tools and innovative therapies for children and adults based on advances in basic scientific knowledge.

** The CNRS has been the administrative organization responsible for overseeing the mixed research unit since January 1, 2025 (CNRS unit UMR8252 and Inserm unit U1335).*

280
people
researchers, clinician-researchers and medical and paramedical staff, engineers and technicians, placement students and administrative/coordinating staff

11
scientific or transverse
project groups

6
clinical trials
underway

3
sites
and several partner hospitals

A multisite institute to federate expertise

reConnect Institute deploys its expertise at several sites in the heart of Paris, each with specific missions:

THE HEARING INSTITUTE

is dedicated to **basic and preclinical research.** Paris, 12th

THE CeRIAH OF THE HEARING INSTITUTE

This Center for research and innovation in human audiology, an Hearing Institute platform, is located on the campus of Institut Pasteur and is dedicated to **clinical research.** Paris, 15th

LARIBOISIÈRE - FERNAND-WIDAL HOSPITAL AP-HP

is dedicated to **ENT emergencies, neurology** and **neurosurgery.** The so-called "patients" bedside CeRIAH" is located there. Paris, 10th

Several hospitals are partners of the IHU, including:

NECKER-ENFANTS MALADES HOSPITAL AP-HP

With its **pediatric ENT emergency unit.** Paris, 15th

PITIÉ-SALPÊTRIÈRE HOSPITAL AP-HP

With its **adult ENT department.** Paris, 13th

Developing the therapeutic solutions of tomorrow

reConnect Institute aims to federate all the actors — from clinicians to researchers, healthcare professionals, industry and patient associations — through advances in research and medicine. This multidisciplinary structure, placing research and innovation at the service of clinical practice and academic training, aims to meet the medical, societal and educational needs engendered by these problems.

Hearing, a major public health issue

Hearing shapes the relationships between individuals and their environment. It conditions the learning of language, spontaneous communication, access to culture and team-working, socialization from childhood and even safety in the environment.

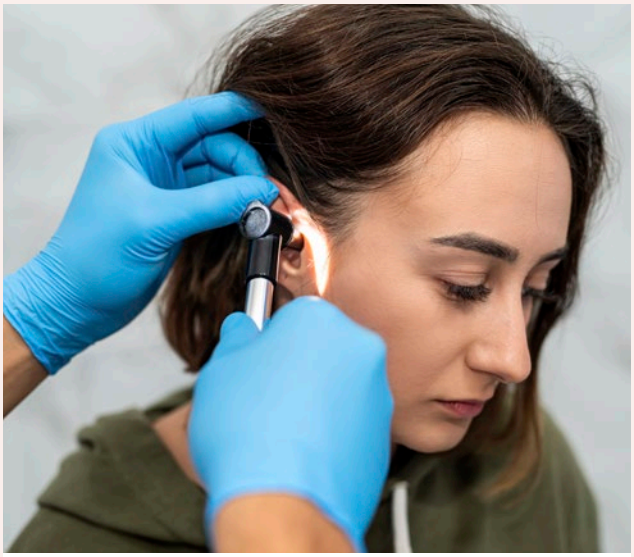
Life expectancy is increasing, and with later parenthood, the number of potentially damaging mutations is increasing. Furthermore, environments are becoming ever more noisy. These factors are contributing to an increase in hearing loss. Today, we do not know how to cure hearing problems, despite their role as one of the principal causes of social isolation.

A strong social ambition

reConnect Institute provides an opportunity to improve the tools and treatments available for managing hearing loss, to meet needs more effectively. The mission of the institute is to invent the therapeutic solutions of tomorrow for preserving and restoring hearing and oral communication, with a global brain-ear-speech strategic vision. reConnect Institute aims to complement current compensatory medicine (hearing aids and cochlear implants) with curative medicine, thanks to new regenerative therapies (gene and cell therapies) to combat:

- Changes in quality of life
- Exclusion
- Mental problems (depression, cognitive decline, dementia)

The institute is, thus, mobilizing its expertise to create new clinical applications with major social and academic implications for the coming decade. These advances will be made possible by the results of research in genetics and neurosciences, medical progress and solid institutional and industrial partnerships.



In 2050,
one person in four
will be affected by hearing and oral communication problems worldwide*

1 billion young adults
sare at risk due to overexposure to noise hazards*

1.5 billion people
will suffer from hearing loss*

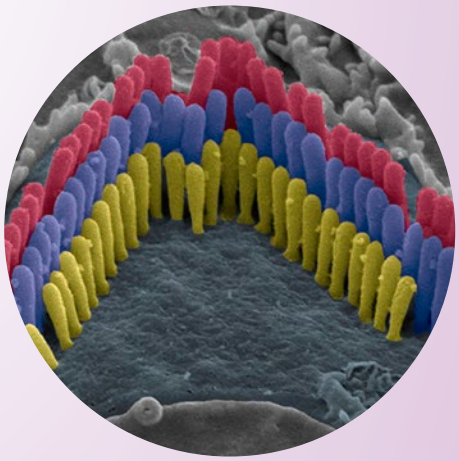
73% of 18- to 34-year-olds
are exposed to an auditory risk in France**

** Source: WHO.*
*** Source: Study by Qoboz, in partnership with the YouGov institute.*

Highlights of the year

AUDIOGENE, THE FIRST CLINICAL TRIAL OF GENE THERAPY IN THE DOMAIN OF HEARING IN FRANCE

Evaluating the safety of use and efficacy of a new gene therapy agent in profoundly deaf children aged six to 31 months, such is the goal of the Audiogene project.
Developed by a French consortium, RHU Audinnove, which brings together reConnect Institute via the Hearing Institute, an Institut Pasteur center, the ENT department and pediatric audiology research center of Necker-Enfants malades Hospital AP-HP, Sensorion and the Fondation Pour l'Audition, Audiogene is the first clinical trial in France of a treatment for a hereditary form of deafness, DFNB9, due to mutations of the *OTOF* gene encoding otoferlin.



GENE THERAPY PRESERVES HEARING IN A MODEL OF PROGRESSIVE HEARING LOSS

A study by the "Progressive sensory disorders, pathophysiology and therapy" group led by Aziz El Amraoui from the Hearing Institute at reConnect Institute has demonstrated the feasibility and efficacy of hearing restoration in a mouse model of progressive hearing loss linked to a deficit of the clarin-2 protein. The gene therapy approach is based on the administration of a valid clarin-2 gene to the inner ear via a viral vector targeting the auditory hair cells. It has notably made it possible to preserve normal hearing effectively and durably, to restore sound transduction and to determine the optimal time window for intervention.

A NEW TEAM AT THE HEARING INSTITUTE

At the end of 2024, Keith Doelling was awarded a G5 (junior group, Institut Pasteur) as well as a CRCN position at Inserm to lead the "Human & artificial perception" team within the Hearing Institute, site of the reConnect Institute. It will be created in 2025.
This new team uses computational models, such as deep learning and Bayesian models (statistical approaches) to improve our understanding of the way in which humans integrate sound information. This work has the potential to revolutionize the study of human perception in cognitive neurosciences and the diagnosis of problems of perception and cognition in clinical practice.

ADMINISTRATIVE LAUNCH

A key moment after the creation of reConnect Institute, the administrative launch event brought together the members of the ANR (the French National Research Agency), the AIS (the Innovation and Health Agency) and the steering and assembly committees, together with the heads of the thematic groups of reConnect Institute and the Hearing Institute on June 6, 2024.

It provided an occasion for the AIS to explain its role in the creation of IHUs and in their follow-up over the next 10 years. This event also enabled the ANR to clarify its role in the selection process for IHUs, the projects retained and their teams.

THE RECONNECT LAUNCH

On November 4, 2024, reConnect Institute was launched within Institut Pasteur. During the morning, the guests attended a scientific symposium dealing with a large range of subjects presented by international experts. It provided an ideal occasion to take stock of research on hearing and speech problems around the world.

During the afternoon, roundtables brought together different actors from the world of auditory health: patients, clinicians, researchers and participants from industry. Together, they shared their experiences and knowledge about various problems, such as tinnitus, stammering, autism and cognitive problems, and about gene therapy.

JÉRÉMIE BARRAL JOINS THE IMPULSCIENCE® PROGRAM OF THE BETTENCOURT-SCHUELLER FOUNDATION

On November 19, 2024, Jérémie Barral, head of the "Neural coding in the auditory system" team joined the Impulscience® program of the Bettencourt-Schueller Foundation.

Since 2022, this program has rewarded mid-career researchers and pursued two principal objectives: preserving the freedom of innovation of French researchers and supporting them in the long term. Jérémie Barral was rewarded the work performed with his team to establish a revolutionary technique: optogenetics.

Media presence*

reConnect Institute appeared in the media 156 times this year,
in interventions dealing with various subjects.

January

Radio Classique
News. Inauguration of the CeRIAH and the mobilization of researchers in the domain of therapy.

France Info
"C'est ma santé". (It's my health). The risks of overcompressed music and presentation of the work of Paul Avan.

France Inter
"Sound ecology"

20 Minutes
"Treating deaf children by gene therapy: the challenge facing French researchers"

February

Le Monde
"Gene therapy to help deaf children: a minirevolution"

March

Femme Actuelle
"Hearing loss and deafness: promising innovations for protecting or restoring hearing"

April

Prima
"Hearing loss and deafness: big hopes"

June

Le Figaro
"Science. Thanks to gene therapy, five deaf children can hear again"

Franceinfo
"Prowess of a team of researchers from the Chinese University of Shanghai"

October

Top Santé
"Special file on hearing – what you need to know to preserve it"

France Inter
News. Interview with Anne-Lise Giraud, Director of reConnect Institute and the Hearing Institute.

Ouest France
"Talking to animals in a silly voice works!"

November

Radio Classique
News. The launch of reConnect Institute, interview with Claire Paquet, Scientific Director.

Pourquoi Docteur
"Hearing problems and speech: what are the objectives of the new IHU reConnect"

Ouest France
"The ambition of auditory medicine"

Femme Actuelle
"Hearing loss. And I switch the sound back on!"

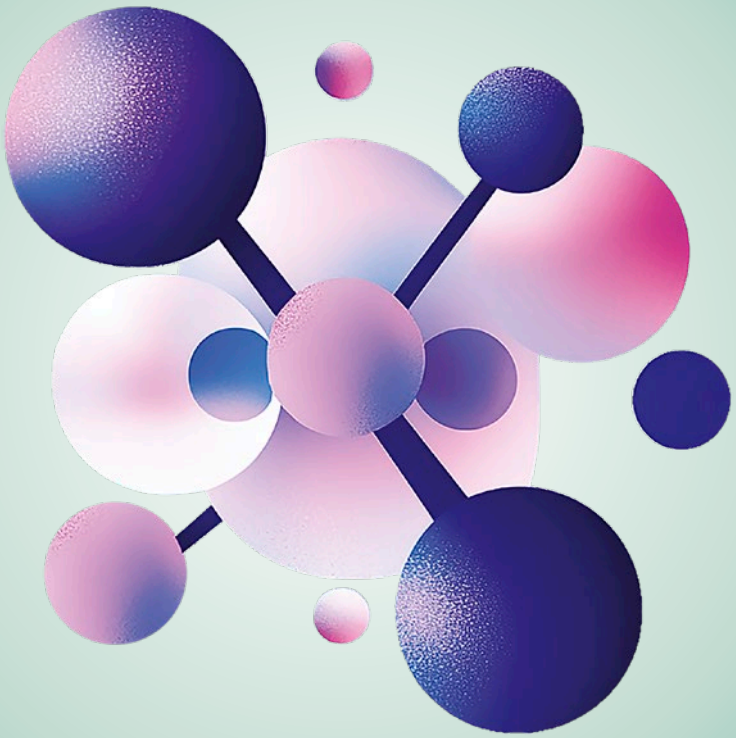
December

Marie France
"Let's look after our ears!"

Maxi
"Health news. Research listening to hearing"

** Content in French.*

Research and health



Patient quality of life and well-being are at the heart of our actions in research and health. Through the use of multidisciplinary approaches, we are working to improve our understanding of auditory, cognitive and speech problems, to propose appropriate diagnostic and therapeutic tools for all.

42

Translational or multidisciplinary projects

963

patients included in cohorts, including 294 new patients in 2024

6

clinical trials underway

48

scientific publications

New treatments and the management of sudden fluctuating deafness

LEADERS

Paul Avan,
reConnect Institute – Director of the Center for research and innovation in human audiology (CeRIAH) of the Hearing Institute, Pasteur Center

Charlotte Hautefort,
reConnect Institute – ENT clinician, Lariboisière – Fernand-Widal Hospital AP-HP

OBJECTIVES

Sudden fluctuating hearing loss requires the rapid prescription of appropriate treatment. The absence of targeted treatment within an appropriate timeframe jeopardizes the patient's chances of recovery.
The aim of this thematic scientific project is to build tools and a care trajectory, including outside the university hospital, providing a follow-up of specifically treatable causes. In the long term, it aims to propose mobile tests or even tests that can be performed autonomously by patients. This proximity and accessibility will make the close monitoring of audiological and biological parameters possible.

2024 RESULTS/ PROJECTS UNDERWAY

Projects underway
- In-depth study of so-called "textbook" clinical cases involving certain symptoms or diseases.
- The use of animal models to investigate the mechanisms involved.
- The development of measurement tools that can be used by the patients themselves, to document in a realistic manner the natural course and progression of the state of health of the individuals treated.

Several major advances occurred during the course of 2024, notably:

Studies of eye movements
Studies of the mechanisms of eye movement improve our understanding of compensation strategies in patients suffering from dysfunctions of the vestibule, the sensory organ linked to balance, particularly in dynamic environments.

Bilateral vestibular areflexia
The understanding of this vestibular problem — a frequent cause of falls, particularly in the elderly — has progressed through a refining of diagnostic criteria and the exploration of potential therapeutic interventions.

MRI anomalies in acute vestibulopathies
Specific MRI anomalies associated with acute vestibular syndromes have been identified, thereby improving the precision of diagnosis.

Cohort study on vestibular atelectasis
This disease is linked to a dysfunction of liquid pressure in the inner ear. Patients with vestibular atelectasis confirmed by MRI were studied with non-invasive tests to explore the correlation between symptoms, imaging results and physical modeling. These results will serve as the starting point for the development and validation of tools for rapid, objective, audiological measurements for precise evaluations of auditory function.

Biomarker development
Progress has been made in the identification of biological biomarkers, notably the inflammatory markers plasma homocysteine and serotonin, providing potential new pathways for diagnostic and therapeutic strategies.

Preventing and curing progressive hearing loss

LEADERS

Yann Nguyen,
Clinical Director of reConnect Institute,
PU-PH in ENT at Sorbonne University and in the ENT department of Pitié-Salpêtrière Hospital AP-HP.
Joint Director of the "Technologies & Gene Therapy for Deafness" team at the Hearing Institute, an Institut Pasteur center

Christine Petit,
reConnect Institute – Director of the "Auditory therapies innovation laboratory" at the Hearing Institute, an Institut Pasteur center

OBJECTIVES

The objective of this group is to develop inner ear therapies to prevent and cure hearing loss.

The members of this group work towards this objective **using improved audiometric tests** to ensure the early diagnosis of hearing loss. They aim to find new molecular biomarkers predictive of hearing loss through the identification of risk factors.

This work focuses principally on two frequent forms of hearing loss:
- **Early-onset age-related hearing loss,**
- **Noise-related hearing loss** following sound-induced trauma or repeated exposure to loud sounds.

ACHIEVEMENTS IN 2024

Several steps and projects for the prevention and cure of hearing loss are underway:

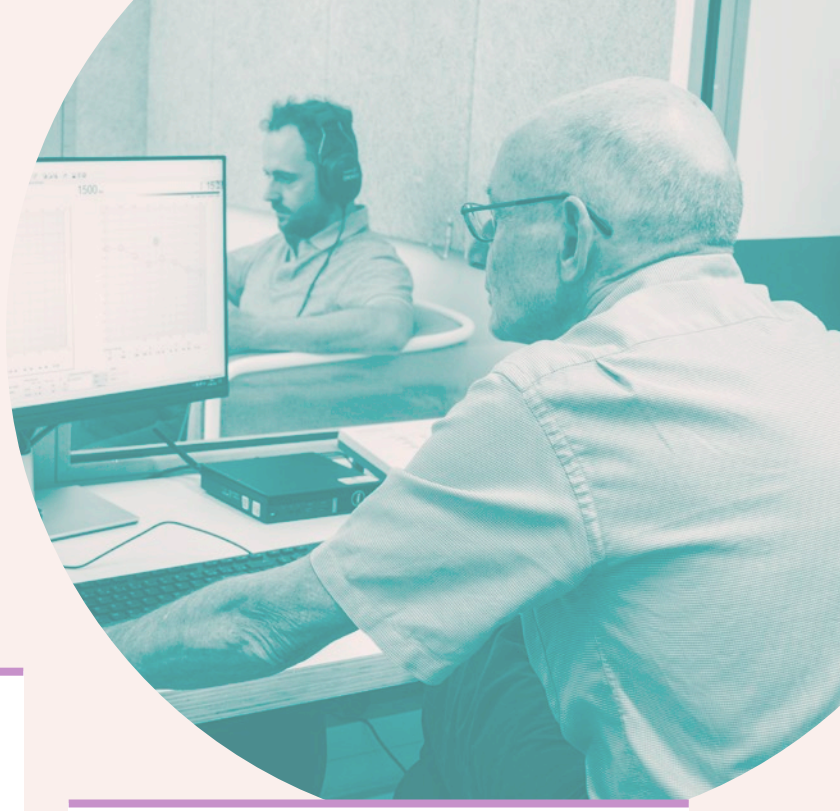
Screening of patients with early-onset age-related hearing loss (precocious presbycusis) and patients with noise-related hearing loss. The information collected will make it possible to establish sufficiently large cohorts to obtain representative data for these conditions. Thanks to these cohorts, the researchers will be able to determine the genetic architecture and to identify biomarkers for the diagnosis and follow-up of these forms of hearing loss.

Once the cohorts have been established and **the causal genes and biomarkers have been identified,** the objective of this thematic group will be to develop dedicated gene therapies. To this end, it will generate innovative animal models of congenital, non-congenital and/or progressive forms of sensorineural deafness and will initiate the search for gene therapies and other treatments, possibly with the aid of industrial partners.

The use of a robotic system will make it possible to optimize intracochlear therapies and surgery.

Finally, the development of optogenetic cochlear implants. These implants will make stimulation by light possible, together with a higher spatial resolution.

Characterization and treatment of auditory perception problems



LEADERS

Arnaud Norena,
reConnect Institute – CNRS research Director at Aix-Marseille University

Alain Londero,
reConnect Institute – ENT specialist, Lariboisière – Fernand-Widal Hospital AP-HP

OBJECTIVES

This thematic group focuses on the mechanisms, functional evaluation and innovative clinical management of auditory perception problems: tinnitus, hyperacusis and misphonia.

ACHIEVEMENTS IN 2024

This group published an article in the journal *Scientific Reports* suggesting that there is a **molecular mechanism underlying tinnitus and hyperacusis,** paving the way for possible treatments. It is possible that certain subtypes of tinnitus and hyperacusis are linked to hyperexcitability of the auditory centers after hearing loss. Now, these results suggest that the neurotransmitter GABA, which is normally inhibitory, becomes excitatory due to underregulation of the membrane cotransporters that maintain low intracellular chlorine levels.

The members of this thematic project work on the **involvement of the inner ear** in certain subtypes of tinnitus and hyperacusis. The resistance of the middle ear to the transmission of acoustic waves can be evaluated by impedance measurements. Such tests can, in particular, reveal whether the muscles of the middle ear are contracted. Such contraction is associated with an increase in the rigidity of the middle ear and, thus, with an increase in resistance at low frequencies.

Other projects are also being developed:
- The Audicog project explores in more detail **the cognitive attention deficits** of patients suffering from tinnitus.
- The HISSING project aims to identify the **risk factors** associated with tinnitus, with the development of a questionnaire for predicting severity.
- A global approach combining **acoustic stimulation** and **relaxation techniques** is currently being tested in military veterans.
- A clinical study based on **virtual reality** has been performed in patients with tinnitus to evaluate the efficacy of this technique.

Hearing and auditory dysfunction in cognitive disorders

LEADERS

Claire Paquet,
Scientific Director of reConnect Institute
PU-PH, Head of the Cognitive Neurology Department at Lariboisière – Fernand-Widal Hospital AP-HP
Vice Dean of the Paris Cité Université Faculty of Medicine

Nicolas Michalski,
reConnect Institute – Head of the "Plasticity of central auditory circuits" team of the Hearing Institute, an Institut Pasteur center

OBJECTIVES

The contribution of hearing problems to cognitive disorders has been largely underestimated, despite being the leading potentially modifiable risk factor.

This lack of knowledge results in missed opportunities to prevent, diagnose and treat cognitive disorders.

This thematic scientific group uses a "laboratory at the patient's bedside" approach to characterize the role of hearing problems in diseases involving cognitive problems. It focuses on the two most frequent cognitive disorders (>80%): Alzheimer's disease and cognitive problems of vascular origin.

ACHIEVEMENTS IN 2024

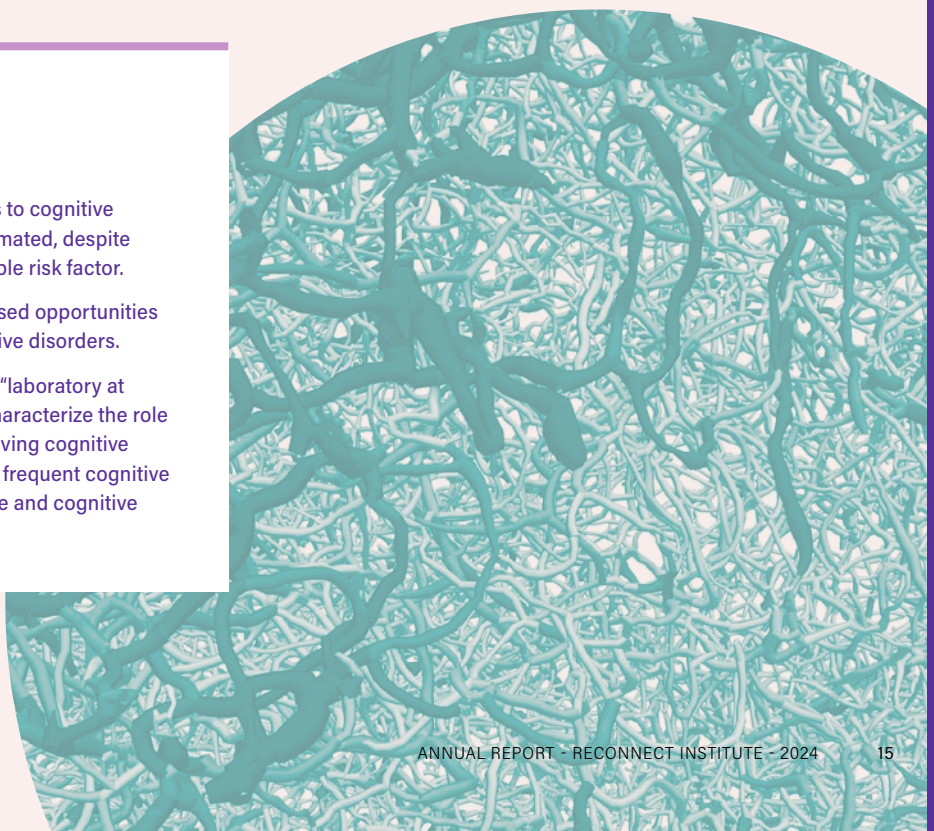
This thematic project explores the relationships between hearing and cognitive functions from various angles:

Structural vascular deficits and deafness
Preclinical studies have shown that congenital deafness — present at birth — leads to a decrease in vascular density in the areas of the brain dealing with hearing that may extend to other cortical areas. In the future, the restoration of hearing, by hearing aids in particular, may prevent the structural vascular deficits responsible for changes in the capacity to think and memory, thereby decreasing the risk of cognitive problems.

Distinction between Alzheimer's disease and Lewy body dementia
Preliminary clinical results suggest that temporal fluctuations on EEG may distinguish between Alzheimer's disease and Lewy body dementia with a high degree of precision.

Screening for hearing problems
Systematic questionnaires and brief screening for hearing loss are being implemented in hospitals to improve the auditory care of patients with cognitive disorders.

Creation of cohorts and clinical cohorts
The group is exploring the link between hearing and cognitive problems in various groups of individuals from different cohorts.



Rewiring disturbed audio-phonological networks

LEADERS

Sophie Bouton,
reConnect Institute – Joint Director of the "Neural coding & neuroengineering of human speech functions" team at the Hearing Institute, an Institut Pasteur center

Emmanuel Mandonnet,
reConnect Institute – Neurosurgeon, Department of Neurosurgery, Lariboisière – Fernand-Widal Hospital AP-HP

OBJECTIVES

This thematic project aims to improve our understanding of alterations to audio-phonological networks and to develop concrete tools for improving the evaluation and management of speech, language and communication problems.

Through a multidisciplinary approach, the work of this group aims to refine existing models and to propose interventions suitable for patients with different profiles, with a view to transfer into clinical practice.

ACHIEVEMENTS IN 2024

The research performed revolves around five main axes: **deafness, dyslexia, autism, stammering and severe anarthria.**

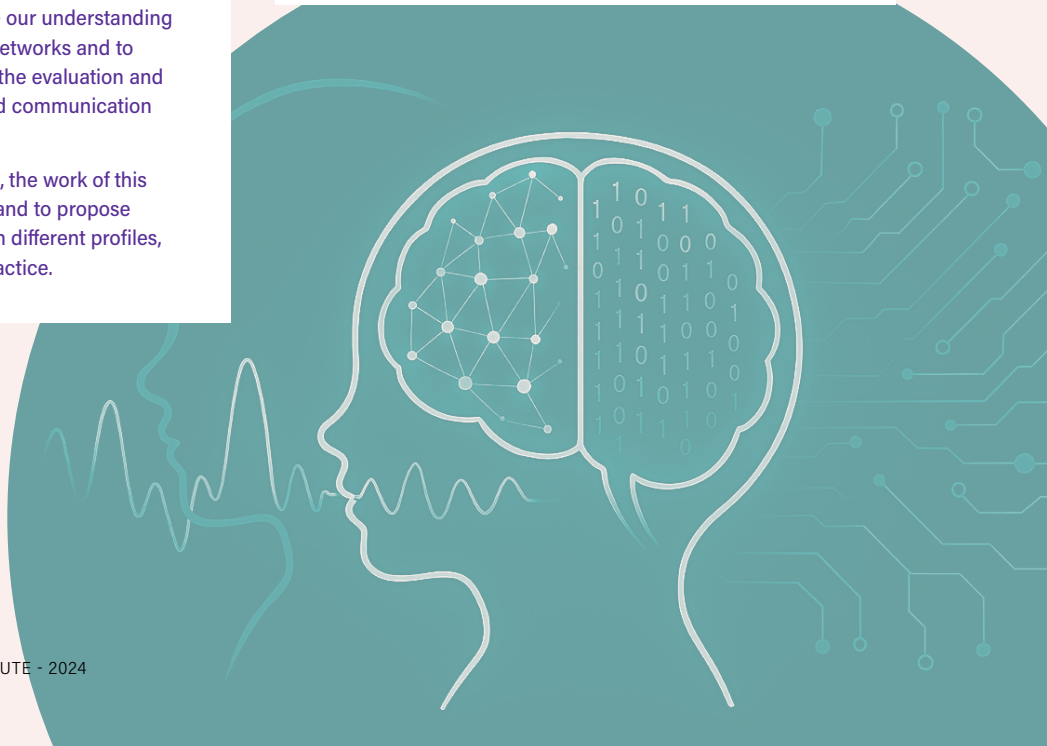
In the field of **deafness,** several initiatives are underway. One such initiative aims to develop an automatic translation tool for converting spoken French into written French, to facilitate communication between deaf individuals and those close to them. Training based on a combination of lip reading and auditory exercises is currently being evaluated, with a view to improving the understanding of speech in noisy environments for people fitted with hearing aids. Finally, a study is being performed to explore the role of certain genetic factors in the processing of speech in deaf children fitted with cochlear implants.

For **dyslexia,** a program of rhythmic training is being tested, to strengthen the temporal processing capacity of the brain with a view to supporting learning and reading in children in difficulty.

In the domain of **autism,** two axes are being explored. The first concerns the development of a prognostic tool based on early neuronal markers, making it possible to anticipate language trajectories more effectively. The second concerns the evaluation of a targeted stimulation protocol for the processing of speech, aiming to improve social interactions.

The work of this group on **stammering** is based on an approach combining non-invasive transcranial stimulation and rhythmic auditory stimulation. This strategy aims to modulate the cerebral circuits involved in verbal fluency with the aim of decreasing the severity of the problem.

Finally, for patients with **severe anarthria,** a computerized communication system is being developed with the aim of enabling these individuals without speech, often due to major brain lesions, to express their intentions via a device translating thoughts into language.



INTERVIEW

3 questions for
Yann Nguyen

Yann Nguyen is the Clinical Director of reConnect Institute. He is an ENT surgeon at Pitié-Salpêtrière Hospital AP-HP, joint Director of the "Technologies & gene therapy for deafness" team at the Hearing Institute, an Institut Pasteur center and professor at Sorbonne University.

What is your role as Clinical Director of reConnect Institute?

I act as the coordinator between IdA researchers and the doctors of AP-HP hospitals, drawing attention to the needs of patients, developing solutions in research laboratories and evaluating the innovative therapeutic approaches that emerge. I ensure that research remains patient-centered and leads to concrete clinical applications. The integration of patients in the process from the start makes it possible to develop new tools for diagnosis, rehabilitation and treatment that are more effective, making use of the complementary nature of the skills of doctors and researchers from the institute.

Why is collaboration between medical and research teams essential to combat auditory problems?

The rapid evolution of research techniques is rendering the landscape more complex and makes it more difficult for clinicians — even those familiar with research — to understand all the possibilities and limitations of these new approaches.

Furthermore, for collaborations to be fruitful, it is crucial to identify clinical needs correctly.

> **Our objectives extend beyond the framework of medicine compensating for auditory disability, towards curative medicine.**

This cooperation between the various actors of auditory health and speech is essential to allow medicine to progress and to improve patient health and quality of life in a durable manner.

Could you cite an example of collaboration between doctors and researchers that has led to the development of an innovation?

For some types of deafness, the fitting of a cochlear implant requires complex surgery. As a means of limiting the trauma associated with the insertion of the implant, researchers, clinicians and industrial partners have joined forces to develop the first dedicated ear surgery robot in the world, RobOtol®. During its first intervention in 2019 at Pitié-Salpêtrière Hospital AP-HP, this robot enabled the surgeons to insert the implant with no problem and without trembling, resulting in remarkable stability. These interventions are not just occasional; they occur all the time.

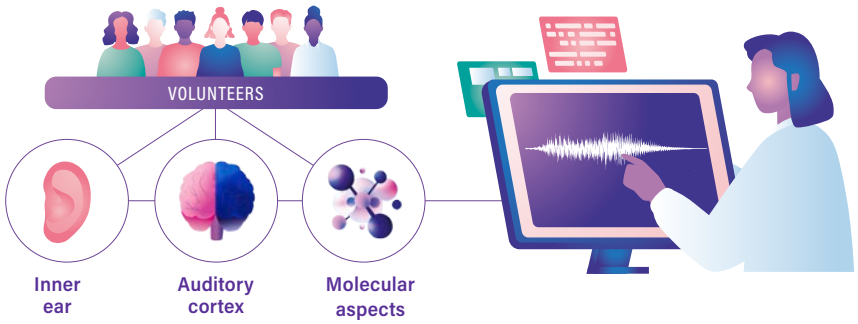
The range of clinical research

The CeRIAH (Center for research and innovation in human audiology), created in 2020 at the heart of the Hearing Institute, is a key element in the clinical research of reConnect Institute. It is dedicated to the performance of research protocols of three types for studies of hearing in humans.

CeRIAH Bench

IMPROVING OUR UNDERSTANDING OF AUDITORY PROBLEMS TO CREATE A PERSONALIZED MEDICINE WITH PROFESSIONALS IN THE FIELD.

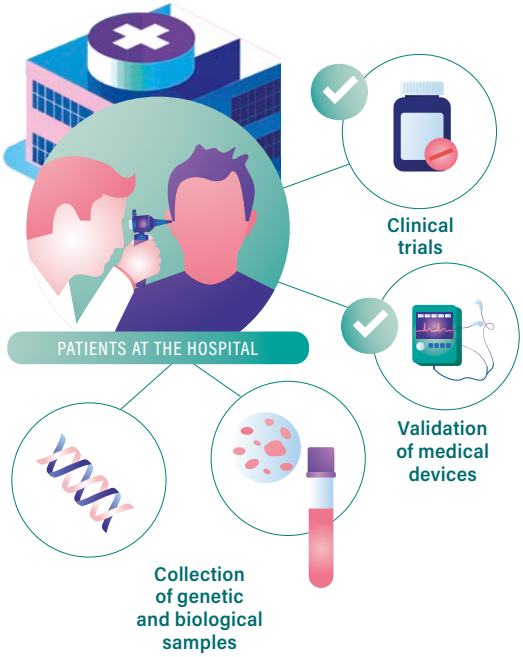
Located in the 15th arrondissement of Paris, CeRIAH bench brings together about 20 experts (ENT doctors, audioprosthesists, researchers, engineers, etc.) and a complete technical platform dedicated to the development of innovative tools, as in a design unit.



CeRIAH Bedside

CONNECTING BASIC AND CLINICAL RESEARCH.

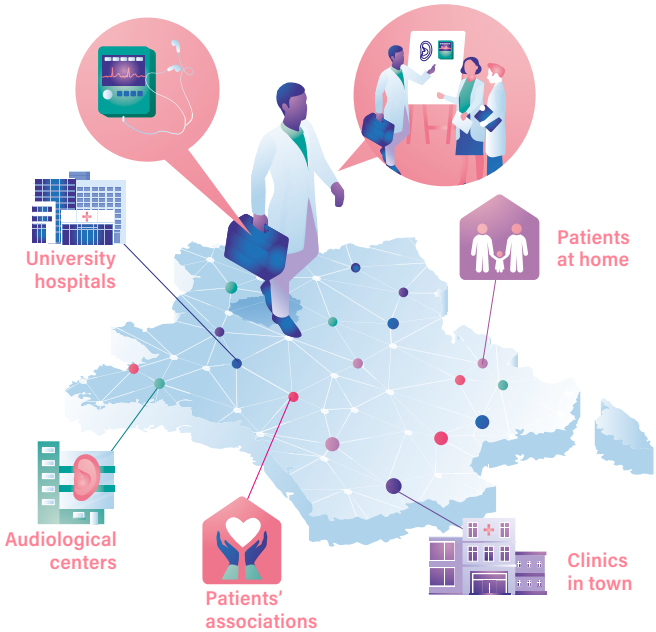
CeRIAH bedside, implanted in the hospital partners of reConnect Institute, has as its principal mission, the transformation of patient care pathways to enable patients to benefit from the most recent advances. Through the innovations developed by the institute, it links basic and clinical research.



CeRIAH Mobile

TRAINING AUDIOLOGY PROFESSIONALS, DISSEMINATING KNOWLEDGE AND PROMOTING RECONNECT INSTITUTE.

Through displacements throughout France, the actors of CeRIAH mobile disseminate the knowledge and good practice acquired and validated by reConnect Institute to other hospital or clinical centers, ENT doctors in private practice, audiological centers and patients at home. This dissemination makes it possible to establish a network and to recruit volunteers to expand cohorts.



INTERVIEW

Participating in a clinical trial

The participation of volunteers plays a primordial role in medical advances. Feedback from Mohamed Laroussi and Laura Attia, the parents of Maïssa and Talia, respectively, participants in the RnDys project of the "Neural coding & neuroengineering of human speech functions" team at the Hearing Institute.

Why did you want to participate in the RnDys project?

Laura Attia: After the visit of an author to my workplace, I contacted the independent speech therapist working with the team, who immediately convinced me to allow Talia to participate in the study. We wanted to try something extra to help her because she found it very hard not being able to read like the others despite her best efforts.

Mohammed Laroussi: Maïssa had been followed by a speech therapist for a while before he introduced us to the NeuroSpeech team. I was already aware of the reputation of Institut Pasteur and Hearing Institute and so I had confidence in their clinical program.

What was the experience like for your daughters?

ML: The learning program required a lot of concentration and rigor. It was tiring for Maïssa but the team were able to create a reassuring environment, with follow-up at each step, making the experience more enjoyable for my daughter.

LA: Talia really liked the autonomy afforded by the two clinical protocols. The added bonus was the character of GraphoGame, which motivated her, and being able to draw, color and develop her artistic side through the lologo program.

What is next for you after the study?

LA: We really noticed that Talia was more at ease, peaceful and that she smiled more at the end of the six months of the clinical study and we will keep our eyes open for other opportunities open to us!

ML: We will continue to attend sessions with the speech therapist, but the combination of training at home and professional follow-up was really successful because Maïssa is now much more willing to read. If the Hearing Institute were to ask us to participate in another study we would be delighted, particularly given the difficulty finding appropriate help for dyslexic children.

INTERVIEW

Norbert Krief

Norbert Krief, aka Nono — cofounder and composer of the group Trust since 1977, Johnny Hallyday's regular guitarist for eight years and one of his collaborators for more than 20 years — has suffered from tinnitus for more than 40 years. Here is his story.

How did your tinnitus symptoms begin?

Contrary to what one might think, my tinnitus didn't start after working with amplified instruments. I began experiencing very light hissing noises after starting to listen to music through headphones on a Walkman. I was 25 years old.

My career as a musician has involved continuous exposure to high levels of sound, through tours, concerts and studio work, with no real pause.

My tinnitus, which was initially limited to light hissing in my left ear, has today been transformed into an incessant, strident hissing noise generalized to both ears.

How do you cope with your tinnitus?

At the start, I traveled all over France to meet diverse doctors and specialists, but I never found a solution to my problem. I therefore looked for answers myself.

As a musician who had studied electronics, I tried to measure and identify the frequency of my tinnitus with an oscilloscope. I then inversed the phase with a frequency generator in the hope of canceling out the hissing noise.

Obviously, that didn't work because tinnitus is generated by the brain rather than external noise. I therefore tried cognitive therapy, with involves training the brain to ignore these sounds.

The other thing that really helped was the fitting of a hearing aid following an audiogram during an ENT consultation. Having a hearing aid has enabled me to recover high-frequency hearing, which made it a bit easier to ignore the tinnitus.

What is your commitment to the field of hearing?

I often speak at events relating to hearing, like the launch event for reConnect Institute, to help with prevention, particularly in young people. With their earpods and headphones always fixed to their ears, and with night clubs and so on, it's now or never for the protection of their hearing.

3 questions for Claire Paquet

Claire Paquet is the Scientific Director of reConnect Institute. She is a neurologist, neuropathologist, professor and Vice Dean of the Paris Cité Université Faculty of Medicine. She is Head of the Center for Cognitive Neurology at Lariboisière – Fernand-Widal Hospital, AP-HP, which is searching for new treatments and new markers of neurocognitive diseases.

What is your role as Scientific Director of reConnect?

It is my job, together with the Director and the Clinical Director, to define the major scientific orientations and to set up research projects, principally at Lariboisière – Fernand-Widal Hospital AP-HP, in accordance with the strategy of the institute. This involves, notably, the identification and planning of responses to calls for projects, but also the definition and organization of needs in terms of research, equipment and budgets, and through the projection of platforms and of the future building project of the Lariboisière Research Center.

Why did you, as a neurologist, contribute to the development of the reConnect Institute project?

All the epidemiological studies performed have shown that hyperacusis is the most important modifiable risk factor for cognitive problems. Hearing is a particularly important factor (more so than vision or olfaction) in this context, and the effect is more marked for Alzheimer's disease than for other neurocognitive disorders. Auditory pathways, thus, appear to have a particular link to cognitive functions.

> The project is to perform clinical research in the new building of the Lariboisière Research Center from 2030.

Our objectives are, thus, to understand the link between hearing and cognitive problems and to use auditory pathways for the development of new treatments, involving sound stimulation in particular, to target the pathophysiological mechanisms of Alzheimer's disease.

What are your challenges for the new few years at the institute?

We aim to establish the clinical research of reConnect Institute progressively but rapidly, initially at Lariboisière Hospital, but subsequently in the new building of the Lariboisière Research Center from 2030 onwards.

We also aim to integrate all the clinical, neurosurgical and neurological ENT research into the clinical and research activities of Lariboisière Hospital to ensure that we can remain close to patients and arrive at clinical applications as soon as possible.

Network and data science

LEADERS

Brice Bathellier,
reConnect Institute – Head of the "Neural codes & dynamics" team at the Hearing Institute, an Institut Pasteur center

Jean-Baptiste Masson,
reConnect Institute – Head of the "Decisions and Bayesian computation" laboratory at Institut Pasteur

OBJECTIVES

The objectives of this thematic transverse project group are to provide tools enabling the five scientific thematic project groups to manage and process research data in clinical and research environments in accordance with modern standards, and to develop new algorithms for auditory prostheses and neurostimulatory implants.

ACHIEVEMENTS IN 2024

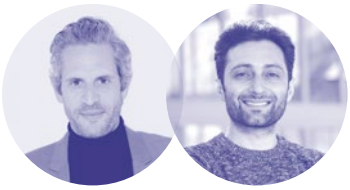
Establishment of a generic data management pipeline
During the first year, a data manager will set up a processing chain for all the research data produced by reConnect Institute. This data processing chain operates from the reception of research data, their preparation and formatting, to their storage. This pipeline makes it possible to harmonize the collection and storage of data for future use.

Innovations in the domain of algorithms
Innovations have occurred in the algorithms used for auditory rehabilitation and diagnosis from imaging results for inner ear problems. Current cochlear implants function through Fourier transform. The new methods of encoding developed by the Hearing Institute and LORIA (*Laboratoire lorrain de recherche en informatique et ses applications,* INRIA at Nancy) have introduced an important AI tool: autoencoders. These artificial neuron networks have made it possible to break down auditory information without loss and in a more flexible manner than Fourier transform. These autoencoders could then be tested in real devices, including the auditory cortex implants that will be used in another thematic project.

Planning of surgical operations
Institut Pasteur and AP-HP researchers have developed a new system combining CT-scan and MRI images. This system aligns the images to obtain a faithful reconstitution of the inner ear, enabling doctors to prepare and plan surgical interventions more effectively.

Connected research and medicine

LEADERS



Luc Arnal,
reConnect Institute – Head of the "Auditory cognition & communication" team at Hearing Institute, an Institut Pasteur center

Yohan Attal,
reConnect Institute – CEO Cyrebro, Cyrebro Neurosignals

OBJECTIVES

This thematic group of projects exploits digital technologies to improve hearing research and care. The members of this group develop connected solutions to optimize the collection and use of data for auditory health with a view to accelerating diagnosis and optimizing treatment.

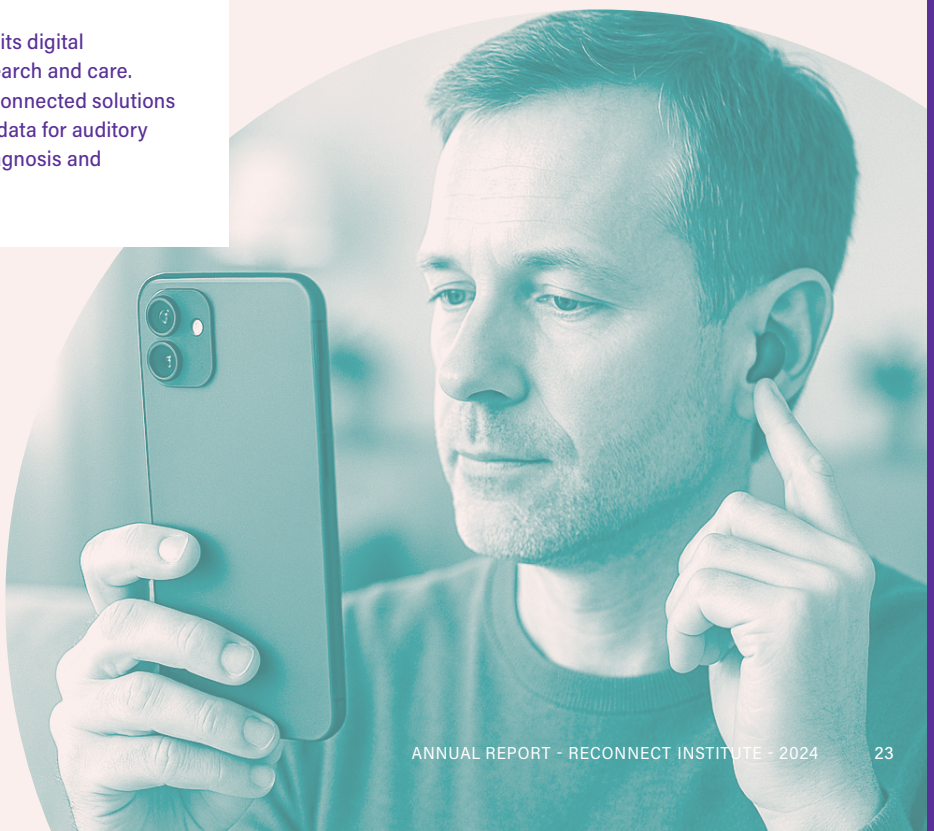
PROJETS EN COURS ET À VENIR

Actions underway:

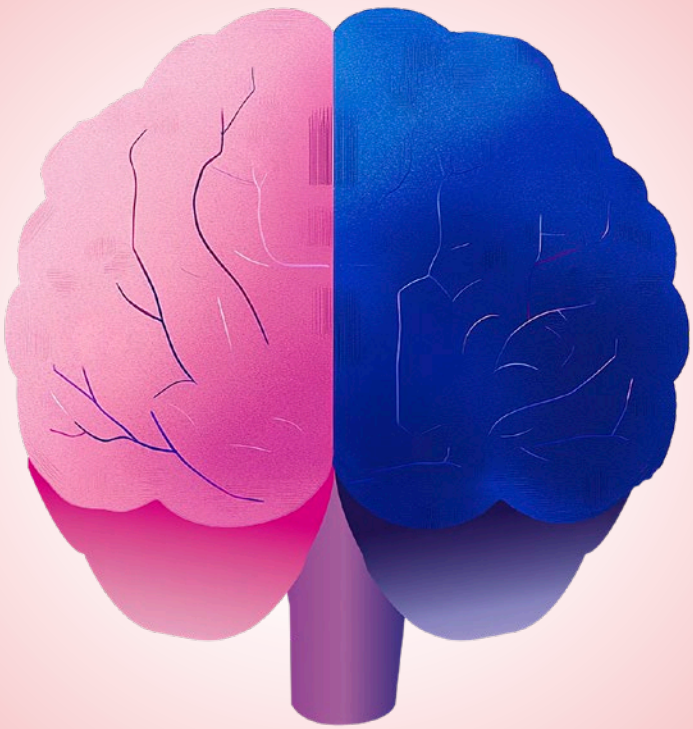
- **Development of mobile phone applications** for the diagnosis of hearing problems outside of laboratories and hospitals. In collaboration with iAudiogram and the Brain & Mind biocluster.
- **The Hypersonic project:** studies of the ways in which sounds influence epilepsy, including, in particular, the possible role of "common" sounds or "complex" music in the emotional and cerebral excitability of humans.
- Studies of how **sound compression** and **auditory protection affect the emotions** felt during concerts. This work will also help us to understand the effect of noise on mental and physical health and to make new recommendations about how best to control sound or concerning the use of auditory protection.

Future actions:

- Creation of an **online recruitment platform** to facilitate the inclusion of participants in reConnect studies. This platform will make it possible to collect large amounts of data on auditory and cognitive health.
- Establishment of a **multimodal recording system** that can be connected to several different devices, such as EEG headsets, connected glasses or watches, and mobile applications. This will make it possible for the sources and formats of different types of data to be used together while respecting scientific and medical standards.
- The **development of tools** that participants and healthcare professionals can use independently. These tools will be easy to use, reliable and durable and will respect the private life of the participants, cost constraints and the environment.



Innovation



Innovation transforms discoveries into concrete applications for patients. Thanks to close collaboration between scientists, industrial partners and healthcare professionals, we are accelerating the development of pioneering diagnostic and therapeutic solutions. Through technology transfer, we are promoting the emergence of an industrial audiological sector.

2

patents filed in 2024

6

industrial partnerships

2 millions US $

Evaluation of the size of the world market for cochlear implants in 2024

Innovation and industrial partnerships

LEADERS

Nicolas Le Goff,
reConnect Institute – Director of Innovation

Isabelle Pelletier-Bressac,
reConnect Institute – Senior Consutant, AttLeva Conseils

OBJECTIVES

This group of projects aims to transform the results of research into products and solutions for improving the life of patients suffering from speech or hearing problems and/or dementia.

Based on research results, this group establishes industrial partnerships focusing on the development of products and solutions, such as new drugs, medical devices, diagnostic tools or digital health tools.

The innovations of reConnect Institute include, in particular, gene therapy, hearing aids, cochlear implants, solutions for dyslexia and treatments for dementia linked to hearing problems.

ACHIEVEMENTS 2024

Sensorion
The Audiogene project aims to test a gene therapy agent for treating children with a hereditary form of deafness (DFNB9) due to mutations of the *OTOF* gene encoding otoferlin.

Amplifon
In collaboration with Amplifon, reConnect Institute has launched the BIG DATA AP project, which aims to improve the management of patients with hearing aids by characterizing the tests most informative for the regulation of these devices in the long term.

Iologo
The aim is to determine whether rhythmic auditory training is a useful tool for improving the performance of children with specific written language problems and to compare its efficacy with that of training to support the establishment of graphophonological correspondence.

PARTNERS

Strategic partnerships with start-ups and CAC 40 companies are under discussion.

PATENTS

Two patents have been filed, one on dyslexia and the other on cortical implants.

3 questions for
Nawal Ouzren

Nawal Ouzren, General Director of Sensorion, a biotech company specializing in the prevention and treatment of hearing problems and the restoration of hearing, talks about this collaboration.

Audiogene is the first clinical trial of gene therapy in France aiming to treat profound deafness in children. It is being performed by a French consortium bringing together teams from the Hearing Institute, the ENT department and Pediatric Audiology Research Center of Necker-Enfants malades Hospital, Sensorion (the sponsor of this trial) and the Fondation Pour l'Audition.

What is the Audiogene project?

Audiogene is a phase II clinical trial testing the restoration of hearing by SENS-501, a type of gene therapy developed by Sensorion, in children under the age of 31 months suffering from a hereditary form of deafness, DFNB9. This form of deafness is due to mutations of the *OTOF* gene, which encodes a protein called otoferlin.

The gene therapy agent is injected into the inner ear and transports the functional *OTOF* gene to the cells of the cochlea, enabling them to produce a functional otoferlin protein, thereby restoring hearing.

How was the collaboration between Sensorion and the Hearing Institute established?

When I joined Sensorion in 2017 as General Director, I met the teams working in this domain of hearing at the Hearing Institute. These teams are now part of reConnect Institute. I was very interested in the work of the teams of Professor Christine Petit and Dr Saaid Safieddine on gene therapy.

> « Giving these children every chance to develop socially and cognitively.

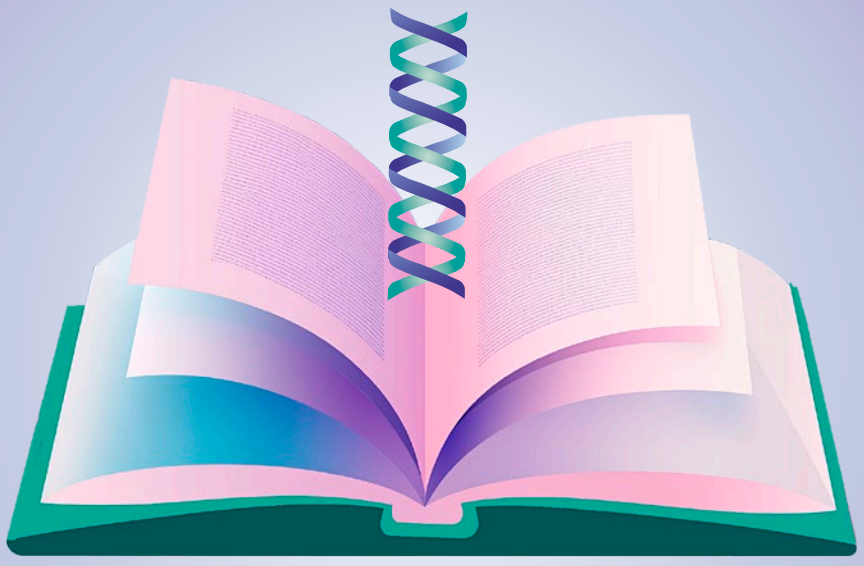
In 2019, Sensorion signed a licencing agreement with Institut Pasteur for gene therapies developed by the Hearing Institute. We then began preparing a clinical trial. We met with Professor Natalie Loundon, who agreed to be the principal investigator for Audiogene. We filed the necessary dossiers for the approval of a clinical trial and Audiogene, thus, began, with the first patient included in Australia in the summer of 2024.

How does your approach differ from those of other actors in gene therapy?

Audiogene is the only trial on a homogeneous population of patients. It focuses on children with DFNB9 deafness under the age of 31 months, without cochlear implants.

We chose to focus our trial on children aged 6 to 31 months because this corresponds to the period of optimal cerebral plasticity and, thus, to the best therapeutic time window for ensuring that children are able to acquire and develop language and to display normal social and cognitive development. This is in line with the recommendations of scientific societies concerning cochlear implants.

Training and raising awareness



Training and prevention guarantee the spread of scientific advances and new practices among students, health professionals and the general public. By sharing our results, we raise the awareness of people who are or will be concerned by auditory, cognitive or speech problems, whilst valorizing the excellence and impact of our work.

54

training actions

2,280

people trained

44

information and prevention actions for the general public

12

external events with a scientific impact

Education, training and communication

LEADERS

Aziz El Amraoui,
reConnect Institute – Head of the "Progressive sensory disorders, pathophysiology and therapy" team at the Hearing Institute, an Institut Pasteur center

Brice Bathellier,
reConnect Institute – Head of the "Neural codes & dynamics" team of the Hearing Institute, an Institut Pasteur center

Hung Thai-Van,
reConnect Institute – Joint Director of the CeRIAH of the Hearing Institute, an Institut Pasteur center

OBJECTIVES

In a country in which audiology is not yet a recognized discipline and in which the number of specialists in this domain is, thus, limited, this thematic project aims to educate, structure and disseminate offers of innovative and appropriate training while reinforcing access to knowledge for healthcare professionals, students and the general public.

PROJECTS UNDERWAY

Educating and training

The group aims:
- To develop new teaching units in partnership with Paris Cité Université, Sorbonne University, the University of Lyon and the Montpellier Audiocampus.
- To participate actively in more than **30 university training programs leading to a diploma,** from degree to doctorate level.
- To create a **new master's degree** in audiology at Paris and Lyon, in collaboration with the Collège National d'Audioprothèse.
- To extend the **audience of the Pasteur HeaR course,** which is now available to master's and PhD students and young clinicians.
- To ensure the professional training of various healthcare professionals (ENT specialists, audioprosthesists, speech therapists, specialist nurses), notably through **DU, DIU, and specialist workshops.**

Communicating and informing

The group works:
- To design **educational multimedia content** for patient, families and partners.
- To organize **international seminars and workshops,** such as neMO-Camp, the AFREPA meeting and WCA2024, open to clinicians and researchers.
- To participate in **awareness-raising actions with secondary and high-school students** to inform them of the scientific and medical issues relating to hearing.
- To valorize the teaching and actions of the group through our web site, social media and YouTube videos.

FOCUS

Pluridisciplinary training

The theoretical and practical courses created and run by the members of reConnect Institute are open to a diverse public (bachelor's degree students, students on masters' degree courses in neurosciences, cognitive sciences or physiology, healthcare professionals, researchers etc.). They initiate and deepen knowledge relating to the themes linked to hearing.

HeaR: From mechanisms to hearing restoration techniques

This course, which Institut Pasteur has organized for several years with researchers from the Hearing Institute, deals with the mechanisms of auditory perception from the ear to the brain, and the problems of auditory perception, together with modern methods for repairing auditory function.

HeaR, which is open to students from master's degree level upwards, was designed for both hearing specialists wishing to deepen their knowledge and young researchers wishing to pursue a career in the domain of hearing.

DIU – Audiology and Medical Otology

In partnership with Claude Bernard University in Lyon, this interuniversity diploma is open to doctors, audioprosthesists and physiotherapists.

This training is designed to be the reference course in France on the clinical and paraclinical evaluation of hearing and balance problems. The speakers present the most recent data in the pathophysiology and genetics of audiovestibular problems, together with topical subjects in audiology and medical otoneurology. The aim is also to present and discuss therapeutic management adapted to the patient, with an openness to innovation.

PSL Week

Organized by PSL (Paris Sciences & Lettres) University and the Hearing Institute, PSL Week is open to the entire university community and aims to raise the awareness of students about modern issues in hearing sciences.

This partnership makes it possible to cover almost all levels of study and all approaches to the human auditory system: genetics, cochlear biophysics, integrative, theoretical and cognitive neurosciences, psychoacoustics, experimental and clinical audiology and applications in acoustics and machine learning.

Prevention, ethics and society

LEADERS

Paul Avan,
reConnect Institute – Director of the CeRIAH, Hearing Institute, an Institut Pasteur center

Jean-Claude K. Dupont,
reConnect Institute – Head of the Ethics Cell of Institut Pasteur, associate researcher at Paris Cité Université and member of the steering committee of the French Biomedicine Agency *(Agence de la biomédecine)*

Marie-Josée Duran,
reConnect Institute – Director of Scientific Affairs, Fondation Pour l'Audition

OBJECTIVES

Based on the data and recommendations of the institute, this group of projects aims to improve the prevention of hearing problems, to raise the alarm concerning situations presenting a risk to hearing and to influence health policy.

This objective involves raising the awareness of the general public about hearing problems, evaluating new sound nuisances presenting a risk to auditory health and using social science methods to orient health policy.

ACHIEVEMENTS IN 2024

Social networks are the ideal arena in which to perform actions to increase awareness about hearing problems. Via the LinkedIn account of reConnect Institute and the social networks of the Fondation Pour l'Audition, this project group develops messages to raise awareness and for the prevention of sudden deafness, presbycusis, tinnitus, hyperacusis and misophonia.

For the evaluation of new sound risks, this project group is working within a French consortium aiming to study the perception of very-low frequency deep sounds.

Finally, this group promotes interfaces between science, social sciences and public decision-making. In this spirit, it took part in the project group established by the French health authorities *(Haute Autorité de Santé)* and the organization of the national auditory screening program in newborns.

PROJECTS

- Coordination of bibliographic monitoring for noise and health within the working group of the French National Committee for Noise *(Conseil National du Bruit).*
- Coconstruction of a research protocol for evaluating subjects exposed to intense infrasound, in which the psychological profile of these individuals will be defined.

Transverse interface and new perspectives

LEADERS

Anne-Dominique Lodeho-Devauchelle,
Deputy Director of reConnect Institute and of the Hearing Institute, an Institut Pasteur center

Danuta Oficjalska,
reConnect Institute – Head of the research support division of the Hearing Institute, an Institut Pasteur center

Céline Quinsac,
reConnect Institute – Operational Director of the CeRIAH of the Hearing Institute, an Institut Pasteur center

OBJECTIVES

The principal objective of this transverse project group is to create the ideal conditions for collaboration to favor the development of new axes of research and to maintain the level of excellence and novelty of research throughout the first 10 years of reConnect Institute.

Its strategy can be broken down into three axes:

- **Structuring and developing the network of the institute** at the local, national and international scales, via the CeRIAH mobile or cutting-edge functional exploration units. These units, which can be rapidly deployed outside the walls of reConnect, favor collaborations with hospital, university or independent structures requiring expertise in audiology. This opening up to the outside will also be made possible by calls for projects including external partners, events of the hackathon type, workshops and open days.
- **Encouraging interactions between the major themes of reConnect** to create new collaborations, through scientific conferences for example.
- **Rendering reConnect Institute agile during the course of its existence,** by continuing to listen to new ideas, new technological possibilities, scientific discoveries and unexpected societal or clinical changes, through calls for emerging projects.

ACHIEVEMENTS IN 2024

This project group launched a call for projects entitled “Auditory infection and/or immunity” in November 2024, offering research grants over a period of two years. This initiative was designed to establish collaborations between the reConnect Institute and Institut Pasteur on new issues in the domains of infection and immunology linked to congenital or acquired auditory deficits.

Regulatory processes to launch the activity of CeRIAH mobile have also been initiated and should make it possible for the first units to become functional in 2025.

Commitment and support

In the face of the major societal issues linked to hearing, the steadfast commitment and support of visionary partners are essential to propel research towards innovative solutions capable of transforming lives. The visibility of our actions also promotes the commitment of all.

2.5 billion

supporting research for the 2.5 billion people who will suffer from hearing loss by 2050 according to the WHO

€325 M

The sum required to cover the running costs of the institute for the first 10 years, including the sum provided by the ANR (€40 M)

156

items of media coverage (written press, radio, television, Internet)

COMMITMENT

Thomas Dutronc, committed sponsor of reConnect Institute

The year in which reConnect Institute was launched was marked by the support of Thomas Dutronc, a committed sponsor and spokesperson for the auditory cause. His commitment has helped to raise the awareness of the general public concerning hearing and speech problems, which are still all too often invisible, and to valorize the excellence of the research performed by the institute.

Thomas Dutronc, French musician and singer, has been committed for several years to issues relating to hearing, initially thanks to Christian Hugonnet, President of *La Semaine du Son,* an event in which reConnect Institute is a partner, and through the work of Paul Avan, Director of the CeRIAH of the Hearing Institute on sound compression. "We encounter problems with tinnitus in the music industry. I am concerned about these problems relating to listening and the ear" he explained.

Compression is a technique that used to be used to overcome the limitations of audio equipment but, today, the electronic "packing" of sound is engendering auditory fatigue and weakening the reflexes of our ears. This problem also concerns the use of telephones, radios and videoconferences and therefore now affects the entire population.

Thomas Dutronc meets researchers from the reConnect Institute.

In November 2024, Thomas Dutronc visited the Hearing Institute, where he met researchers and witnessed the importance of research in this domain. On this occasion, he obtained a glimpse of the diversity of research performed at reConnect Institute.

He highlighted the importance of supporting those working to ensure that future generations benefit from better preservation of their hearing.

"There are people who are working to protect the hearing of future generations and to ensure that it will be less affected than ours" he affirmed. "I have a limitless admiration for all medical personnel, from surgeons to researchers and carers." He concluded by evoking the future of research with optimism: "There is good news, progress in hearing research, and I hope to be able to shine a little spotlight on the magnificent work done by the researchers here."

There are people working for the hearing of future generations and to ensure that it is less damaged than ours.

The NGO *La Semaine du Son* is a partner of reConnect Institute. Together they share a societal commitment.

The association *La Semaine du Son* aims to provide the public, together with politicians and all actors of society, with a better knowledge of sound and the importance of the quality of the sound environment, which should not only be preserved, but also, ideally, restored.

Since 2004, the NGO *La Semaine du Son* has organized, in France and elsewhere, UNESCO Sound Week, an event devoted to the problems linked to sound through a transverse approach (cultural, medical, industrial, education and economic) in which reConnect Institute plays an active role.

Sponsorship

The support of economic actors for the institute's projects

Sponsorship is a lever providing different forms of useful benefits for the action and anchorage of reConnect Institute in the auditory health sector. Philanthropic partnerships are being forged to strengthen research, accelerate innovation, transform care and build the reputation of the institute. By cultivating awareness among professionals and the general public, sponsorship projects also help to fight against the stigmatization of deaf people and the hard-of-hearing whilst helping to improve their living conditions and integration into society.

Economic benefits

The principal role of sponsorship is to help fund innovative research projects, topping up traditional public funding. It provides private resources, which may be determinant for triggering or completing significant investment in equipment, technology and human resources. Sponsors are particularly attentive to the populations benefiting from their commitment, in this case deaf or hard-of-hearing patients or groups at risk in the general population.

A strategic opportunity

As an economic development tool, sponsorship reinforces the independence and perennial survival of scientific institutions by diversifying their funding sources in a national and international context that is currently difficult for science. Philanthropy can provide an impetus or drive the prioritization of a scientific project of general interest, including the dissemination of scientific knowledge, professional training for researchers, the valorization of scientific work and the organization of events for professionals and students.

Institutional communication

Sponsorship is also an instrument for raising the awareness of the general public about hearing and oral communication problems, their causes and consequences, and the means of prevention and screening, through institutional communication campaigns, events, informative content or awareness-raising actions.

Supporting the cause of hearing

There are three types of approach for supporting the work of the institute. Firstly, a desire to take hold of a particular disorder or family of disorders fully, to explore them and to inform a target public about them. Next, the intention to take part in a project to valorize the scientific work likely to lead to a therapeutic pathway. Finally, a wish to elevate hearing to the rank of a major societal subject through preventive actions and by informing the population of advances in compensatory medicine and breakthroughs in curative medicine.

Through these three approaches, sponsorship helps to plead the case, to both professionals and individuals, for improving the living conditions of deaf people and the hard-of-hearing to combat their invisibility in society, and to promote their inclusion.

Contact sponsorship and patronage

dons-mecenat@ihu-reconnect.org

SPONSORSHIP AIDING FLAGSHIP PROJECTS

REPAIRING THE HEARING ORGAN
- Conception of gene therapies for deafness
- Development of precision pharmacology

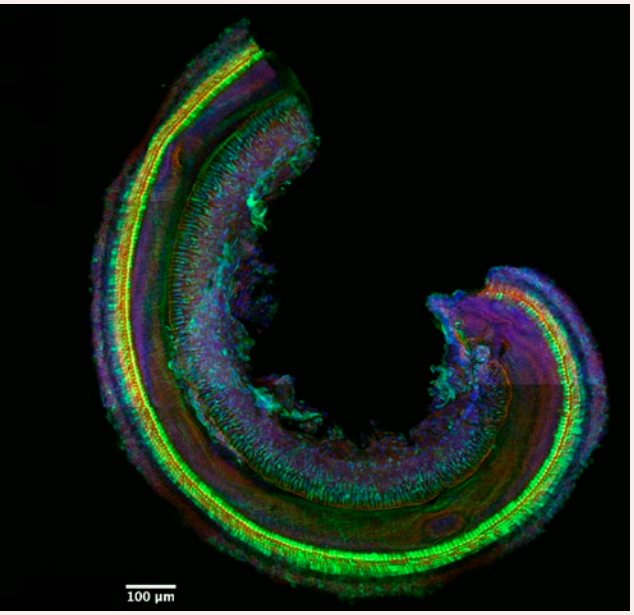
ADMINISTERING THERAPEUTIC VECTORS
- Developing robot-assisted surgery

DEVELOPING HEARING MEDICINE
- Creating a new generation of hearing aids with artificial intelligence

TREATMENT BY SOUND
- Preventing and managing sound-induced trauma
- Slowing the progression of Alzheimer's disease

RESTORING THE CORTICAL NETWORKS OF SPEECH
- Re-establishing oral communication

DESIGNING NEW CORTICAL AND COCHLEAR IMPLANTS
- Developing a new generation of implants with artificial intelligence
- Treating auditory perception problems



Governance and finances

By creating favorable conditions for research, we ensure the long-term survival of our actions. The institute's authorities guarantee the effective functioning of the institute and the development of its scientific and medical strategy. Human and financial resources are the pillars of the implementation of actions for each project.

5

founding members

280

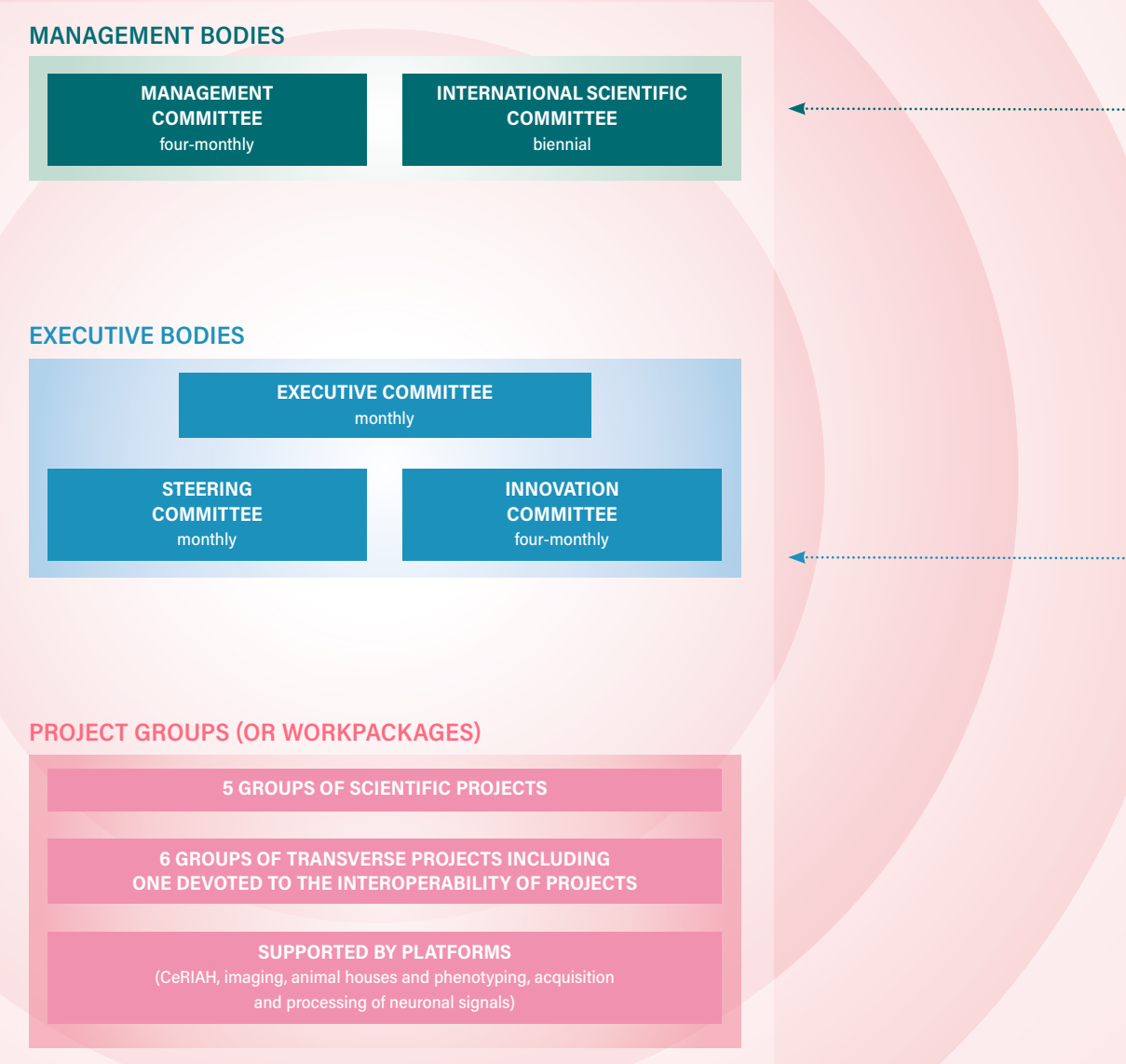
people involved
in reConnect Institute

37

grants linked to the activity
of the Hearing Institute

The governance of reConnect Institute

reConnect Institute is a foundation hosted by the Institut Pasteur.
It has five founding members: AP-HP, Inserm, Paris Cité Université, la Fondation Pour l'Audition and Institut Pasteur. To ensure the functioning of the institute and the development of its scientific and medical strategy, the management of reConnect Institute relies on several bodies and committees.



Our university-hospital institute (IHU) aspires to be a site of federation and cohesion based on scientific and medical excellence in the domain of hearing. Together, professionals in auditory health, researchers and medical teams work every day to combat hearing problems. This teamwork and synergy bring together all the necessary expertise in this domain, providing our current and future patients with the best possible management.

As Deputy Director, I contribute to the formulation of the development strategy of the institute and supervise its execution on a daily basis. This involves good coordination between the founding members, partners, the executive authorities and the teams of the institute. I am also responsible for supervising the administrative and financial steering of reConnect Institute, together with coordination of the various support services involved.

Anne-Dominique Lodeho-Devauchelle

MANAGEMENT COMMITTEE

The principal mission of the management committee of reConnect Institute is to ensure the correct functioning of the institute. It validates the strategic and financial orientations of the institute. Its President is Benoît Dubuis and it meets three times per year.

INTERNATIONAL SCIENTIFIC COMMITTEE

The scientific committee is composed of international specialists and researchers working in the domains of hearing, speech problems and cognitive disorders. Its mission is to provide an independent advice on the Institute's scientific, clinical and technological strategy.

More information about the composition of the management committee and the international scientific committee.

EXECUTIVE COMMITTEE

The principal mission of the executive committee is monitoring the activities of the institute and the application of its scientific and medical orientations.

The executive committee of reConnect Institute consists of:

- **Anne-Lise Giraud,** Director
- **Anne-Dominique Lodeho-Devauchelle,** Deputy Director
- **Claire Paquet,** Scientific Director
- **Yann Nguyen,** Clinical Director

STEERING COMMITTEE

The steering committee consists of the leaders of the project groups (or workpackages). It is presided by the Director of reConnect Institute, Anne-Lise Giraud. Its mission is to provide advice on scientific and medical strategy.

INNOVATION COMMITTEE

The innovation committee is responsible for defining the strategy for technology transfer and ensuring its implementation for the transfer of the discoveries of reConnect Institute through their transformation into products and solutions destined to improve the lives of people with hearing or speech problems and/or dementia. It also coordinates the management and distribution of intellectual property within the institute. The committee is presided by the Director of the institute and the Director of Innovation.

It relies on the participation of the scientific experts of the institute and of the transverse domains, such as research assistance, the CeriAH, innovation, communication, sponsorships and finances.

Focus on the organization of the Hearing Institute, the cornerstone of reConnect Institute

MANAGEMENT
EXECUTIVE ASSISTANT – Emeline Mouasseh

DIRECTOR
Anne-Lise Giraud

DEPUTY DIRECTOR
Anne-Dominique Lodeho-Devauchelle

SCIENTIFIC HUB – Anne-Lise Giraud
ASSISTANTS – Catherine Ladan, Evelyne Castanié

PROGRESSIVE SENSORY DISORDERS, PATHOPHYSIOLOGY AND THERAPY
Aziz El Amraoui

TECHNOLOGIES & GENE THERAPY FOR DEAFNESS
Saaid Safieddine, Yann Nguyen

NEURAL CODES & DYNAMICS
Brice Bathellier

NEURAL CODING IN THE AUDITORY SYSTEM
Jérémie Barral

AUDITORY SYSTEM DYNAMICS & MULTISENSORY PROCESSING
Brice Bathellier

RESEARCH ASSISTANCE HUB (pôle accompagnement de la recherche, POLAR) – Danuta Oficjalska

BIOIMAGING PLATFORM
Maia Brunstein

HISTOLOGY/CELL CULTURE
Béatrix Meha

CUSTOM MICROSCOPY
Yannick Goulam-Houssen

ANIMAL FACILITY & PHENOTYPING
Marta Lindner

PHENOTYPING

ANIMAL REARING

COMMON TECHNICAL FACILITIES & LOGISTICAL SUPPORT
Emeline Prandato

DATA ACQUISITION & SIGNAL PROCESSING PLATFORM
Clara Dussaux

DATA MANAGEMENT
Fatma Elleuch

OPERATIONAL ADMINISTRATIVE AND FINANCIAL HUB*
Anne-Dominique Lodeho-Devauchelle

FINANCIAL MANAGEMENT
Chantal Yang

COMMUNICATION
Juliette Hardy

OPERATIONAL SERVICES & DIRECTIONS

The Hearing Institute is today the cornerstone of reConnect Institute.
All collaborators from the Hearing Institute are contributing to the development of reConnect Institute.

AUDITION MECHANISMS AND THERAPIES
Nicolas Michalski

PLASTICITY OF CENTRAL AUDITORY CIRCUITS
Nicolas Michalski, Boris Gourévitch

COCHLEAR DEVELOPMENT & THERAPEUTIC PERSPECTIVES
Raphaël Etournay

AUDITORY THERAPIES INNOVATION LABORATORY
Christine Petit

NEURAL CODING & NEUROENGINEERING OF HUMAN SPEECH FUNCTIONS
Anne-Lise Giraud, Sophie Bouton

AUDITORY COGNITION & COMMUNICATION
Luc Arnal

HUMAN & ARTIFICIAL PERCEPTION
Keith Doelling

CENTER FOR RESEARCH AND INNOVATION IN HUMAN AUDIOLOGY (CeRIAH) – Paul Avan
ASSISTANT – Madalina Dumitru

CeRIAH RESEARCH
Paul Avan

CeRIAH OPERATIONAL DIVISION
Céline Quinsac

HUMAN RESEARCH PROMOTION AND COORDINATION

PHILANTHROPY
Simon Gilabert

INDUSTRIAL PARTNERSHIPS AND INNOVATION
Nicolas Le Goff

HUMAN RESOURCES
Benoît Goutermanoff

OF INSTITUT PASTEUR

** Also concerns reConnect Institute.*

Human resources

reConnect Institute brings together several teams formed before its creation:

THE HEARING INSTITUTE, CORNERSTONE OF BASIC AND PRECLINICAL RESEARCH OF RECONNECT INSTITUTE, COMPOSED OF 180 PEOPLE (ANNUAL TOTAL).

CLINICAL AND PRECLINICAL RESEARCH TEAMS (80 PEOPLE) INCLUDING:

the neurology, neurosurgery and ENT departments of Lariboisière – Fernand-Widal Hospital AP-HP,

the ENT departments of Pitié-Salpêtrière Hospital AP-HP,

two teams from Institut Pasteur,

private teams (industrial, clinical, basic research) involved directly in the search for and implementation of technical solutions for patients.

SUPPORT TEAM BASED AT IDA AND DEPLOYED THROUGHOUT RECONNECT (16 FTE AT THE END OF THE YEAR).

THE SUPPORT SERVICES OF INSTITUT PASTEUR, THE FOUNDATION OVERSEEING RECONNECT:

Legal, financial, human resources, technological and medical management etc.

DISTRIBUTION OF PERSONNEL BY POST WITHIN RECONNECT INSTITUTE (~280 PEOPLE)

~120
RESEARCHERS

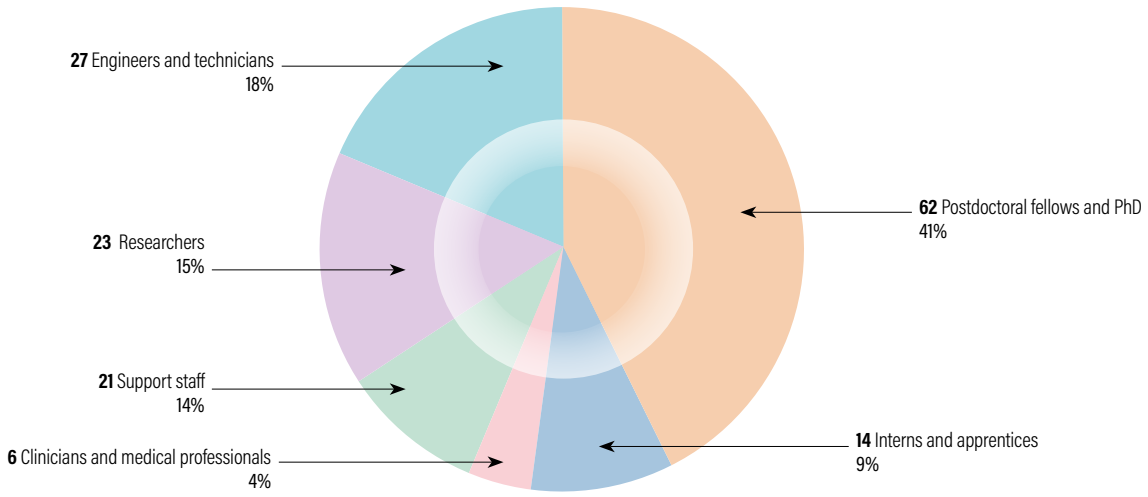
~50
CLINICIAN-RESEARCHERS AND MEDICAL AND PARAMEDICAL PERSONNEL

~50
ENGINEERS AND TECHNICIANS

~40
INTERNS

~16
PERSONNEL DEDICATED TO COORDINATION/ADMINISTRATION WITHIN RECONNECT

DISTRIBUTION OF PERSONNEL BY POST WITHIN THE HEARING INSTITUTE – 153 PEOPLE ON 12/31/2024



Financial resources of reConnect Institute

In its first financial year, the accounts of reConnect Institute opened on 04/24/2024, the date on which the IHU was created, and closed on 12/31/2024 (end of the financial year).
This accounting period was linked principally to the ANR research convention in the framework of the "Institut hospital-universitaire IAHU3" (IAHU, plan France 2030) framework for action.

BALANCE SHEET AT 12/31/2024 – IN THOUSANDS OF EUROS

ASSETS			LIABILITIES		
	31-dec-24	31-dec-23		31-dec-24	31-dec-23
			Endowment		
Intangible and tangible assets			Balance carried forward		
Financial fixed assets			Profit or loss for the financial year	79	
EQUITY			**FIXED ASSETS**	**79**	
Operating receivables	98		Dedicated funds	1,754	
Liquid assets	4,453		Debts	397	
Prepaid expenses	3		Deferred income	2,325	
CURRENT ASSETS	**4,554**		**CURRENT LIABILITIES**	**4,475**	
Accruals (assets)			Accruals (liabilities)		
ASSETS	**4,554**		**LIABILITIES**	**4,554**	

reConnect Institute is a third party-funded foundation (created with no initial endowment). Its funds amount to €4 M, corresponding to the first payment under the ANR IAHU3 convention. However, the funds on 12/31/2024 do not fully reflect the activity of this financial period as regularizations were performed at the start of 2025. Furthermore, the dedicated funds amount to €1.8 M, corresponding to projects for which expenditure has yet to be engaged. These funds include €1.6 M specifically linked to the ANR IAHU3 contract. Deferred income amounts to €2.3 M, including €1.9 M linked to the ANR IAHU3 contract. These amounts correspond to funding received but not yet accounted for as income, due to the principle of matching expenses and revenues.

PROFIT AND LOSS SUMMARY FROM 04/24/2024-12/31/2024
IN THOUSANDS OF EUROS

	31-dec-24	31-dec-23
Operating revenues	2,201	
Operating costs	2,166	
EBIT (earnings before interest and taxes)	**35**	
Financial income	43	
Financial costs		
FINANCIAL RESULT	**43**	
Exceptional income		
Exceptional costs		
EXCEPTIONAL RESULT		
NET RESULT	**79**	
Contributions of the founders not valorized in the balance sheet	**7,306**	
Institut Pasteur (overseeing foundation)	2,253	
Fondation Pour l'Audition	4,599	
AP-HP	83	
Inserm	363	
Paris Cité Université	7	

The net result is €79,000, to which should be added the capital provided by the founders, amounting to a total of €7.4 M, €6.8 M of which is dedicated to the Hearing Institute, the cornerstone structure of reConnect Institute.

EBIT

The operating revenues amount to €2.2 M, €2.0 M of which result from the ANR IAHU3 research contract.
The operating costs of €2.2 M are principally linked to this contract, which accounts for €1.8 M.

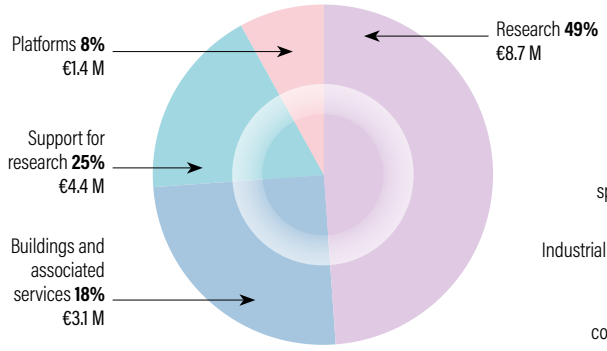
Financial result

The financial income results from the interest on short-term placements of the first payment under the ANR IAHU3 convention.

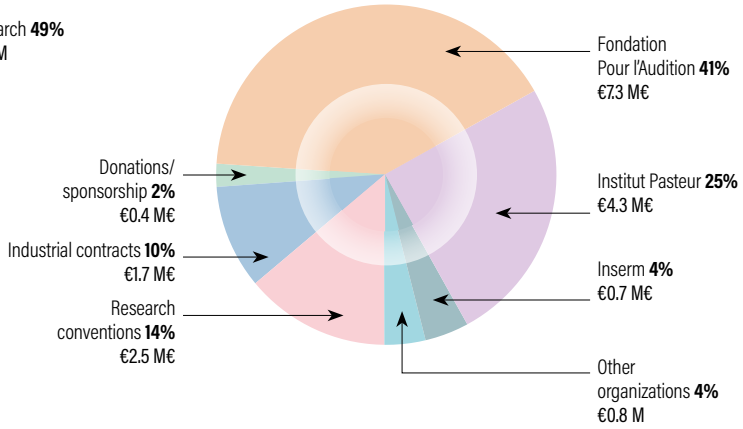
Financial resources of the Hearing Institute

USE AND RESOURCES 2024 – €1.6 M

USE

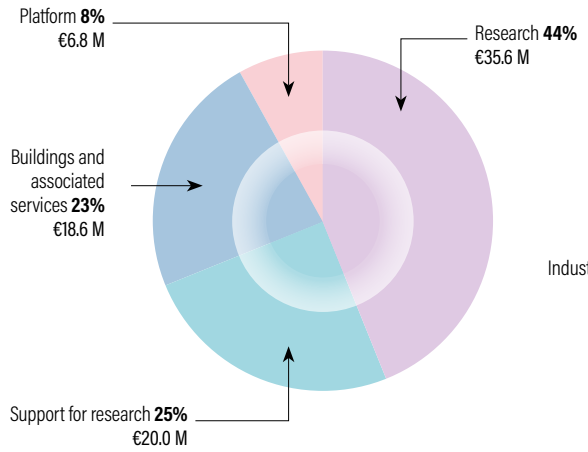


RESOURCES

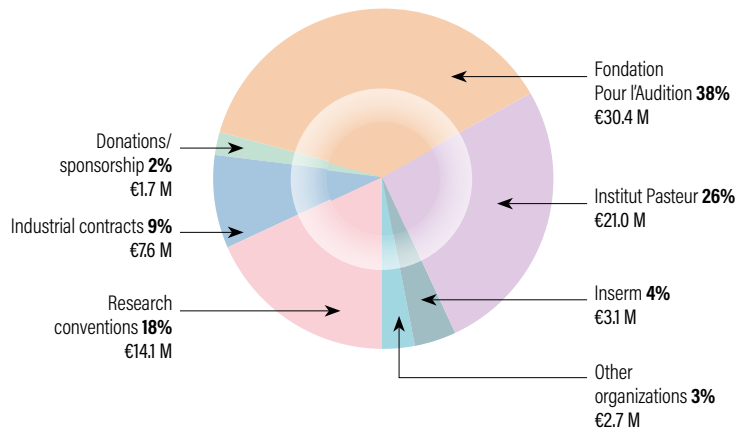


UPDATED BUSINESS PLAN 2019-2024 – €81 M

USE

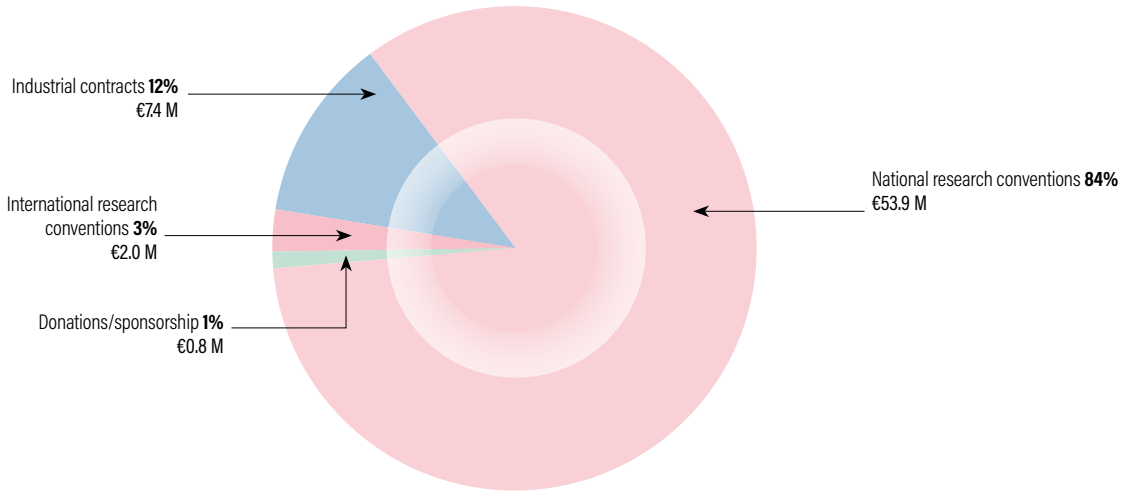


RESOURCES



EXTERNAL FUNDING* IN PLACEX — ON 12/31/2024

59
EXTERNAL FUNDING SOURCES
AMOUNTING TO A TOTAL OF **€64 M**
INCLUDING **€43 M** OBTAINED IN 2024



DISTRIBUTION BY TYPE OF EXTERNAL FUNDING

44
NATIONAL RESEARCH CONVENTIONS
ANR **29**
BPI France **1**
Île-de-France Region **4**
Others **10**

6
INTERNATIONAL RESEARCH CONVENTIONSS
European Union **3**
Others **3**

4
INDUSTRIAL CONTRACTS
Sensorion **2**
Others **2**

5
DONATIONS/SPONSORSHIP
LHW **1**
Others **4**

** Excluding projects financed by the founding members.*

Grants and funding

FOUNDING MEMBERS OF THE HEARING INSTITUTE

Fondation Pour l'Audition (FPA), start-up grant (2019-2024), **€7,575,000**
Institut Pasteur, 2 PhD grants (PPU) (2024-2026), **€307,000**
Institut Pasteur, Transverse research project (PTR), "Auditory neuropathies: new genetic models and audiological tests to decipher the underlying pathophysiological mechanisms" (2024-2025), **€199,000**
Institut Pasteur, PTR "Neuronal excitability as a neurophysiological substrate for sensitivity to sounds" (2022-2025), **€186,000**
Institut Pasteur, 1 Roux-Cantarini grant (2024-2026), **€129,000**
Institut Pasteur, 2 "seed grants junior call" (2024), **€15,000**
Institut Pasteur, end of thesis grant (2024), **€12,000**

INTERNATIONAL GRANTS

Alzeimer's association, "Role of mTORC1 signaling during memory consolidation in Alzheimer's disease" (2023-2026), €155,000
Antwerp University, "A mass spectromic approach to identify novel components of a key complex involved in auditory hair cell function, analysis of their interactions and functional characterization" (2022-2025), €21,000

EUROPEAN GRANTS

FET Open Hearlight, coordinator (2021-2025), €3 M for five international participants, including **€698,000** for Institut Pasteur
MSCA Hissing (2024-2027), **€268,000**
MSCA MemoryRecAll (2025-2027), **€196,000**

NATIONAL GRANTS

ANR IHU reConnect (2024-2033), €40 M
ANR Audinnove (2020-2025), €4.319 M
BPI France, project PATRIOT* (2020-2025), €2.276 M
ANR Neuropathear (2024-2029), €734,000
Institut Carnot Voir et Entendre (2021-2028), €636,000
ANR Time-to-ear (2023-2028), €561,000
ANR HearAgain (2024-2029), €428,000
ANR P2P (2023-2026), €389,000
ANR Infernoise (2023-2027), €373,000
ANR Selfmorpho (2021-2025), €322,000
ANR Vamphears (2021-2025), €282,000
ANR Memnet (2022-2026), €264,000
ANR Presage (2021-2025), €250,000
ANR SpeakOut (2024-2029), €237,000
ANR Fatigaudit (2021-2026), €222,000
ANR Hypersonic (2024-2029), €206,000
ANR Nanoear (2021-2024), €202,000
ANR Refined (2021-2026), €199,000
ANR AudioDream (2022-2026), €197,000
ANR Cortiogran (2022-2026), €123,000
ANR Audieco (2023-2027), €116,000
Grant from the French Ministry of Higher Education, Research and Innovation (2022-2025), €110,000
Grant from Paris Cité Université (2022-2025), €101,000
CIFRE Grant from the French Ministry of Higher Education, Research and Innovation, École Normale Supérieure (2022-2025), €96,000
ANR Statex/Idex (2023-2025), €90,000
ANR Access (2024-2028), €70,000
AFM-Téléthon "Humanized mice to expedite effective translation of reliable inner ear gene therapies" (2024-2026), €66,000
ANR Tympabiom (2022-2026), €50,000

GRANTS FROM THE ÎLE-DE-FRANCE REGION

DIM C-BRAINS (IdF), PhD funding (2024-2027), €158,000
REGION IDF, PhD funding (2025-2028), €120,000
REGION IDF, PhD funding (2025-2028), €105,000
DIM C-BRAINS (IdF), "A platform for two-photon microscopy in freely moving animals" (2022-2025), €105,000

FOUNDATIONS

Foundation Fighting Blindness, "Fighting Usher syndrome type IB blindness: disease pathogenesis and treatment solutions" (2022-2027), **€646,000**
Fondation pour la Recherche Médicale, postdoctoral fellowship (2023-2026), **€159,000**
Inserm Liliane Bettencourt School, PhD funding (2024-2027), **€132,000**
Fondation pour la Recherche Médicale, end of thesis grant (2024-2025), **€42,000**
Fondation pour la Recherche Médicale, end of thesis grant (2024-2025), **€22,000**

PRIX

Académie des sciences, Lamonica Prize (2023-2026), €100,000
Fondation Pour l'Audition (FPA), Scientific Emergence Prize (2023-2025), €20,000

ENTREPRISES - R&D CONTRACTS

Sensorion
Amplifon
L-Acoustics SAS

DONATIONS

LHW (2022-2025), €650,000
Optic 2000 (2024-2026), €60,000
Audition Conseil Labs (2023-2025), €40,000
Souhaiel Chaouachi (2024-2025), €10,000

** The PATRIOT project is supported by the Programme d'Investissements d'Avenir program of BPI France.*

Publications

These articles were selected for presentation here based on their impact in terms of health and our understanding of diseases. They reflect the scientific excellence of the different scientific themed projects.

A progressive form of isolated deafness occurs in individuals with defects of the *Clrn2* gene. Researchers have shown that providing an intact copy of this gene *in vivo* results in a durable preservation of the functions of the initially defective hair cells. This study thus describes the possibility of effectively and durably restoring hearing by gene therapy and paves the way for new perspectives in the treatment of genetic forms of deafness.

Mendia C., Peineau T., Zamani M., Felgerolle C., Yahiaoui N., Christophersen N., Papal S., Maudoux A., Maroofian R., Patni P., Nouaille S., Bowl MR., Delmaghani S., Galehdari H., Vona B., Dulon D., Vitry S., El-Amraoui A.

CLARIN-2 GENE SUPPLEMENTATION DURABLY PRESERVES HEARING IN A MODEL OF PROGRESSIVE HEARING LOSS

Molecular therapies. 2024

https://doi.org/10.1016/j.ymthe.2024.01.021

Otoferlin is a protein essential for the processing of sound information. Its absence leads to severe hearing loss. It has been shown that the C-terminal domain of this protein is crucial for its role as a major calcium sensor in the auditory synapse, which is essential for the rapid and effective transmission of sound signals to the brain.

Dulon D., de Monvel J.B., Plion B., Mallet A., Petit C., Condamine S., Bouleau Y., Safieddine S.

A FREE INTRAVESICULAR C-TERMINAL OF OTOFERLIN IS ESSENTIAL FOR SYNAPTIC VESICLE DOCKING AND FUSION AT AUDITORY INNER HAIR CELL RIBBON SYNAPSES

Prog Neurobiol. 2024

https://doi.org/10.1016/j.pneurobio.2024.102658

Neuron activity may be reduced by the neurotransmitter GABA, which opens a channel allowing the entry of chloride ions. The entry of these ions is facilitated by the low intracellular concentration of chloride ions. This low concentration is maintained by modified KCC2 cotransporters. This study shows that, after noise-related hearing loss, the amount of KCC2 decreases in two zones: the cochlear nuclei and the inferior colliculus. In addition, the application of a GABA channel antagonist on the inferior colliculus increases neuronal activity in animals not exposed to noise, but reduces this activity in noise-exposed animals. These results suggest that GABA becomes excitatory after hearing loss due to a decrease in KCC2 levels. This molecular mechanism may be involved in the onset of tinnitus and hyperacusis. This study paves the way for the treatment of tinnitus and hyperacusis with molecules enhancing the activity or expression of KCC2 on the membrane.

Parameshwarappa V., Siponen M.I., Watabe I., Karkaba A., Galazyuk A., Norena A.J.

NOISE-INDUCED HEARING LOSS ALTERS POTASSIUM-CHLORIDE COTRANSPORTER KCC2 AND GABA INHIBITION IN THE AUDITORY CENTERS

Sci Rep. 2024 May 9;14(1):10689

https://doi.org/10.1038/s41598-024-60858-1

Researchers have studied markers in the blood to improve the diagnosis of dementia with Lewy bodies (DLB). They have identified a marker that can be used to distinguish between Alzheimer's disease and dementia with Lewy bodies.

Vrillon A., Bousiges O., Götze K., Demuynck C., Muller C., Ravier A., Schorr B., Philippi N., Hourregue C., Cognat E., Dumurgier J., Lilamand M., Cretin B., Blanc F., Paquet C.

PLASMA BIOMARKERS OF AMYLOID, TAU, AXONAL, AND NEUROINFLAMMATION PATHOLOGIES IN DEMENTIA WITH LEWY BODIES

Alzheimers Res Ther. 2024 Jul 3;16(1):146

https://doi.org/10.1186/s13195-024-01502-y

Non-invasive electrophysiological measurements have shown that dogs understand the content and prosody of human speech, but via much slower cerebral mechanisms. Humans spontaneously adapt the speed of their speech by slowing down to match the neural capacities of dogs more effectively and to facilitate communication.

Déaux E.C., Piette T., Gaunet F., Legou T., Arnal L., Giraud A.L.

DOG-HUMAN VOCAL INTERACTIONS MATCH DOGS' SENSORY-MOTOR TUNING

PLoS Biology 2024

https://doi.org/10.1371/journal.pbio.3002789

Mice with Usher syndrome type 1 received a healthy version of the *SANS* gene, which was injected up to 21 days after birth (equivalent to the neonatal period in humans). This treatment induced a regeneration of the sensory cells of the inner ear and restored both hearing and balance. When administered later (22-30 days), this treatment again corrected balance, but not deafness. This study shows that the time window for effective gene therapy is much larger than

previously thought. It renders postnatal interventions Plausible in babies suffering from Usher syndrome type 1.

Lahlou G., Calvet C., Simon F., Michel V., Alciato L., Plion B., Boutet de Monvel J., Lecomte M.J., Beraneck M., Petit C., Safieddine S.

EXTENDED TIME FRAME FOR RESTORING INNER EAR FUNCTION THROUGH GENE THERAPY IN USHER1G PRECLINICAL MODEL

JCI Insight. 2024 Feb 8;9(3):e169504

https://doi.org/10.1172/jci.insight.169504

This study showed that the responses of neurons to sound are very different in awake individuals and in those under anesthesia. Anesthesia strongly decreases the activity of the cochlear nucleus in the absence of sound and modifies the identity of the neurons responding to a particular sound. Under anesthesia, modified information affects neuronal processing. This finding has major implications for the interpretation of measurements performed under anesthesia.

Gosselin E., Bagur S., Bathellier B.

MASSIVE PERTURBATION OF SOUND REPRESENTATIONS BY ANESTHESIA IN THE AUDITORY BRAINSTEM

Science Advances

https://doi.org/10.1126/sciadv.ado2291

The authors showed that the evolution of languages is different from that of genes and technologies. Languages evolve with a stationary dynamic, without advancing towards a final form, which allows social groups to differentiate whilst conserving their overall adaptability. Family trees of languages can therefore be established. Understanding these evolutions should help us to anticipate the impact of AI on societies or the accelerated disappearance of languages.

Bickel B., Giraud A.L., Zuberbühler K., van Schaik C.

LANGUAGE FOLLOWS AN EXTRA-GENOMIC MODE OF EVOLUTION

Physics of Life Reviews 2024

https://doi.org/10.1016/j.plrev.2024.08.003

All the publications of reConnect Institute appearing in 2024 are available here

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Design and production: Clara Busson, Corinne Belin and Frédérique Duvignacq

Photograph credits: François Gardy/Institut Pasteur (pp. 1, 2, 3, 4, 7, 10, 12, 14, 15, 19, 21, 22, 24, 28, 32, 33, 39, 40, 53) – SATW technology for society (p. 2) – JAQ architectes/Aldo Amoretti (p. 4) – AP-HP/direction de la communication (pp. 4, 34, 39) – François Marin/AP-HP (p. 4) – AdobeStock (pp. 5, 32) – Sandrine Vitry, Jean-Marc Panaud/Institut Pasteur (p. 6) – Geoffroy Van der Hasselt (p. 7) – Johan Letellier (p. 12) – Peter Bagde (p. 13) – Valérie Zeitoun/Institut Pasteur (p. 15) – Matninatsudio.com (p. 20) – Laurent Attias/FPA (p. 32) – Yann Orhan (p. 36) – Mauricio Saenz/Institut Pasteur (p. 39)

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Acknowledgments*

We thank all the contributors to reConnect Institute, at the Hearing Institute and in the hospitals of the AP-HP, Institut Pasteur, the foundation overseeing the institute, our founding members, institutional and private partners, sponsors and donors. Their long-term support and daily commitment are essential for the functioning and development of reConnect Institute.

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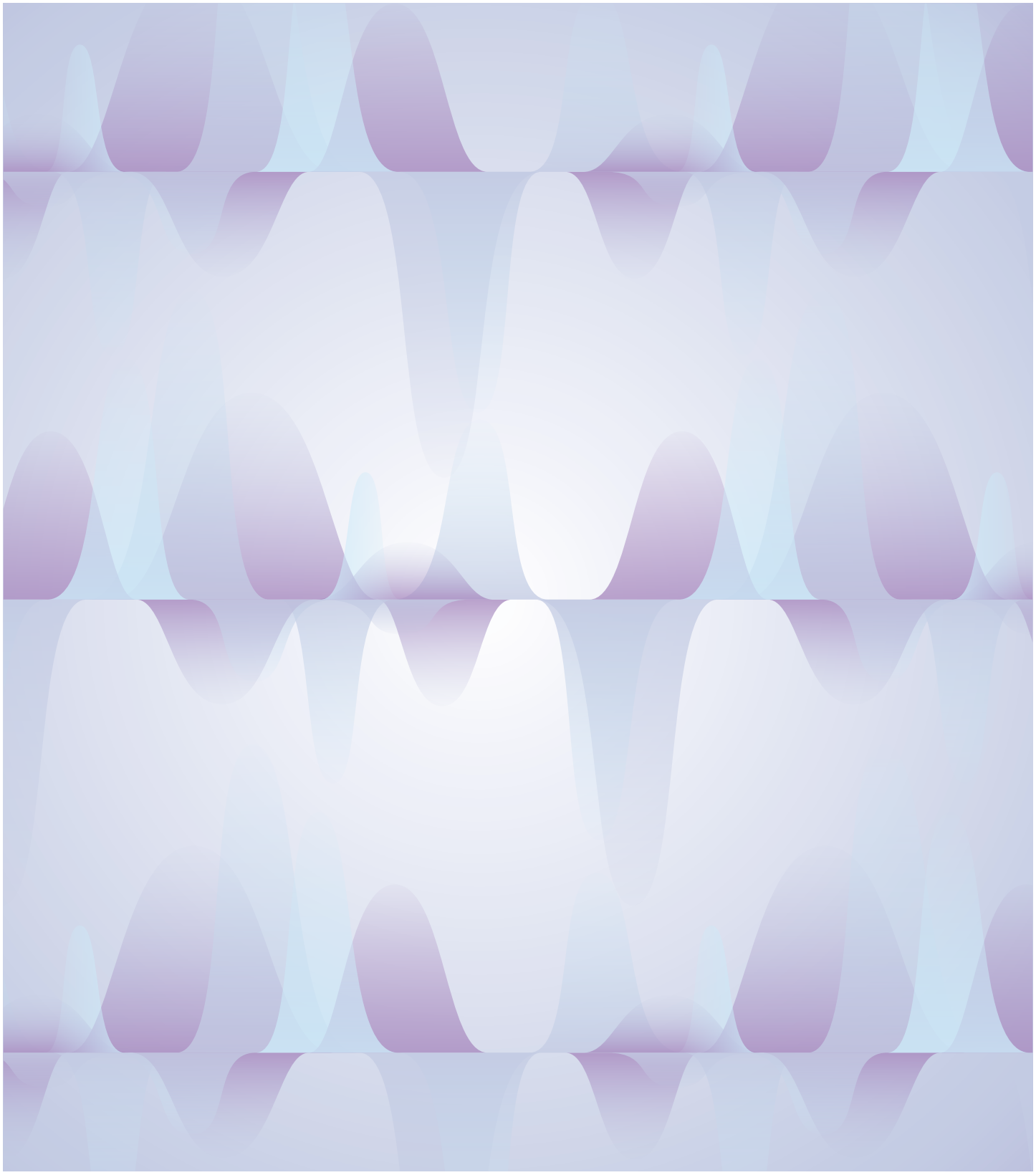
ALZHEIMER ASSOCIATION ▪ BPI FRANCE ▪ CNRS ▪ DIM C-BRAINS ▪ ÉCOLE DE L'INSERM LILIANE BETTENCOURT
FONDATION POUR LA RECHERCHE MÉDICALE ▪ FONDATION POUR L'AUDITION ▪ FOUNDATION FIGHTING BLINDNESS
INSERM ▪ INSTITUT PASTEUR ▪ L-ACOUSTICS SAS ▪ LHW ▪ MESR ▪ OPTIC 2000 ▪ RÉGION ÎLE-DE-FRANCE
SEMAINE DU SON ▪ SENSORION ▪ SOUHAIEL CHAOUACHI ▪ UNIVERSITÉ D'ANVERS
UNIVERSITÉ PARIS CITÉ

** Non-exhaustive list*



reconnect
Healing hearing and speech disorders

Soutenu par
GOUVERNEMENT
Liberté
Égalité
Fraternité

FRANCE 2030

Institut de l'Audition

INSTITUT Pasteur

FONDATION POUR L'AUDITION
À L'ÉCOUTE DE LA VIE

ASSISTANCE PUBLIQUE HÔPITAUX DE PARIS

Université Paris Cité

Inserm