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# THE CNRS FROM BASIC RESEARCH TO DEEPTECH

From biotechs and greentechs to quantum technologies and sport, scientists and start-ups from CNRS laboratories and those of its partners present the technologies of the future.

## Contact

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## The CNRS at VivaTech: from basic research to Deeptech

- Technology transfer for research is one of the missions of the CNRS. With nearly 100 start-ups created per year, and over 7,000 families of active patents, 1,300 active licenses, and more than 170 joint laboratories with companies, the CNRS is a major actor in French Deeptech.
- Thirty start-ups and technologies created from laboratories under the supervisory authority of the CNRS and its partners will be presented at the 2021 edition of VivaTech.

*Visit us in Hall 1 J09.*

**For its second participation in VivaTech, the global tech gathering in Europe that will take place from 16-19 June 2021 in Paris, the CNRS will present a broad sample of its know-how in Deeptech! From biotechs to greentech, quantum technologies, hydrogen, and sports, scientists and start-ups from CNRS and partner laboratories will present the technologies of the future.**

*"The CNRS's presence at VivaTech bears witness to the organisation's commitment to the start-ups that have emerged from its laboratories, and illustrates our voluntaristic policy fostering an entrepreneurial spirit and technology maturation for the results of scientific research,"* points out CNRS Chairman and CEO Antoine Petit. *"The diverse range of projects being presented reflects the research we conduct with our partners in an effort to meet the challenges facing our society. From basic research to Deeptech, the CNRS is a dynamic player in the country's economic revival."*

This year, the CNRS has decided to showcase quantum technology, hydrogen, and medtech. In the field of quantum technology, visitors can learn more about: Prometheus, Quandela's single-photon source, which will be integrated in future quantum computers; the carbon nanotubes of C12 Quantum Electronics, a promising material for the quantum processors of the future; and Atlas, the *in silico* molecular simulator from Qubit Pharmaceuticals.

Hydrogen technologies will be represented by H2SYS, which will exhibit one of its hydrogen-powered electric generators, while H2Pulse, will provide a demonstration of a test bench for companies seeking to transition to hydrogen.

Medtech is also a leading sector of creation for start-ups at the CNRS: Healshape will present a 3D bioprinted breast implant obtained from the patient's own cells, which can be adapted to all morphologies. Grapheal will exhibit its biosensing technologies and graphene-based bandages and patches, notably for remote medical monitoring of the healing process for wounds.

Also present on the CNRS stand will be a connected pollen sensor proposed by Lify-Air, which can predict peaks in pollen, an invaluable tool for offering relief to allergic individuals. Visitors will also be able to test the SportsDynamics platform for analysing football matches from, which provides dynamic indicators of sports performance, in addition to the new sound absorbing material from Vibiscus, which is operated by artificial intelligence. It is energy-efficient, compact, and versatile, and can reduce even low frequency noise.

Finally, the robotic hand developed at the CNRS's Pprime Institute, with four fingers each with four joints, can grasp objects of varying shapes and manipulate them in intricate fashion. It will be on display in VivaTech's digital space!

Over twenty start-ups that emerged from CNRS and partner laboratories will also be present at VivaTech: Actronika (LVMH stand), Adagos (AD'OCC - Région Occitanie stand), Aqemia (Sanofi stand), Arskan (Région Auvergne-Rhône-Alpes stand), BeFC (BNP Paribas stand), Ciloa (Sanofi stand), Damae Medical (Dassault systèmes stand), EVerZom (Région Ile-de-France stand), GreenSysTech (Orange stand), Learning Robot (Région Ile-de-France stand), MAbSilico (Sanofi stand), Olisens (Véolia stand), Pasqal (Région Ile-de-France stand), XScalibur (Orange stand).

Also: Cosmian (BNP Paribas stand), Domoscio (ManpowerGroup stand), Exotrail (BPI France - Hall 1 - J42), GAT (région Nouvelle Aquitaine stand), Inalve (Inria - Hall 1 - D21-004), KeeeX (Région Sud stand), Neocean (AD'OCC - Région Occitanie stand), Wever (Huawei stand), Ynsect (BNP Paribas – Lab stand).

With more than 1,500 start-ups from laboratories under its supervision, the CNRS is a major actor in French Deeptech.

**To meet these start-ups at VivaTech, please contact Alexiane Agullo to make an appointment: [alexiane.agullo@cnrs.fr](mailto:alexiane.agullo@cnrs.fr)**

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**Reliable quantum processors for solving the most complex industrial problems**

© Hubert RAGUET / C12 Quantum Electronics /  
LPENS / CNRS Photo library

**Who:**

Emerging from the ENS Physics Laboratory (CNRS/ENS - PSL/Sorbonne Université/Université de Paris), where a team dedicated to quantum technology, the C12 Quantum Electronics company is developing a reliable quantum computer based on carbon nanotubes. It is supported by CNRS Innovation's RISE programme.

**What:**

Quantum materials interact very easily with their environment, with the least disruption capable of causing errors. Recent technological breakthroughs in the field of materials science are one of the most promising approaches for unlocking the power of quantum computing.

Thanks to its purity and minimal interface with its environment, the carbon nanotube is a promising material for processing quantum information with high fidelity on a large scale. Scientists from C12 Quantum Electronics have developed a patented system in a vacuum for integrating these carbon nanotubes on a classical chip with printed circuits. They want to increase the number of qubits on their chips to 5 by late 2021, with an overall fidelity that would make it the new quantum standard for semiconductors, before bringing complete processors to market in 2025.

For C12 Quantum Electronics, carbon nanotubes are to quantum computing what silicon is to classical computing, namely the material that enables a new industry to emerge.

**For what markets:**

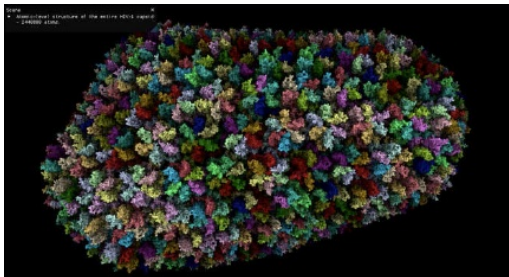
Their processors aim to more quickly solve the complex problems faced by industrial actors, which are beyond the reach of classical computers, in sectors as varied as transportation, chemistry, finance, and the automobile and pharmaceutical industries.

**C12 Quantum Electronics in a few key figures:**

- Date founded: 2020
- Number of employees: 11
- Industrial partners: ATOS, Artelys
- Website: <https://www.c12qe.com/>

**Presented at VivaTech:** a carbon nanotube model used by C12 Quantum Electronics.

## Quantum computing for the development of new drugs



© Qubit Pharmaceuticals

### Who:

Led by scientists from the Laboratory of Theoretical Chemistry (CNRS/Sorbonne Université) and the Paris Institute of Physical and Theoretical Chemistry (CNRS/Sorbonne Université), Qubit Pharmaceuticals offers the world's most accurate and fast software suite for improving the discovery of drugs through *in silico* modelling of molecular interactions, the first link in the value chain of the pharmaceutical industry. Qubit Pharmaceuticals uses the latest advances in software and materials for quantum computing. It is supported by CNRS Innovation's RISE programme.

### What:

Qubit Pharmaceuticals has developed Atlas, a platform for simulating and modelling interactions between molecules, with the primary aim of finding the best candidates for future medicines. The modelling of Qubit Pharmaceuticals has such little margin for error that it is truly predictive, without sacrificing speed. The company has optimized its algorithms for high-performance computing to achieve multiple orders of magnitude in terms of speed and reliability. Its approach allows it to execute quantum algorithms on existing computers or quantum simulators.

### For what markets:

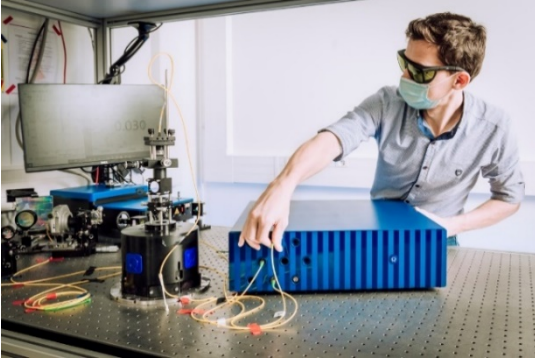
Qubit Pharmaceuticals already has a foothold in the quantum transition thanks to its partnerships within the French quantum ecosystem. Its mature technology is already of interest to companies in the fields of biology, chemistry, and pharmaceuticals.

### Qubit Pharmaceuticals in a few key figures:

- Date founded: 26 May 2020
- Number of employees: 11
- Present in France and the US.
- Website <https://qubit-pharmaceuticals.com/>

**Presented at VivaTech:** An example of a protein modelled by Qubit Pharmaceuticals.

## Single photons on demand, at the heart of quantum computers



© Cyril FRESILLON / Quandela / C2N / CNRS Photo library

### Who:

Emerging from the Centre for Nanosciences and Nanotechnologies (CNRS/Université Paris-Saclay), Quandela produces and markets light sources that deliver a single photon with each pulse, and integrates them within quantum computers. This technology is currently central to a number of European quantum computers (Austria, the Netherlands, Italy, Russia).

### What:

Prometheus, which was developed by Quandela, is the world's first integrated source of photonic qubits. This photon-emitting technology is one of the most effective today, with rates of emission 20 to 30 times higher than currently available, which helps reduce computing time considerably.

Prometheus consists of semiconducting structures measuring 20  $\mu\text{m}$  in diameter, each with an integrated quantum dot, an artificial atom tasked with emitting photons. They are then used to form qubits of excellent quality, with no decoherence. In addition to the ease with which the qubits can be manipulated, the other advantage of this optical quantum computing is that it functions at room temperature. Photon sources and their sensors must of course be cooled by a cryostat, but at much more lower temperatures than for other quantum options, a substantial advantage in terms of energy efficiency.

Prometheus is the first building block in Quandela's future optical quantum computer. The start-up is already at work on integrating Prometheus to create a quantum computer with digital qubits.

### For what markets:

The start-up's strategy combines the development of a complete computer with commercial activity based on the computer's building blocks. It sells its components to companies and research centres worldwide including in Italy, Russia, Australia, and Austria, which sets it apart from other start-ups pursuing an optical quantum computer.

### Quandela in a few key figures:

- Date founded: 2017
- Number of employees: 20
- Exports to 5 different countries
- Website: <https://quandela.com>

**Presented at VivaTech:** the integrated single-photon emission system Prometheus will be presented at VivaTech.

## Accompanying the "hydrogen projects" of companies



© Frédéric MALIGNE / LAPLACE / CNRS Photo library

### Who:

H2Pulse offers support to companies in their hydrogen-related projects. The young company uses its 30 test benches as well as the expertise of its senior PhDs and engineers from the Hydrogen Platform in Toulouse, which was established by four local academic research laboratories.<sup>1</sup> H2Pulse benefited from a maturation programme with the Laplace Laboratory (CNRS/Université Toulouse III Paul Sabatier/INP Toulouse), in addition to assistance creating the company provided by the teams of Satt Toulouse Tech Transfer.

### What:

Hydrogen is a highly promising clean energy vector, notably for transportation (aviation, rail, river, road, etc.). To facilitate research in all of these domains, H2Pulse supports industrial actors in their projects, studies, and the creation of components and systems based on hydrogen energy. Its primary areas of expertise are the following:

- Analysis and feasibility studies (for gas and liquid hydrogen);
- Operational training for client applications (theoretical and practical in the form of personalized tests);
- Hybridization, modelling, characterization, and aging of "hydrogen system";
- Assistance in product development (feasibility, design, validation, testing);
- Study and production of testing tools (algorithms, cards, test benches);
- Hydrogen metrology;
- Material studies and software based on specifications.

Website: <https://h2pulse.com>

### For what markets:

H2Pulse's strategy is to transfer to industrial actors the know-how it has acquired over the last twenty years in system design and engineering relating to hydrogen technology. This foundation of skills, embodied by its pool of PhDs and engineers, has already enabled the company to sign contracts with major industrial actors in aeronautics and ground transportation. There is strong demand, bolstered by the national strategy for developing decarboned hydrogen in France, which was recently presented by the government.

**Presented at VivaTech:** modular fuel cells will be on display at VivaTech, as will H2Pulse's services for studying, testing, and diagnosing the hydrogen-related needs of clients.

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<sup>1</sup> The Laboratory on Plasma and Energy Conversion (Laplace, CNRS/Université Toulouse III Paul Sabatier/INP Toulouse), the Chemistry Engineering Laboratory (CNRS/Université Toulouse III Paul Sabatier/INP Toulouse), the Toulouse Institute of Fluid Mechanics (CNRS/Université Toulouse III Paul Sabatier/INP Toulouse), and the Inter-university Material Research and Engineering Centre (CNRS/Université Toulouse III Paul Sabatier/INP Toulouse).



## A mobile solution for producing electricity from hydrogen



© H2SYS

### Who:

H2SYS embodies the successful transition from academic research to the development of industrial solutions. This SMB of twenty people develops and produces hydrogen-powered electric generators, a technology based on the hybridization of a fuel cell that can generate electricity ranging from 1 kVA to 100 kVA in power.<sup>2</sup> Emerging from CNRS research activities focusing on hydrogen energy conducted by the FCLAB research federation in Belfort over the last twenty years, the company was founded in 2017 after a two-year maturation and incubation period for developing its products.

### What:

H2SYS has capitalized on the technological know-how of its founders to offer high-performance fuel cells that integrate all command and control functionalities, as well as hydrogen/electric hybrid solutions for applications in the transportation and electricity production sectors.

Hydrogen fuel cells are increasingly used in the energy and transportation sectors as a complement to battery technology, owing to their better charging time, life cycle, and performance (volume, mass, energy, density).

One of the leading products of H2SYS is the hydrogen-powered electric generator, which has reinvented the electric generator as an ecological, reliable, and silent solution by coupling a fuel cell to batteries.

### For what markets:

- development of hydrogen-powered electric generators
- development of hydrogen-powered electric vehicles

### H2SYS in a few key figures:

- Date founded: 2017
- 20 collaborators
- 1 million euros in revenues in 2020
- 30% of revenues from exports
- Website: <https://www.h2sys.fr/fr>

**Presented at VivaTech:** Hydrogen-powered electric generator. Enter the zero carbon world with the hydrogen-powered electricity generator.

<sup>2</sup>VA, or volt-ampere: unit of measurement for apparent electrical power.

## Connected digital biosensors for the diagnosis and healing of wounds.



© Grapheal

### Who:

Grapheal is a start-up that emerged from research conducted at the CNRS's Institut Néel on the synthesis and electronic properties of graphene, a layer of pure carbon with the thickness of just a single atom. Grapheal develops disposable and connected portable sensors that provide continuous monitoring and diagnosis, especially for treating wounds and conducting diagnoses in the field. To this end, Grapheal has introduced digital biosensing technology as part of embedded systems. By combining a smartphone's connectivity with flexible biosensors, Grapheal developed test bandages and electronic patches. Its aim is to revolutionize diagnosis in the field as well as the remote home monitoring of patients.

### What:

The electrical properties (the manner in which it allows an electric current to flow or not) of graphene change depending on its physicochemical environment; for instance, contact with biological material slightly modifies its behaviour. Grapheal has integrated medical grade monatomic layers of conducting graphene within polymer films to produce flexible and fully biocompatible electrodes. The start-up offers Woundlab™, an electronic patch for remote medical monitoring of the healing process for wounds. The wound's biometric parameters are measured and memorized continuously, with no need to open the bandage. The doctor and nurses can thus remotely follow changes in healing, and be alerted at an early stage in cases of infection to prevent further complications.

In the context of the Covid-19 epidemic, Grapheal recently adapted this concept of an embedded sensor to create TestNpass™, a digital antigenic test connected to a smartphone. The idea is to attach an anti-Sars-CoV-2 antibody onto a graphene biosensor. The test sample is then placed on the graphene covered in antibodies, which recognize the Spike protein of the Sars-CoV-2 virus potentially present in saliva. A clinical study is underway at Grenoble Hospital. The test could provide results in less than 5 minutes via a smartphone.

### For what market:

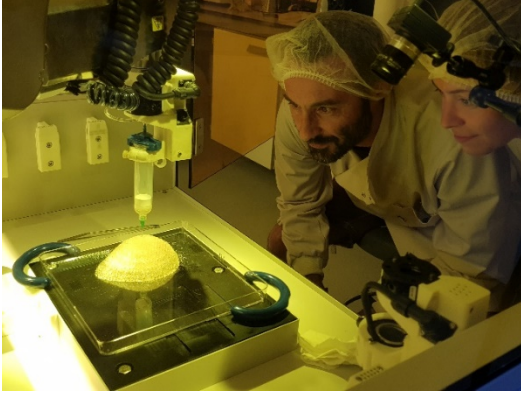
The healing application is designed for patients affected by chronic wounds, including diabetic individuals and the elderly. Thanks to flexible electronics, the measured data is transmitted via smartphone and a telemedicine system to the doctor, nurse, or nursing assistant, who can then quickly intervene in case of infection. The digital biosensing platform can be adapted to multiple other uses, especially the diagnosis of pathogens in the field, home screening tests, bacteriological monitoring of water quality, veterinary uses, etc.

### Grapheal in a few key figures:

- Date founded: April 2019
- Number of employees: 13, including 6 PhDs
- Fundraising: 2 M€
- Website: <https://fr.grapheal.com/>

**Presented at VivaTech:** the Woundlab patch will be presented at VivaTech, along with TestNpass technology.

## Personalized mammary reconstruction using 3D printing



© Healshape

### Who:

Using technologies developed at the Institute for Molecular and Supramolecular Chemistry and Biochemistry – ICBMS (CNRS/Université Claude Bernard Lyon 1), in collaboration with the company LabSkin Creations, the start-up Healshape develops 3D printed solutions for mammary reconstruction that are implantable, adapted to the morphology of each patient, and able to regenerate patient tissue using their own cells. A maturation programme is underway, with support from the Pulsalys Satt technology transfer company.

### What:

ICBMS and LabSkin Creations created and patented a medical-grade implantable "biological ink." The ink's composition and properties are such that it can be printed in 3D, and also promote the increase of human cells and the secretion of tissues. Healshape holds the exclusive licence for the ink's use in the medical field. This technology was initially created to print substitutes for skin (in 2D). The process for the printing of volumes (in 3D) had to be adapted for the Healshape project, as did the development of tissue consolidation after printing, in a manner compatible with implantation within the body.

The start-up is developing its process in two complementary avenues: the development of an industrial process, and the preparation of *in vivo* trials (preclinical).

### For what market:

Each year, two million women worldwide are diagnosed with breast cancer, with 40% of them undergoing a mastectomy. Following the surgical procedure, only a minority of them choose mammary reconstruction, for fear of too many surgeries, medical complications, and unsatisfactory aesthetic results. To meet their expectations, the start-up Healshape has developed innovative mammary reconstruction solutions based on advanced 3D printing technology and tissue engineering: the bioprosthesis is a mould printed in 3D based on the patient's anatomy. Its composition is close to that of human tissue, and allows the cells of the patient's tissue to regenerate. The bioprosthesis is implanted and the patient's cells are reinserted into the bioprosthesis using lipofilling, which enables the natural growth of the fatty tissue and the total absorption of the bioprosthesis. Thanks to this simple operation, the patient will regain their breast as it was in just a few months.

### Healshape in a few key figures:

- Date founded: January 2020
- Number of employees: 4
- Website: <https://healshape.com/>

**Presented at VivaTech:** an example of a 3D printed implant.

## Connected sensors for a real-time "pollen forecast"



© Lify-Air

### Who:

The start-up Lify-Air has developed, with the Laboratory of Physics and Chemistry of the Environment and Space (CNRS/Cnes/Université d'Orléans), connected and intelligent pollen sensors that can detect and predict peaks in pollen. It was supported by CNRS Innovation's RISE programme.

### What:

Individuals allergic to pollen currently receive information that is solely based on predictive models, or on data that is a few days old. Today pollen measurements are conducted by sensors whose readings are gathered manually each week. Lify-Air has brought to market the first real-time pollen information solution, based on an innovative and patented sensor as well as artificial intelligence algorithms. This solution can detect, count, and distinguish between the 25 most problematic pollens for health, as well as inform allergic individuals during the asymptomatic phase of their illness so that they can adapt their treatment appropriately. This solution allows everyone to know the level and type of pollen present at any time in the sensor's environment.

### For what markets:

It is estimated that 25% of the world's population is allergic to pollen, with this number likely to rise to 50% by 2050, notably due to the impact of global warming (plant migration, negative synergy between pollen and pollution, etc.). There is enormous demand today to better examine pollen on the part of local authorities, health services, and public service delegation companies.

### Lify-Air in a few key figures:

- Date founded: 8 November 2018
- Number of employees: 9
- Website: <https://www.lifyair.com/>

**Presented at VivaTech:** One of Lify-Air's sensors will be presented at VivaTech, along with the measurements of a sensor installed in Orléans.

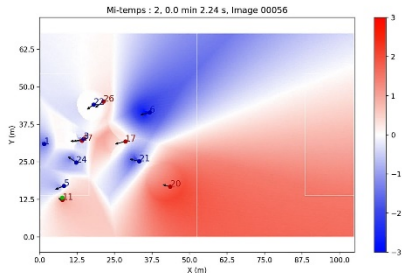
## The hidden aspects of professional football teams



Manchester City - Paris Saint-Germain



Champions League Semifinal 04/05/21  
1-0 Goal - SportsDynamics Dynamical Map  
Kevin De Bruyne's dynamical zone and advanced time before the pass.



© SportsDynamics

### Who:

SportsDynamics, a start-up that grew out of research in the physics of motion, specializes in sports analytics. Supported by CNRS Innovation's RISE programme, it was incubated at Agoranov, a leading French incubator. The company, which was created in November 2019, holds an exclusive licence for the patented technology developed by its co-founder Vincent Bacot as part of the LadHyX Laboratory (CNRS/École Polytechnique). SportsDynamics provides dynamic and innovative indicators of sports performance, and is initially intended for professional football clubs.

### What:

"The most important thing in a football match is what each player is doing during the 87 minutes he does not have the ball." This adage aptly sums up the vision of SportsDynamics, whose algorithm reveals the spaces and opportunities created by players thanks to data analysis of ball and player position. SportsDynamics launched its platform *GaTa* in March 2021, with two objectives: providing coaches and analysts with the ability to personalize their dynamic indicators based on their conception of the game, and adapting their operating data and visualization files to their working process. SportsDynamics aims to provide the most accurate dynamic data and the most personalizable product on the market.

### For what markets:

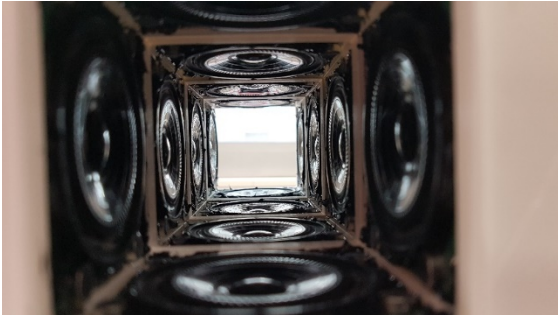
The scientists of SportsDynamics conducted hundreds of interviews with experts—players, coaches, analysts, and sports journalists—in an effort to understand the needs connected to the game's dynamic aspects, and to define the relevant indicators corresponding to real opportunities. They then conducted full-scale tests with very high-level clubs. The start-up also plans to offer a genuine simulation tool that will generate situations to show players the relevant actions to take. In the long term, SportsDynamics plans to expand to other sports, and to offer its services to sports media as well as sports betting and gaming operators, who will have the means to objectify their match analyses and improve their predictive models.

### SportsDynamics in summary:

- Founded: 2019.
- Based at Agoranov, the public research incubator located in Paris.
- Number of employees: 6.
- First clients in the German Bundesliga (German football championship) in 2020.
- Website: <https://sportsdynamics.eu/>

**Presented at VivaTech:** A situational analysis of real matches thanks to the *GaTa* platform for coaches and analysts by SportsDynamics.

## An electronic material that absorbs sound in open environments



© Vibiscus

### Who:

Vibiscus aims to combat one of the major health risks of the 21st century: noise. Stemming from 15 years of research at the CNRS, its unique patented technology consists of a sound-absorbent electronic material operated by artificial intelligence. Energy-efficient, compact, and versatile, it guarantees noise reduction even in low frequencies and open spaces, unlike passive solutions based on "anti-noise." It is supported by CNRS Innovation's RISE program.

### What:

Noise negatively impacts everyday life for many people, whether it is at home, on the road, or at work, with an impact on health. New standards and technological proposals emerge each year to contend with this major social challenge. Vibiscus products absorb noise in open and closed spaces, and ensure a gentle and comfortable acoustic environment for the user, one that can be personalized based on an individual's needs or desires (concentration, creativity, rest, etc.).

### For what markets:

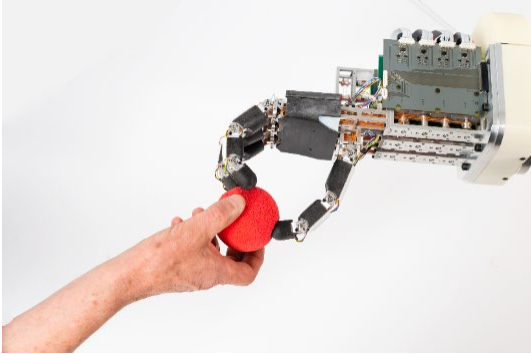
The impact of noise on health is estimated at 16,600 premature deaths per year, with over 32 million people being bothered by noise, and 13,000 children having their learning capacities altered due to noise exposure. Vibiscus targets B2B markets in which noise must be managed in open spaces. Target clients are owners of office and residential buildings, along with hotels and leisure centres.

### Vibiscus in a few key figures:

- Date founded: 2021
- Number of employees: 2

**Presented at VivaTech:** a life-size demonstration of an air vent solution.

## The robotic hand by RobiOSS



### Who:

The robotics research conducted by the RobiOSS team at the CNRS's Pprime Institute focuses on manipulation and collaborative robotics, humanoid robotics, and mechatronic system design.

© Cyril FRESILLON / Pprime / CNRS Photo library

### What:

With its four fingers each with four joints, the robotic hand developed by the CNRS's Pprime Institute can grasp objects of various forms and subtly manipulate them with ease, such as screwing and unscrewing a plastic cap. Thanks to the coordinated movements of its fingers, it is the only robotic hand in France that can manipulate an object once it has been grasped and ensure an accurate trajectory with no fits and starts. There are only a few hands worldwide that can manipulate an object with such precision, mostly in Germany. It was the subject of a patent by the CNRS.

### For what uses:

The objective of this robotic hand, one of the world's most skilful, is to match the gripping capacities of a human hand. In their sights is the factory of the future, where humans and robots will work together. One advantage of the RobiOSS hand is that it can assess the effort required to grip an object, thereby allowing it to adapt to a wide range of tasks, as opposed to industrial robots, which are generally highly specialized.

The RobiOSS robotic hand will soon be marketed as part of technology transfer in connection with CNRS Innovation's RISE programme.

**Presented at VivaTech's digital space:** video demonstrations of the RobiOSS hand.

## Continue your journey with the CNRS at VivaTech

- **Actronika: enriching human-machine communication through the sense of touch**

The haptic system developed by Actronika produces dozens of different tactile sensations. It was designed to be integrated in virtual reality systems, connected objects, vehicle cockpits, and laboratory instruments.

**Laboratory:** Institute for Intelligent Systems and Robotics (CNRS/Sorbonne Université)

**Located at:** the LVMH stand (Hall 1 - H22-001)

- **Adagos, for parsimonious artificial intelligence**

Adagos has developed a new form of artificial intelligence based on parsimony, allowing for much better predictions with far less training data. Its technology can reduce, by multiple orders of magnitude, the resources needed for machine learning methods, including energy.

**Laboratory:** Toulouse Mathematics Institute (CNRS/Insa Toulouse/Université Toulouse III – Paul Sabatier)

**Located at:** the AD'OCC - région Occitanie stand (Hall 1 - D01-008)

- **Aqemia: artificial intelligence and theoretical physics in the search for new drugs**

Aqemia has developed a digital platform for generating therapeutic molecules by combining artificial intelligence and theoretical physics inspired by quantum technology. Aqemia's objective is to identify drug candidates in a replicable manner, both in collaboration and independently.

**Laboratory:** Laboratory for the Selective Activation Processes Through Single-Electronic and Radiation Energy Transfer (CNRS/ENS – PSL/Sorbonne Université)

**Located at:** the Sanofi stand (Hall 1 - D09-012)

- **Arskan expert in the mobile visualization of massive 3D data**

Arskan develops gradual compression/decompression technologies that can generate complex 3D worlds without constraints or loss, as well as interactive, collaborative, and real-time digital twins connected to all kinds of databases (IoT, software, AI, multimedia, etc.). Its fields of application are maintenance, security controls, and training or assistance for the perfect gesture.

**Laboratory:** Computer Science Laboratory for Image Processing and Information Systems (CNRS/Insa Lyon/Université Claude Bernard Lyon 1/Université Lumière Lyon 2/École centrale de Lyon)

**Located at:** the région Auvergne-Rhône-Alpes stand (Hall 1 - L10-002)

- **BeFC: a glucose bio-battery**

BeFC offers an enzymatic glucose-based bio-battery that produces electricity from sugar via bioelectrocatalysis. This environmentally-friendly energy solution is already capable of powering an electronic chip equipped with a humidity and temperature sensor, as well as a transmission and Bluetooth system.

**Laboratory:** Department of Molecular Chemistry (CNRS/Université Grenoble Alpes)

**Located at:** the BNP Paribas stand (Hall 1 - F36-024)

- **Ciloa targets viruses and tumours with new therapeutic agents**

Ciloa develops new generation therapeutic vectors and natural vaccines based on exosomes.



**Laboratory:** Laboratory of Pathogen Host Interactions (CNRS/Université de Montpellier)

**Located at:** the Sanofi stand (Hall 1 - D09-012)

- **Damae Medical, toward diagnosis of cutaneous tumours without a biopsy**

Damae Medical has developed a quick and non-invasive diagnosis technology for skin cancer using optical imaging.

**Laboratory:** Charles Fabry Laboratory (CNRS/Institut d'optique Graduate School)

**Located at:** the Dassault systèmes stand (hall à compléter)

- **EVERZOM, bioproduction of exosomes**

EVERZOM has developed an innovative process for the bioproduction of exosomes for therapeutic applications in regenerative medicine. It was co-founded by Amanda Silva Brun, the recipient of the 2021 CNRS Innovation Medal.

**Laboratory:** Matter and Complex Systems Laboratory (CNRS/Université de Paris)

**Located at:** the région Ile-de-France stand (Hall 1 - E41-005)

- **GreenSysTech develops IoT solutions for smart cities, smart farming, and logistics**

GreenSysTech (GST) develops smart, autonomous, and high-precision IoT sensors for actors in smart cities, smart farming, and logistics. Intended for private companies and local governments, their sensors are used to detect and anticipate risks of frost or fire, optimize rubbish collection, and automate the supervision of agricultural or industrial silos.

**Laboratory:** CNRT – Materials (CNRS/Ensicaen/Université Caen Normandie/Université le Havre Normandie)

**Located at:** the Orange stand (Hall 1 - H10-041)

- **Learning Robots and its educational robot AlphaI**

Learning Robots markets the educational robot AlphaI to teach artificial intelligence to young children. The robot can assimilate tasks for which it was not programmed. Its goal is to teach the mechanisms of machine learning and to demystify AI with both the young and the old.

**Laboratory:** Paris-Saclay Institute of Neuroscience (CNRS/Université Paris-Saclay)

**Located at:** the région Ile-de-France stand (Hall 1 - E41-005)

- **MABSilico accelerate the discovery of therapeutic antibodies thanks to artificial intelligence**

MABSilico is a software publisher that uses solutions combining artificial intelligence and machine learning to accelerate the development of therapeutic antibodies. It provides computing tools to help map epitopes, predict undesirable effects, propose replacement antibodies, and identify the therapeutic target. The discovery phase for antibodies is thereby reduced to a few days instead of a few months, as with more traditional laboratory-based approaches.

**Laboratory:** Physiology of Reproduction and Behaviour (CNRS/Inrae/Université de Tours/Institut français du cheval et de l'équitation)

**Located at:** the Sanofi stand (Hall 1 - D09-012)

- **Olisens: real-time quality control for water**

Olisens designs new generation sensors that can extract an electronic signature for a liquid in real time for comparison with other signatures, with many promising applications in water quality control and industrial process control for industry 4.0.

**Laboratories:** Lyon Institute of Nanotechnology (CNRS/Université Claude Bernard Lyon 1/Ecole centrale de Lyon/Insa Lyon/CPE Lyon) and the Institute of Analytical Sciences in Lyon (CNRS/Université Claude Bernard Lyon 1)

**Located at:** the Véolia stand (Hall 1 - J10-003)

- **Pasqal, cold-atom based quantum processors**

Pasqal specializes in the arrangement of quantum processors based on atoms that are cooled by a laser and trapped in matrices by optical tweezers. It attained 49 qubits in 2018, over 100 today, and is aiming for 1,000 shortly.

**Laboratory:** Charles Fabry Laboratory (CNRS/Institut d'optique Graduate School)

**Present at:** the Région Ile-de-France stand (Hall 1 - E41-005)

- **XScalibur facilitate the modelling and environmentally-responsible management of multicloud**

XScalibur is a software publisher that has developed an interface for modelling and managing resources and services from various cloud providers. It is a two-in-one product that can design and graphically manipulate different cloud environments, as well as manage the state of resources in real time.

**Laboratory:** Research Centre in Computer Science, Signals, and Automatic Control of Lille (CNRS/Université de Lille/Centrale Lille), Inria Spiral team.

**Present at:** the Orange stand (Hall 1 - H10-023)

#### See also:

- Cosmian, (BNP Paribas - Hall 1 - F36-024)
- Domoscio (ManpowerGroup)
- Exotrail (BPI France - Hall 1 - J42)
- GAT (région Nouvelle Aquitaine - Hall 1 - D13-003)
- Inalve (Inria - Hall 1 - D21-004)
- KeeeX (Région Sud - Hall 1 - K14-016)
- Neoclean (AD'OCC - Région Occitanie -Hall 1 - D01-008)
- Wever (Huawei - Hall 1 - K40-002)
- Ynsect (BNP Paribas – Lab)