

This year's Annual Report offers a visual representation of our community.

With a bold colour palette, playful forms, and rich textures, the report seeks to capture the vibrancy and diversity that define us. Each group's unique characteristics are highlighted, yet when viewed together, new meanings and patterns emerge. This approach aims to bring the CR community to life on the page, allowing us to see both its individual and collective identities and to explore the interconnected stories within.

Champalimaud Research 2023

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Foreword

CR Directors

Celso Matos

Champalimaud Experimental Clinical Research Programme

Joe Paton

Champalimaud Neuroscience Programme

Henrique Veiga-Fernandes

Champalimaud Physiology & Cancer Programme

2023 saw significant achievements across our triad of research programmes

— Experimental Clinical Research,
Neuroscience, and Physiology & Cancer

— a testament to the dedication and interdisciplinary approach that defines
Champalimaud Research (CR). Each programme made unique contributions towards advancing our understanding of brain function and the complex interplay between disease and the human body.

The Experimental Clinical Research (ECR) Programme embodies a dynamic interface between clinical disciplines and fundamental research. In 2023, the ECR Programme saw its groups, now numbering ten, reach new levels of maturity. This was a year of consolidation, where varied research objectives were met with innovative methodological approaches, resulting in notable scientific publications, increased competitive funding, and diversified clinical and industrial partnerships.

Our research in 2023 encapsulated the programme's diverse activities and achievements: from making strides in prostate cancer detection and the safe clinical use of Artificial Intelligence to hosting global workshops on cancer research with zebrafish xenografts. Whether advancing our understanding of movement disorders, such as Parkinson's disease, or developing clinically relevant cell therapies, the ECR Programme fostered both internal and external collaborations to achieve CR's broader objectives, as well as embarking on new initiatives such as supporting the recently established doctoral programme for clinical researchers.

In the realm of neuroscience, this year's edition of the CR Symposium was "The Brain within the Body within the World - the Neuroscience of the Self". It touched on topics such as the neurobiology of self-awareness, the role of cognitive maps in navigation, and the gut-brain axis in regulating behaviour. More than 350 onsite participants attended, to hear about the latest results from almost 30 speakers.

The development of The Warehouse, poised to become Europe's first centre dedicated to digital therapeutics, is advancing apace. It plans to tackle chronic brain diseases by integrating fields such as human neuroscience, clinical neurology, neuropsychiatry, artificial intelligence (AI) and immersive technologies. On one hand, it will offer clinical services for enhancing well-being and restoring neurological functions. On the other, it will create a research ecosystem marked by innovation and creativity, with educational resources for future generations. This approach heralds a future where digital solutions significantly improve health outcomes through behavioural interventions.

The Physiology & Cancer Programme welcomed new members with the addition of the Tissue Immunity and Immunoregulation Labs, led by Klaas van Gisbergen and Carlos Minutti, respectively. These new groups fortified our expertise in immunology and explorations at the cancerbody interface. Our scientists secured prestigious international funding for cross-disciplinary projects, affirming the global relevance of our curiosity-driven approach to physiology and cancer.

Collaborations, within and beyond CR, are uncovering important findings, such as how paediatric cancer impacts brain function and the workings of brain circuits affected by injury. The research programme is advancing in established domains, such as the function of extracellular vesicles in cancer, while also exploring new territories, like the role of conventional dendritic cells in activating adaptive immune responses. We were also excited to see the expansion of our Scientific Advisory Board, which now encompasses a broader range of research areas, including cancer, immunology, immunotherapy, microbiology, and cell biology.

Outside the lab, our CR Annual Retreat, set against the backdrop of Serra do Buçaco in the Grande Hotel do Luso, forged connections among more than 250 members from different fields through a mix of scientific presentations and social activities, fostering CR's strong sense of community. For the second consecutive year, we hosted European Researchers' Night, a public event celebrated across Europe, emphasising our commitment to making science more inclusive and accessible to everyone. Nearly 2,000 attendees participated in a range of activities over the course of ten hours.

2023 has been a year of interconnected growth and discovery for CR.

The achievements within each programme not only highlight the individual strengths and innovations of our researchers but also reflect the collaborative and multidisciplinary ethos that propels us forward. Our efforts were further recognised through an increase of €4.5M in external funding relative to 2022, with a substantial portion coming from international sources, particularly the European Commission. As we look to the future, we remain committed to advancing science for the betterment of society, driven by curiosity, community spirit and an unending quest for knowledge.

Champalimaud Foundation



Leonor Beleza President

João Silveira-Botelho Vice-president The programmes that make up Champalimaud Research (CR) constitute a large group of scientists (PIs, postdocs, doctoral students), support units, and laboratory and equipment technicians, who come together in an ecosystem that they call a community. As a research organisation, the Champalimaud Foundation (CF) invests its resources with the aim of making original scientific contributions to the fight against disease.

CR is currently divided into three groups. The first two focus on the areas of neuroscience and cancer, and are largely dedicated to basic research. The third covers applied science at the interface of clinical practice and research. All three groups are financed primarily by the Foundation itself, as well as by various external sources of national and international scientific funding. Of these, the European Union is the most relevant.

Alongside our CR programmes, we have multiple initiatives related to the clinic. These are based on the clinical units and services, which enrich all aspects of our work.

The new project of digital therapies for brain diseases ("The Warehouse") brings our neuroscience work into the clinical arena. This initiative involves exploring the capabilities of artificial intelligence to contribute to our goal of transforming innovation into solutions.

Following the path of "fusion research" requires us to overcome various obstacles along the way. This leads us to reorganising our work in a way that gives researchers and health professionals an increasing sense of sharing common goals.

The year 2023 was very intense in terms of achievements by our researchers, as is clear from reading this report. It is also fair to say that the year was important in seeking new ways of strengthening our community and the feeling of belonging to a shared adventure. CF is very proud of the quality of its researchers and their science.

Structure

Champalimaud Foundation (CF)

Ombudsperson

Champalimaud Centre for the Unknown (CCU)

Champalimaud Clinical Centre (CCC)

Champalimaud Research (CR)

Scientific & Technological Platforms

Advanced Biolmaging

Rodent

& Biooptics Experimental
Biophotonics
Fish
Flow Cytometry
Fly
Glass Wash & Media Preparation
Hardware & Software
Histopathology
Molecular & Transgenic Tools
Multimedia

CR Support Units

Communication,
Events & Outreach
CR Managing Direction
Graduate Programme Office
Health & Science
HR & Fellows Support Office
Lab Administration
Operations
Post-Award
Strategic Research Development

Direction team

Experimental Clinical Research groups

Cancer Development
& Innate Immune Evasion
Computational Clinical Imaging
Immunotherapy / ImmunoSurgery
Molecular & Experimental
Pathology
Myeloma Lymphoma Research
Neural Circuits Dysfunction
Neuropsychiatry
Ocular Low-cost Gene Therapy
Preclinical MRI
Radiopharmacology

Physiology & Cancer groups

Cancer Dormancy & Immunity
Cancer & Stem Cell Biology
Immunophysiology
Immunoregulation
Stem Cells & Regeneration
Systems Oncology
Tissue Immunity

Education

Direction
Coordination
Teaching Lab
Education & Courses

Neuroscience groups

Behaviour & Metabolism

Behavioural Neuroscience
Circuit Dynamics & Computation
Cortical Circuits
Learning
Mathematics of Behaviour
& Intelligence
Natural Intelligence
Neural Circuits & Behaviour
Neural Dynamics
Neuroethology
Sensorimotor Integration
Systems Neuroscience
Theoretical Neuroscience
Vision to Action

Research associates

Computational Cognitive
Decision Science
Development of Neural Circuits

Innate Behaviour

Neural Circuits for Visuomotor Behaviour

Adjunct & visiting scientists

Cognitive-Motor Interface Social Neuro Endocrinology

Graduate Programme SAB *

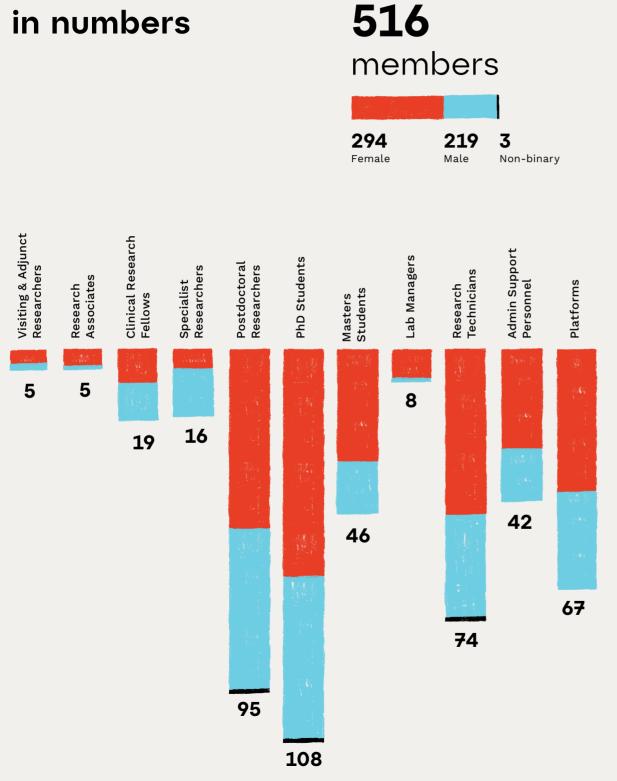
CF SAB *

^{*} The Scientific Advisory Boards (SAB) consist of external scientists who provide helpful guidance to CR Programmes and Research Groups.

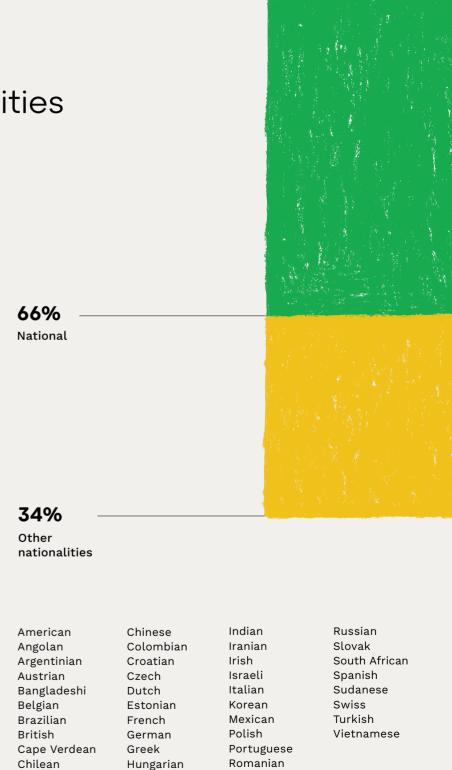
CR community in numbers

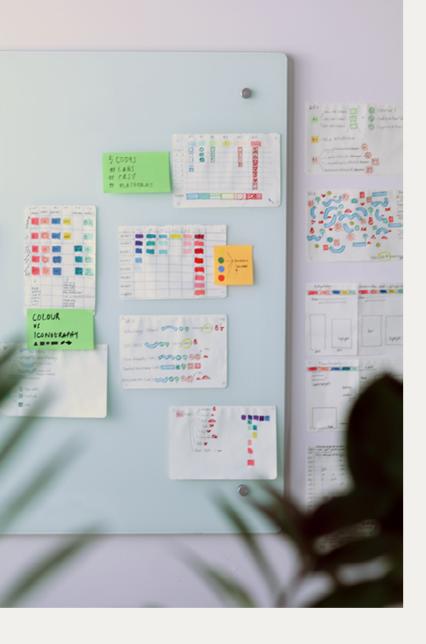
Group Leaders

31



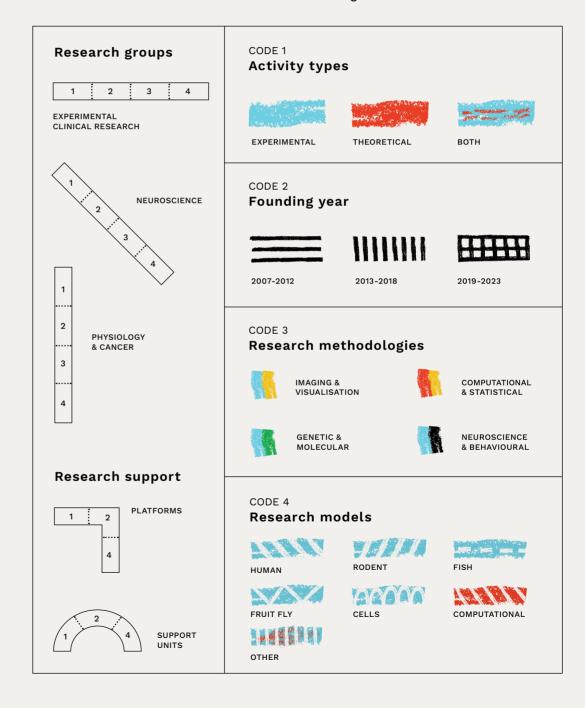
38 nationalities

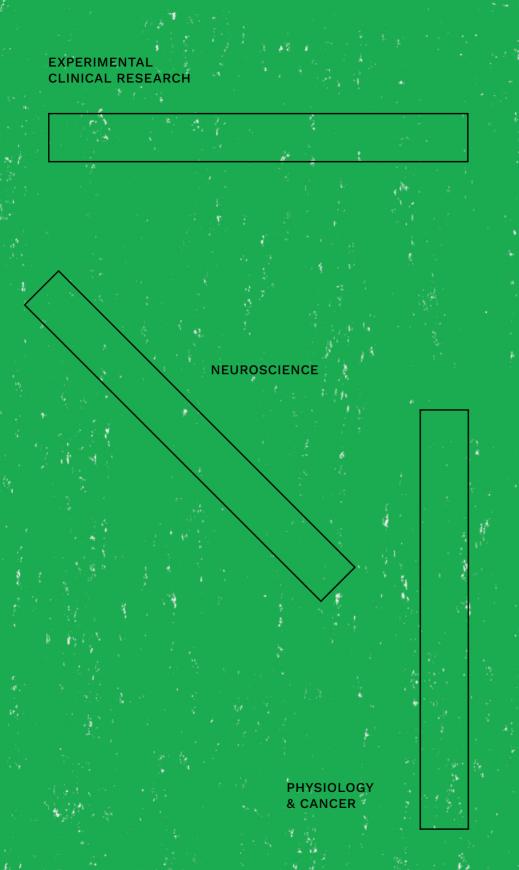




Crack the code

From here on, we will use shapes and colours to graphically represent key aspects of our community. These visual elements offer a creative interpretation of the features and characteristics of our labs, platforms, and support units. If you ever feel lost, return to this page for guidance.





research

groups

Champalimaud Research integrates three programmes: Experimental Clinical Research Neuroscience Physiology & Cancer

Each programme comprises groups of scientists and students conducting basic, clinical and/or applied research, often in collaboration with other groups at the Champalimaud Foundation or beyond.

FIOR LAB

Cancer Development and Innate Immune Evasion



Experimental

2019

Zebrafish xenografts Immunofluorescence In situ hybridisation Confocal and light-sheet microscopy Single-cell RNA sequencing Zebrafish

Our lab uses the zebrafish avatar model as a platform for personalised medicine and discovery of innate immune mechanisms and modulators for cancer immunotherapy



Principal investigator Rita Fior

Lab manager Bruna Costa

Postdoctoral researchers Bruna Costa Marta Estrada Raquel Mendes Vanda Póvoa

PhD students

Ana Beatriz Machado Cátia Almeida

MSc students

Salvador Ferreira Sara Cardoso

Lab technicians

Filipa Amorim Márcia Fontes

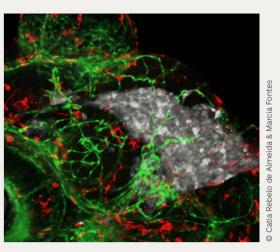
Highlights

Our lab was honoured with the Cancer Research Institute (CRI) Impact Award and received funding from the Liga Portuguesa contra o Cancro through the LPCC-Terry FOX grant, recognising our contributions to cancer research.

Due to overwhelming interest, we hosted two editions of the "Handson Zebrafish Xenograft course," attracting international participants from Europe, the US, Brazil, Dubai, and India. The course focuses on using zebrafish xenografts with human cancer cell lines.

With the help of Alexandre Azinheira (Multimedia Platform), Marta Correia and Hedi Young (Communication, Events and Outreach team), we also produced a movie to introduce our upcoming clinical trial to a broader audience, including patients, clinicians, and philanthropists.

In addition, our lab members participated in various outreach activities, including European Researchers' Night, Ciência di Noz Manera, and Neuronautas, demonstrating our commitment to science communication and outreach.



A glioblastoma zebrafish xenograft (tumour cells in white, blood vessels in green, macrophages/microglia in red and cell nuclei in grey).

Our lab focuses on advancing personalised cancer treatments and understanding cancer-immune system interactions. We aim to eliminate the trial-and-error approach in cancer therapy by developing the zebrafish xenograft model (zAvatar), a rapid *in vivo* test offering exceptional cellular detail. This model promises to refine existing treatments, potentially revolutionising care for many patients.

Additionally, we investigate how cancer cells evade or manipulate the body's innate immune system. By exploring these interactions with the zAvatar model, we aim to develop therapies that adjust the innate immune response and integrate them with immune checkpoint blockade (ICB) therapies, mobilising both components of the immune system against cancer.

PAPANIKOLAOU LAB

Computational Clinical Imaging



Experimental Theoretical

2017

Al models for medical

Humar

Develop AI systems to enhance outcomes for cancer patients, support healthcare providers, and improve healthcare systems, while offering education on the safe clinical application of AI research



Principal investigator Nikolaos Papanikolaou

Postdoctoral researcher José Almeida

Radiologist Raquel Moreno PhD students

Ana Carolina Rodrigues Ana Sofia Castro Verde Nuno Rodrigues

MSc student

Teresa Sotto Mayor

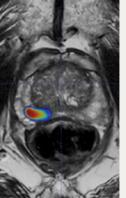
Research technician Miguel Chambel

Highlights

Our lab made strides in prostate cancer detection and management through the ProCancer-I Europeanfunded project. We developed and validated advanced AI models using deep learning and radiomics techniques. Utilising the largest prostate cancer imaging data repository, which includes 12,000 mpMRI examinations and over 6 million image representations of the prostate in both normal and diseased states, we trained nnU-net models. These innovative models can automatically segment and pinpoint prostate cancer lesions in multi-parametric MRI images.

Our efforts were recently recognised by the European Commission, with our models being selected for inclusion in the pan-European EUCAIM platform, a project we are partners of. This selection marks a major milestone for our lab.

Moreover, we created and successfully tested models that combine radiomics and clinical data to non-invasively predict the aggressiveness of prostate cancer in over 4,000 patients. This breakthrough has the potential to revolutionise therapeutic decision-making, offering a more personalised approach to treatment. Our findings were showcased at various international meetings, including RSNA, ECR, ESGAR, and IEEE. We also organised a 2-day consortium meeting for the ProCancer-i project at the end of June 2023, and in collaboration with the International Society of Cancer Imaging, we hosted an international AI meeting.





After a detection model found a high probability of aggressive disease in a patient, another AI model outlined the prostate gland and radiomic features were extracted to predict clinically significant disease. A biopsy confirmed an aggressive tumour, validating the AI's prediction.

Our group specialises in computational medical imaging, integrating imaging features with clinical data to advance oncology research. Using machine learning, we identify key features to address cancer research questions. Our AI models focus on automatic tissue and lesion segmentation, early disease detection, and predicting disease recurrence risk. We collaborate internationally with clinical partners across the UK, France, Italy, Denmark, Sweden, Greece, and Brazil, enriching our research with diverse data.

We are active in major research initiatives like ProCancer-I and EUCAIM, a pan-European cancer imaging data repository. As founding members of FUTURE AI, we set guidelines for safe AI use in clinics and enhance AI model fairness and explainability.

We also work on improving clinical AI infrastructure and communication. By developing large language models, we aim to present AI predictions in a user-friendly way, making complex AI insights accessible for practical healthcare applications.

MAEURER LAB

Immunotherapy / ImmunoSurgery



Experimental

2018

Cell culture RNA & DNA Sequencing Flow cytometry Cell-cell interaction analysis Computational techniques Live-cell imaging Genetic engineering

Ex vivo human

Engineering of smart anti-tumour-directed immune cells



Principal investigator
Markus Maeurer

Quality control manager Cristina Afonso

Postdoctoral researchers Carolina Gorgulho Joana Lérias Senior molecular specialist Dário Ligeiro

Pharmacist Bernardo Marinheiro

Clinical pathologist Leonardo Lordello

Genetic engineers Karina Balan Vitaly Balan **Bioinformatician** Eric de Sousa

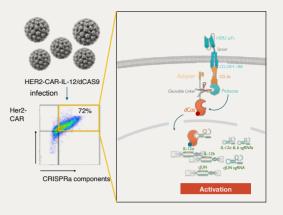
Technicians Jéssica Kamiki Patrícia António Rodrigo Eduardo Sara Cascais

Visiting student Matilde Sedas

Highlights

We reached a pivotal agreement under which Champalimaud Foundation (CF) is now the sole licensee of a comprehensive portfolio of synthetic biology engineering applications from Stanford University, spanning all therapeutic fields. CF further solidified its position in developing and implementing clinically relevant cell therapies, acquiring a patent portfolio from Refuge. This resulted in clinically relevant partnerships i.e. the CF licences the synthetic biology platforms to Kite, a Gilead Company, to develop potential treatments for patients with blood cancer, under the licensing agreement announced by Refuge and Kite in October 2022.

Synthetic biology engineering allows for the precise genetic and epigenetic manipulation of cells: this technology opens the door for the creation of "smart" Advanced Therapeutic Medicinal Products (ATMPs) capable of responding more effectively in cancer tissue to achieve a clinically relevant and long-lasting anti-cancer-directed immune response. The potential of these treatments is significant, offering improved efficacy and safety, most likely in combination with existing standard therapies. We also welcomed several experts in immunotherapy and are particularly honoured to receive guidance from Prof. Christoph Huber who joined us as the lead scientific advisor in cell therapy development.



Developing smart technologies in genetic engineering of immune cells: a flow cytometry example of gene transfer to enhance immune cell function.

We focus on achieving the accreditation of the GMP facility at CF, guided by an international expert panel, a prerequisite for any operational activity in cell therapy. In parallel to the robust expansion of anti-cancer-directed T-cells from tumour tissue, CF secured licences and IP to enhance cell products in order to create safer and potentially more effective therapies for future phase I clinical trials for patients with solid cancer. These efforts resulted in the development of a first anti-Her2 CAR / IL-12 cell product candidate in fall 2023. The gene-modified cells are able to target a protein associated with cancer cells (Her2) and produce a cytokine (IL-12) upon tumour recognition, with the aim of changing the environment within the tumour tissue to facilitate longterm anti-cancer immune responses. This project, along with other clinical product developments, continues to progress with strong international partnerships.

CASTILLO-MARTIN LAB

Molecular and Experimental Pathology



Experimental

2017

Immunohistochemistry Immunofluorescence Multispectral microscopy Digital pathology Human biological samples

We investigate molecular signatures in cancer and its microenvironment to identify new biomarkers that enhance patient outcomes



Principal investigator Mireia Castillo-Martin

PhD student Andreia Maia

MSc students Ana Soares Andreia Lopes Hasti Calá Visiting scientists Filipe Maia Inês Pontinha

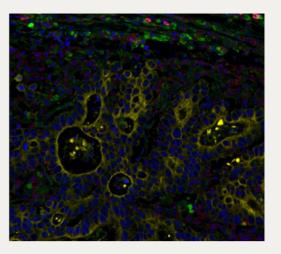
Highlights

Our two Master's students presented their thesis data at several conferences, including the Pasteur International Cancer Conference in Paris and the III ASPIC-ASEICA International Meeting on Cancer Immunology, Tumor Microenvironment, and Metastasis in Porto. We are currently in the process of drafting scientific articles based on these projects' findings.

Andreia Maia, concluding her PhD, undertook a second nine-month internship at the Dana-Farber Cancer Institute in Boston, under Dr. Romee's mentorship in the NK Cell Manipulation and Therapy laboratory.

In collaboration with Prof. Paula Videira from NOVA Medical School, we welcomed a Master's student into our lab. This student is mastering immunohistochemistry techniques to study the expression of sialyl-Tn in pancreatic adenocarcinoma, including both naïve and post-treatment tissues, as well as in precursor lesions like Intraductal Papillary Mucinous Neoplasm (IPMN) and Pancreatic Intraductal Neoplasm (PanIN) across various histological types and grades.

Additionally, Mireia Castillo-Martin engaged in outreach through the Ciência di Noz Manera (Science our Way) programme, bringing science to 8th graders at Escola Secundária José Azevedo Neves in Amadora, an underserved community near Lisbon.



Through multispectral microscopy, we can count and analyse the distribution of various cell types within human cancer tissues. Cancer cells are labelled in yellow, while inflammatory cells in the tumour microenvironment are distinguished by different colours: T lymphocytes in red, NK cells in green, cytotoxic NK cells in orange, and activated NK cells in purple.

Our research team has advanced the development of new multiplex immunofluorescence techniques to examine how various immune cells are spatially arranged within the tumour environments of several solid cancers, including colorectal, pancreatic ductal adenocarcinoma, and prostate cancer.

JOÃO LAB

Myeloma Lymphoma Research



Experimental

2019

Flow cytometry Genomics Proteomics Cell cultures Human Mouse Cell lines

Our lab, a collaboration between clinical haematologists and nonclinical researchers, conducts extensive research, primarily on Multiple Myeloma, to advance treatment of lymphoid cancers



Principal investigator Cristina João

Postdoctoral researchers Ana Queirós Bruna Ferreira Emilie Carneiro **PhD students** Filipa Barahona Joana Caetano

Raquel Lopes

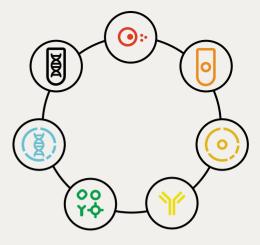
MSc students Catarina Carvalho Jéssica Rodrigues Madalena Grenhas **Technician**Diana Lourenço

Highlights

In 2023, our lab showcased its research with 18 presentations at key conferences, including kevnote lectures at major haematology meetings in Viseu and Porto, and significant contributions to international gatherings like EHA2023 in Frankfurt and the 65th ASH Annual Meeting in San Diego. We expanded our knowledge through participation in advanced immunology and flow cytometry courses and welcomed two new Master's students, Catarina Carvalho and Jéssica Rodrigues. New collaborations were established with experts from the Mayo Clinic in the US.

The lab's group leader Cristina João was appointed to the Board of Directors of both the Portuguese Group of Multiple Myeloma and EuroFlow, named Secretary of the Assembly for the Portuguese Society of Hematology, and awarded the 2023 Portuguese Woman in Science by FCT. Our lab co-authored six publications, with a highlight being the first national treatment guideline for Multiple Myeloma in Portugal.

Additionally, our members actively engaged in organising and participating in the 1st National Meeting on Multiple Myeloma, the 2023 Champalimaud Research Retreat, the mentoring programme Ciência di Noz Manera, and European Researchers' Night.



Advancing accessible precision medicine: this image shows our work in refining clinical decision-making through minimally invasive methods. By integrating data on tumour biology and microenvironment, we aim to tailor cancer care, enhancing treatment efficacy and resource allocation.

Our lab focuses on Multiple Myeloma (MM) and mature B-cell Lymphomas, the second most prevalent types of blood cancer, emphasising four key areas:

- 1. Identifying biomarkers for Monoclonal Gammopathy of Undetermined Significance (MGUS) and MM diagnosis using liquid biopsies to analyse circulating DNA, tumour cells, proteins, and immune profiles;
 2. Developing novel therapies for MM and Lymphoma targeting the bone marrow
- microenvironment, using mouse models and a 3D organoid drug screening platform; 3. Studying the role of neuronal signals in MM progression and their effects on MM cells
- and natural killer (NK) cells within the bone marrow, aiming to improve patient outcomes and suggest new treatment approaches;
- 4. Enhancing Lymphoma tumour assessment with advanced imaging techniques.

Our goal is to advance the treatment of mature B-cell malignancies, improve patient care, and introduce innovative therapies, providing practical insights for haematologists and deepening understanding of the tumour microenvironment.

ALVES DA SILVA LAB

Neural Circuits Dysfunction



Experimental

2022

Electrophysiology Dopamine transporter imaging Calcium imaging Optogenetics Chemogenetics

Human Mouse

Our main goal is to map movement disorder symptoms to brain circuit dysfunctions and use that information to develop specific circuit manipulations that can reverse these symptoms.



Principal investigator Joaquim Alves da Silva

Lab manager Sofia Marques

Postdoctoral researchers Daniela Pereira Filipa Barros Marcelo Mendonça **PhD student** Pedro Ferreira

MSc students Henrique Barbosa Pedro Coelho Raquel Colucas Research technicians Diana Bernardo Sónia Batáguas Tatiana Saraiva

Highlights

Our lab continued to make progress in researching the pathophysiology of movement disorders in Parkinson's disease and the striatal circuit changes in dystonia. We secured competitive funding from the Dystonia Medical Research Foundation, enabling us to delve deeper into the dysfunction of neural circuits in dystonia.

We played a key role in organising two symposia at the FENS Regional Meeting in Algarve, focusing on animal models of movement disorders and the clinical application of brain stimulation tools for circuit disorders.

Our collaborations with the Nuclear Medicine and Neuropsychiatry Groups were strengthened, enhancing our clinical research on Parkinson's disease. We welcomed a new Master's student and two technicians to our team. One student successfully defended his Master's thesis, and a lab member received a competitive PhD scholarship.

Our contributions to scientific meetings earned two awards: the Innovate Competition award at the iMed Conference 15.0 and Best Oral Communication at the Portuguese Movement Disorders Society.

Outreach was also an active area, with team members participating in European Researchers' Night, speaking at the Young Parkies Portugal association, and leading a Grant Writing Workshop.



Searching for "dystonic" spines in medium spiny neurons: we have developed a method to obtain a complete picture of the neuron components that receive signals from other neurons (the dendrites and their spines). We're using this technique to investigate changes in these structures potentially linked to dystonia.

Our understanding of the environment, memory recall, and emotion regulation is facilitated by the processing of information across various brain circuits. This delicate balance can be disrupted by brain disorders, where symptoms reflect disturbances in specific neural circuits. Even the loss of a single neuron group can trigger widespread changes across different circuits, manifesting as varied symptoms.

Our research group adopts a systems approach to investigate brain circuit dysfunctions, particularly focusing on movement disorders like dystonia and Parkinson's disease. By studying both clinical populations and animal models, we aim to address critical questions. We employ a blend of detailed behavioural analysis, brain imaging, electrophysiology, and optogenetics to uncover the mechanisms by which symptoms arise from disordered motor control circuits.

OLIVEIRA-MAIA LAB

Neuropsychiatry



Experimental

2022

Calcium imaging MRI PET/SPECT Optogenetics TMS Psych/behavioural assessments Psychophysics Human

Cortico-striatal function in health, and dysfunction in disease, in the context of reward-related behaviours



Principal investigator Albino J. Oliveira-Maia

Postdoctoral researchers

Ana Fernandes Elena Zamfir Gabriel Costa Joana Crisóstomo João Duarte Raquel Lemos

PhD students Ana Maia Nelson Descalço MSc students Carolina Quadrado

Carolina Quadrado Francisco Viana

Diogo Melo Jaime Caballero

Technicians

unit collaborators
Bernardo Barahona-Corrêa
Carolina Seybert
Daniel Silva
Gonçalo Cotovio
Isabel Manica

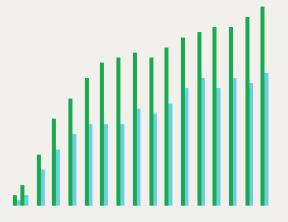
Neuropsychiatry clinical

Jaime Grácio João Estrela José Oliveira Marcelo Mendonça Patrícia Pereira Sílvia Almeida Sofia Marques

Highlights

Our lab members published 20 scientific articles and three book chapters, and delivered close to 120 oral or poster presentations. Those articles published in the New England Journal of Medicine and Nature Human Behavior. leading journals in the field of medicine, were particularly significant. Members also received several prizes, namely the 2022 Distinguished Publication Prize from the Portuguese Society of Psychiatry and Mental Health (Albino J. Oliveira-Maia), the Trainee Poster Award at the 43rd Annual Conference of the National Academy of Neuropsychology in the US (Isabel Manica), and the SPDMov Prize for the Best Work in Basic Science at the 2023 Congress of the Portuguese Society of Movement Disorders (Marcelo Mendonça).

We secured competitive research funds for further development of research work in several areas of interest, Albino J. Oliveira-Maia will receive funding from the European Commission for a study exploring new pharmacological treatments for depression symptoms. Meanwhile, Gonçalo Cotovio has been awarded funding by the Brain and Behavior Research Foundation for research into neuromodulation treatments for obsessive-compulsive disorder. Additionally, Bernardo Barahona-Corrêa will serve as co-PI on a project funded by CaixaResearch Health, focusing on a mechanistic study within neurodevelopmental disorders. Furthermore, the Foundation for Science and Technology granted Diogo Melo and Daniel Silva doctoral fellowships to support their PhD research. Finally, Oliveira-Maia was co-chair of the 2023 Champalimaud Research Symposium.



Patients with treatment-resistant depression treated with esketamine nasal spray exhibited consistently higher rates of remission over a 32-week period than those treated with quetiapine.

The Neuropsychiatry Unit is a joint clinical and research unit, belonging both to the Champalimaud Clinical Centre (CCC) and to CR. The clinical arm of the unit is responsible for care in the areas of mental and brain health. We support patients with cancer treated at other units of the CCC, as well as patients suffering from mood and cognitive issues, obsessive-compulsive spectrum conditions, and movement disorders. The research arm is a human and translational neuroscience laboratory, working at the intersection between psychology, psychiatry, neurology and neuroscience.

Currently, our main focus is centred on the drive to eat, as one of the strongest modulators of behaviour. Specifically, we are interested in understanding the contribution of post-ingestive sensory information about energy content for the processes of food seeking, which we have been studying across several species and paradigms. In rodents, we use optogenetics and deep-brain calcium imaging, while in humans, we use advanced behavioural, cognitive, brain imaging and neurostimulation approaches to study the mind and brain.

SEABRA LAB

Ocular Low-cost Gene Therapy



Experimental

2022

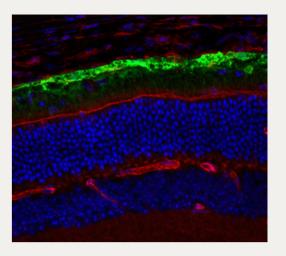
Cell/molecular biology Genome engineering Imaging Flow cytometry Electroretinography Human cell-based

We focus on new affordable non-viral RNA therapies for ocular diseases

Highlights

Our lab embarked on a new project funded to investigate prime editing as a novel gene therapy for ocular inherited diseases, including Choroideremia. We published two papers. The first, in Frontiers in Ophthalmology, reviewed recent advancements in gene editing for Inherited Retinal Diseases (IRDs). The second, an opinion piece, was published in Trends in Molecular Medicine.

Our team expanded with the addition of two new members: Cláudia Carvalho, a Master's student, and Diogo Bruno, a research technician. Luísa Lemos was honoured with the Randy Whellock Award from the Choroideremia Research Foundation, supporting her research into the pathways of the retinal pigment epithelium degeneration in Choroideremia. Additionally, Mariana Castro successfully defended her Master's thesis at NOVA School of Science & Technology (FCT-UNL), becoming our lab's first Master student to do so. Mariana's research focused on in vitro mRNA delivery to retinal pigmented epithelial cells.



Non-viral mRNA delivery to the retina, shown in a mouse retina section with GFP expression (green) in the retinal pigment epithelium. Actin filaments (red) and nuclei (blue) were stained to distinguish the different retinal layers.



Principal investigator Miguel Seabra

Postdoctoral researcher Luísa Lemos

Research scientist
Pedro Antas

MSc students Cláudia Carvalho Mariana Castro

Research technician Diogo Bruno Our group aims to develop low-cost solutions to gene therapy in vision, aiming to make the benefits of this powerful treatment accessible worldwide. Our approach involves adapting mRNA technology to address inherited eye diseases and chronic retinal conditions. By combining the in vitro mRNA system with nanoparticles, we are exploring patient-friendly therapies in the field of ophthalmology.

SHEMESH LAB

Preclinical MRI



Experimental

2014

MRI Optogenetics Electrophysiology Histology Intrinsic optical microscopy Mouse Rat

Harness ultrahigh field
MRI to understand the
mechanisms by which
modifications in tissue
microstructure transcend
globally to modulate
function and behaviour,
and to explore the potential
of these as early disease
biomarkers



Principal investigator Noam Shemesh

Visiting scientist Joana Cabral

Postdoctoral researchers Andrada Ianus Cristina Chavarrias Joana Carvalho Rafael Henriques Sónia Gonçalves Tal Shemesh

PhD students
Carlos Bilreiro
Frederico Severo
Rita Alves
Rita Gil
Ruxanda Lungu
Sara Monteiro

TechniciansFrancisca Fernandes
Renata Cruz

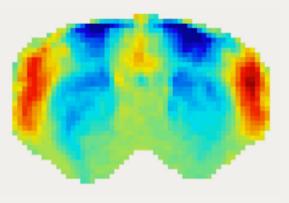
Highlights

In an effort to support open and reproducible research, postdoc Rafael Henriques presented a seminar on Diffusion Imaging in Python (DIPY) at the "MRI Together 2023" workshop, hosted by ESMRMB and available online. DIPY is a collaborative, open-source imaging library that simplifies diffusion imaging analysis.

Postdoc Andrada Janus received recognition for her work with the second prize from Bruker at the International Conference ISMRM 2023 in Toronto. Later, she was awarded an FCT Restart grant for her project on decision-making in rectal cancer treatment, titled "To wait or to operate after neoadjuvant therapy in locallyadvanced rectal cancer: magnetic resonance imaging can provide the answer". Postdoc Joana Carvalho was also nominated for Best Oral Presentation at the ISMRM Brain Function workshop.

The lab engaged in a productive one-day retreat over the summer to discuss overall goals and enhance the integration and transfer of knowledge across our research lines.

In September, Andrada Ianus and Joana Carvalho played a key role in the European Researchers' Night, organising a stand that demonstrated MRI imaging and the principles of electromagnetism to the public. Their interactive display attracted a youthful audience and was met with enthusiasm, marking a successful outreach effort.



This is a still image from a movie obtained from ultrafast fMRI scans, showing how the brain spontaneously synchronises across different areas.

The colours from blue to red represent opposite

We began 2023 by discovering macroscopic intrinsic oscillatory modes in fMRI signals using a novel ultrafast method. These global structures coordinate spontaneous brain activity, prompting inquiries into their biological basis, alterations through brain stimulation, and potential for early detection of brain pathology or neurodegeneration. This aligns with our efforts in mapping conditions such as stroke, gliomas, and neurodegeneration.

We've also advanced research on neurodegenerative diseases and cancer models. Highlights include examining sensory function abnormalities in a Parkinson's Disease mouse model and extensive data collection for an Alzheimer's disease mouse model. We've progressed in detecting precancerous lesions called Pancreatic Intraepithelial Neoplasias (PanINs), with results forthcoming.

Joana Carvalho mapped visual receptive fields in visually-deprived rats using fMRI, yielding remarkable findings in adult plasticity. Additionally, we've refined advanced MRI techniques for better data acquisition and noise reduction, with wideranging applications.

COSTA LAB

Radiopharmacology



Experimental

2018

Image processing/ quantification Imaging biomarkers Statistical methods/ML Radiopharmaceuticals Theragnostic personalised dosimetry Human

To use radiopharmaceuticals to promote better diagnoses, improve prognostication with new biomarkers and develop new treatments to achieve better outcomes for patients



Mathematician Francisco Oliveira

Physicists Mauro Costa Paulo Ferreira Rui Parafita

Radiopharmacist Ana Capacho

Radiochemist Francisco Silva

Nuclear medicine physicians

Ângelo Silva Carla Oliveira (PhD student) Joana Castanheira Ricardo Teixeira Sofia Vaz

Biomedical engineer Cláudia Constantino (PhD student)

MSc students Adriana Raileanu Inês Cardoso Luísa Silva Maria Fortunato Marta Jacques Miriam Sobral

External PhD students Jorge Borbinha, Nádia Canário, Sara Ferreira

Nuclear medicine technicians Ana Canudo, Beatriz Correia, Helena Delgado, Juliana Correia, Mariana Silva, Marisa Machado (PhD student) Miguel Andrade, Rita Oliveira, Sónia Teixeira, Vanessa Santos

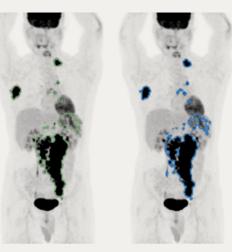
Highlights

Our team members authored or co-authored 12 papers published in international peer-reviewed journals. Additionally, we presented eight peer-reviewed abstracts at two international conferences, EANM 2023 and RSNA 2023.

We are proud to announce the initiation of three new clinical projects, approved by the ethics committee: "FDG-LuCaRad – Predicting primary and secondary lung cancer response to radiotherapy using 18F-FDG PET/CT imaging and machine learning"; "BoneScanDL – Automated identification and segmentation of malignant lesions in bone scans using deep learning"; and "Comparative evaluation of the diagnostic and quantitative efficiency of two PET/CT devices".

Our Nuclear Medicine-Radiopharmacology facilities have been enhanced with two digital state-of-the-art PET/CT systems, one from 2018 and another new one from 2023, bolstering our commitment to clinical and translational radiopharmaceutical imaging research.

Durval Costa was honoured with Life FRSM (Fellow of the Royal Society of Medicine, London, UK) in April 2023. Our team, comprising Luísa Silva, Cláudia Constantino, Francisco Oliveira, and Durval Costa, also secured 2nd place in the Ultra-low Dose PET Imaging Challenge (UDPET) at the IEEE MIC 2023 in Vancouver.



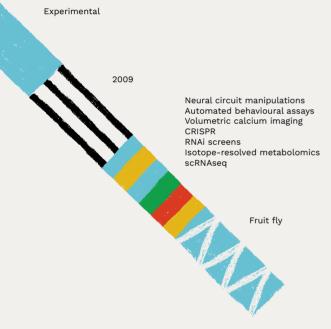
A comparison between a nuclear medicine physician's hand-drawn outlines (left, in green) and automatic outlines created by deep learning technology (right, in blue) of lymphoma lesions in a PET/CT scan using a special tracer, [18F]FDG. This work is detailed in Constantino et al., The Journal of Digital Imaging, 2023.

Our lab maintains a strong partnership with the Nuclear Medicine-Radiopharmacology clinical service, working collaboratively to enhance patient diagnosis, monitor disease progression, evaluate therapy responses, and provide treatment using radiopharmaceuticals-molecules tagged with radionuclides. Our research is dedicated to developing new radiopharmaceuticals and software tools that positively affect patient care within clinical settings. We are also focused on advancing personalised dosimetry in theragnostics, which involves planning and verifying radionuclide therapy effectiveness. In terms of software development, our goals include refining radiation dosimetry related to radiopharmaceutical use and enhancing the processing and analysis of imaging data. This involves creating software capable of classifying and quantifying diseases linked to cellular functional abnormalities.

RIBEIRO LAB

Behaviour and Metabolism

How do nutrients shape brain function, behaviour, and physiology?





Principal investigator Carlos Ribeiro

Lab manager Ana Elias

Postdoctoral researchers Daniel Münch Darshan Dhakan Gili Ezra Ibrahim Taştekin Silvia Henriques

PhD students Dennis Goldschmidt Patrícia Francisco Rita Figueiredo Rory Beresford **Technicians** Célia Baltazar Inês Haan de Vicente

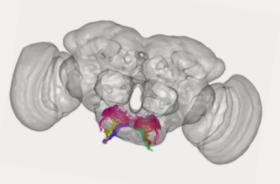
Highlights

We published a preprint on the discovery of a new conserved neuropeptide family we've named "marmite". This research demonstrates how marmite influences feeding behaviours in both flies and mice, shedding light on the genetic underpinnings of feeding across species.

In partnership with the Janelia Research Campus, we also released a preprint on our joint efforts in a comprehensive neurogenetic foraging study. This work pinpointed a key neuron that merges internal nutrient status with external food availability, offering fresh perspectives on the neural computations underlying decision-making in food foraging.

Additionally, our team contributed to an ambitious community project to map the neural wiring diagram of the fruit fly brain, focusing on the gustatory system. This project is crucial for understanding how taste perception impacts feeding decisions and behaviours.

Beyond the bench, our members have been active in the wider scientific and local communities. Our involvement in initiatives like Science on the Walls, the Future of Foraging virtual seminar series, and the Brain-Body Interactions seminar series underscores our commitment to sharing scientific knowledge and fostering collaboration across the scientific landscape.



A map of taste receptor neurons from a female fruit fly's proboscis (mouthpart), illustrating their connections in the brain. Each colour represents nerves from different areas of the proboscis. This work is part of a collaborative project, FlyWire (https://flywire.ai/), to which our lab has made significant contributions.

The food we eat affects all aspects of our lives, including ageing, ability to reproduce, lifespan, mental state and mood. For better or worse, we are what we eat. Yet, how dietary nutrients affect brain function and how the brain controls food choice is still a mystery. What are the neural processes that drive us to choose a pretzel over an apple, or a steak over ice cream? To tap into this problem, researchers have to tackle difficult questions such as "how does the brain know which nutrients the body needs?" and "how is this information translated into decisions?".

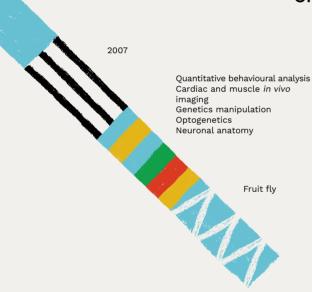
We address these questions using the fruit fly, Drosophila melanogaster, one of the most powerful and versatile genetic animal models currently available. The fly allows us to combine a wide array of tools and approaches. These include genetic circuit manipulations, activity imaging, automated quantitative methods for studying behaviour, microbiome manipulations, and tissue-specific large-scale genetic screens. Team members use this wide array of techniques since it enables them to implement an integrative neuroscience approach, necessary for solving this whole-organism problem.

MOITA LAB

Experimental

Behavioural Neuroscience

We study the rapid physiological and neural changes triggered by external threats that help organisms survive





Principal investigator Marta Moita

Postdoctoral researchers Alexandre Leitão Anna Hobbiss Clara Ferreira Natalia Barrios Ricardo Neto Silva PhD students

Charlotte Rosher Marco Colnaghi Matheus Farias Mirjam Heinemans Violetta La Franca

MSc students Cleusia Manuel Mariana Franco Technicians Ana Eugénio Rui Gonçalves Zara Singh

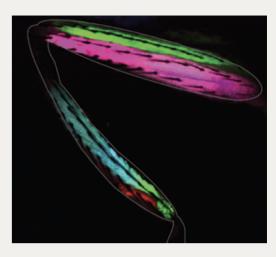
Highlights

Lab member Clara Ferreira became Assistant Professor at Northumbria University, marking a proud moment for us. Mariana Franco defended her Master's thesis with a perfect score of 20/20. Our team grew with the addition of two lab technicians, Zara Singh and Ana Eugénio, and a new PhD student, Marco Colnaghi.

Mariana Franco was recognised with the Best Poster Award at the 9th European Students Conference on Behaviour & Cognition and named Best Alumni at the 15th Workshop on Biomedical Engineering.

Our outreach efforts were particularly active this year. The Science on the Walls project saw Charlie Rosher, Violetta La Franca, and Cleusia Manuel engaging young minds in science, culminating in a two-week summer camp. Additionally, Anna Hobbiss, Ricardo Neto, and Alexandre Leitão contributed to exhibits at the European Researchers' Night at the Champalimaud Foundation, with the goal of making science and education more inclusive.

Moreover, our campaign Conversations with Scientists: Decades of Research for Days of (COVID-19) Vaccines, coorganised by Marta Moita, received the prestigious 2021-2023 Best European Campaign Award from the International Union of Immunological Societies (IUIS) and the European Federation of Immunological Societies (EFIS). Moita also co-chaired the 2023 Champalimaud Research Symposium.



Close-up of a fruit fly's leg, highlighting muscles for walking, flying, grooming, and other actions. Opposing muscle groups bend or straighten the joint, with different colours showing activity at different times. We discovered new muscles in red that are active even when the fly is not moving.

Animals, from fish to primates, freeze when faced with distant or inescapable threats, staying immobile for prolonged periods. In mammals, multiple brain regions are involved in this behaviour, indicating the integration of various information sources. We recently discovered that fruit flies also freeze in response to threats. Using this model, we demonstrated that threatinduced freezing is a distinct internal state, different from spontaneous immobility, as measured by the animal's cardiac activity.

Additionally, we found that freezing is energetically costly, contradicting the belief that it is an energy-saving state. Understanding how contextual cues modulate freezing in flies will enhance our knowledge of survival circuits in the brain. To this end, we study how flies process social and spatial information and how this influences freezing behaviour. With insights into sensory detection of visual looming threats and the neurons involved in freezing, we aim to understand how threat information integrates with environmental cues to guide freezing decisions.

RENART LAB

Circuit Dynamics and Computation

Experimental Theoretical Behaviour Electrophysiology Optogenetics

We are interested in identifying generic computational principles at play during decisionmaking

Postdoctoral researcher Raphael Steinfeld

PhD students Anh Nguyen Juan Castiñeiras Mafalda Valente

Marcel Graetz (Co-Sup. D. McNamee) Naz Belkaya Sofia Freitas (Co-Sup. J. Paton) Tiago Costa (Co-Sup. G. Polavieja)

MSc students João Pimenta Mauro Fernandes

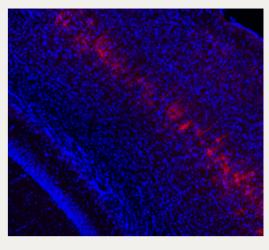
Research technicians Filipe Coutinho Joan Gort Ulysses Tsai

Highlights

Our lab published three research articles. One paper studied foraging decision variables in the mouse brain, another explored the impact of spontaneous cortical state fluctuations on perceptual decisions, and a third introduced the Ratphones, a cost-effective set of miniature headphones for highly controlled sound presentation in freely moving rats.

We received the la Caixa Health Research Grant, amounting to €500K over three years. This collaborative grant, in partnership with Bernardo Barahona-Corrêa from the Neuropsychiatry Unit, will support our research into understanding how sensory intensity is processed in individuals with autism spectrum disorder (ASD) and in animal models of ASD.

Our team welcomed new members this year. Marcel Graetz joined us as a PhD student, under the cosupervision of Daniel McNamee, and João Pimenta came aboard as a new MSc student. Two new research assistants, Joan Gort and Ulysses Tsai, also joined, marking a year of significant growth for our lab.



A band of neurons (in red) in mouse auditory cortex, which have been modified to respond to light. By shining light, researchers can selectively inhibit these neurons to study how this affects the surrounding unmodified neurons (in blue).

Our lab uses both experimental and theoretical approaches to study decisionmaking, using mice, rats, and humans as model systems. This approach enables us to formulate theories based on empirical evidence about basic sensory-guided decisions. Our methods include large-scale electrophysiology, perturbations, quantitative behavioural analysis, and mathematical modelling. The focus of our current research encompasses four main areas:

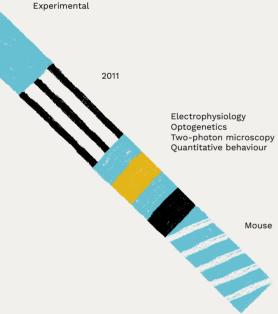
- 1. Understanding the neural basis of decisions related to sensory intensity through psychophysical tasks;
- 2. Employing quantitative behavioural methods to study sensory intensity processing in individuals with autism spectrum disorder and in animal models of the condition;
- 3. Exploring how varying brain-states of engagement or arousal influence decisionmaking;
- 4. Developing mathematical models to understand the interaction between controlled and automatic processes during decision-making, both at the behavioural level and at the level of neural circuits.



PETREANU LAB

Cortical Circuits

We study how the neocortex combines internal knowledge of the world with sensory information to give rise to perception



Principal investigator Leopoldo Petreanu

Postdoctoral researchers Flora Vasile Matthijs Lohuis Rodrigo Dias

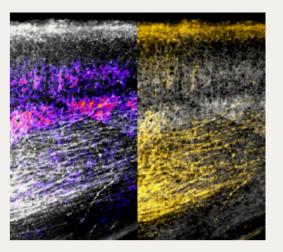
PhD students Beatriz Belbut Radhika Rajan Solene Sautory (Co-Sup. Z. Mainen)

Technicians Gonçalo Ferreira Margarida Beata Pedro Dias

Highlights

Postdoc Camille Mazo's research on the transmission of sound signals from the auditory to the visual cortex was published in bioRxiv. This study discovered that the auditory cortex (AC) communicates information about the location of sounds to the primary visual cortex (V1), enabling the brain to link sounds with their corresponding visual locations. However, the AC does not organise this sound location information in a map-like pattern within V1, suggesting the brain uses a distributed, non-specific way to associate sounds and visuals regardless of their precise spatial alignment.

We also celebrated the PhD defences of Radhika Rajan and Rodrigo Dias. Postdoc Matthijs Lohuis was awarded not just one, but two fellowships (EMBO and Rubicon). Furthermore, Leopoldo Petreanu became Reviewing Editor for the journal eLife and contributed a chapter to the book The Cerebral Cortex and Thalamus.



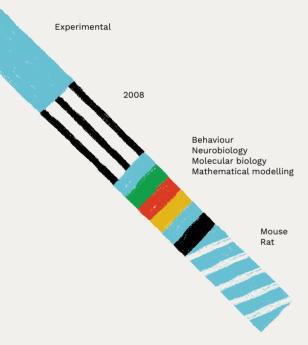
A slice of the visual cortex (V1), a part of the brain that processes what we see, illustrating axons originating from the auditory cortex, the hearing area of the brain. Auditory cortex axons are depicted in white (left) and yellow (right), while neurons in V1 are shown in magenta (left) and white (right). We discovered that these auditory cortical pathways send information about where sounds are coming from to the visual cortex (Mazo et al. bioRxiv 2023).

Our brain continuously interprets the environment around us to plan and guide our actions. This process entails integrating sensory inputs with internal models of the world. We investigate how the brain acquires and uses knowledge about the world to influence perception. By employing optical, electrophysiological, and behavioural methods in mouse models, we explore how brain circuits across various areas learn and retain information about expected regularities of the world. Moreover, we examine how these learned patterns are integrated with sensory information to shape perception.

PATON LAB

Learning

Circuit and computational basis of timing, learning, and behavioural control



Postdoct research Caroline (Co-Sup. Daniel Nu Georg Ra Pawel Bu

Principal investigator Joe Paton

Postdoctoral researchers Caroline Haimerl (Co-Sup. C. Machens) Daniel Nunes Georg Raiser Pawel Bujalski

PhD students

Filipe Rodrigues
Gonçalo Guiomar
(Co-Sup. C. Machens)
Margarida Sousa
Mauricio Toro
Renato Sousa
(Co-Sup. R. Oliveira)
Sofia Freitas
(Co-Sup. A. Renart)
Teresa Duarte
(Co-Sup. M. Carey)

MSc student Simon Zamora

Technicians Ben Zarov Francisco Azevedo Rodrigo Martins Sofia Almeida

Highlights

We published our work on temperature manipulation following peer review, as well as two preprints. The lab was awarded a grant from the Michael J. Fox Foundation to investigate the neural circuit basis of impulse control disorders associated with dopamine replacement therapy for Parkinson's disease. This marks our first foray into disease-focused research, and is a collaborative effort with neurologist Marcelo Mendonça.

Additionally, our Master's student, Simon Zamora, defended his thesis at EPFL and became a technician in the lab. Postdoc Caroline Haimerl led a workshop at the Berstein conference, focusing on neural correlates of flexible behaviour.

In an implicit recognition of the lab's impact on timing research, the biannual Timing Research Forum meeting was held at the Champalimaud Foundation. The group showcased several projects, with Joe Paton serving on the executive organising committee.

PhD student Margarida Sousa had a particularly active year, publishing her preprint Dopamine neurons encode a multidimensional distributional map of future reward on bioRxiv. She delivered selected talks at the TRF meeting and the CR Symposium, and presented her research at the Annual Society for Neuroscience meeting in Washington, D.C. Impressively, Margarida was chosen to speak at the 2024 CoSyNe meeting in Lisbon, the premier international conference in systems and computational neuroscience, a recognition given to less than 2% of submissions.



A mouse considering two foraging choices based on reward likelihood, timing, and size, as found in dopamine neuron activity (Sousa et al., bioRxiv, 2023). The study advances distributional reinforcement learning in AI, showing the brain may use similar algorithms for adaptive behaviour.

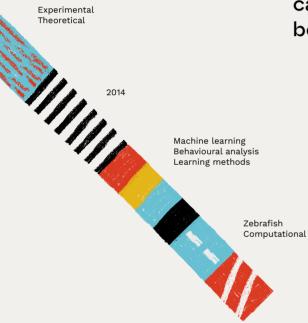
The brain controls behaviour, and 600 million years of evolution have endowed it with diverse mechanisms for this. In vertebrates, the spinal cord and hindbrain manage automated forms of control like reflexes, central pattern generators, and movement primitives. These processes are selected, combined, and modulated by higher brain systems capable of learning from experience, which is the primary focus of our group.

Control by these systems is both heterarchical, requiring distinct computations by specific brain systems, and hierarchical, with each system operating at varying abstraction levels. Building on our interest in how neural circuits acquire a temporal basis for learning, we are uncovering how hierarchical representations across brain systems interact to produce effective behaviours. We explore how different brain regions manage various aspects of behavioural control. Our approach combines behavioural techniques to isolate and quantify specific brain processes with computational modelling and modern tools for monitoring and manipulating neuron activity during behaviour.

POLAVIEJA LAB

Mathematics of Behaviour and Intelligence

We study how interacting units (animals, neurons or mathematical agents) can give rise to intelligent behaviour





Postdoctoral researchers David Méndez Panos Firbas

Software developer Jordi Torrents

ML researcher Carolina Gonçalves

PhD students Dean Rance (Co-Sup. M. Orger) Tiago Costa (Co-Sup. A. Renart) **Technician**Dylan Feldner

Visitors
Mariana Campos Costa
(CIEN, Spain)
Xiang Li
(Key Lab of Chemical
Biology, China)

Highlights

Our lab welcomed Xiang Li from China, who studied how zebrafish manage to sleep while moving in groups. Jordi Torrents enhanced idtracker.ai to accommodate his extensive day-long experiments. Mariana Costa from CIEN (Spain) visited us to explore statistical and machine learning (ML) tools for predicting Alzheimer's disease based on activity data.

We introduced new deep learning tools for analysing collective behaviour, published in the Philosophical Transactions of the Royal Society B. This study expands our understanding of information transfer in animal groups.

Additionally, we reviewed the application of ML methods to multi-omics data and genotype-phenotype relationships, published in Bioinformatics. With regard to Algebraic Machine Learning, our arXiv paper, "Infinite Atomized Semilattices", extended the theory of atomised semilattices to the infinite setting.

```
1 goal

a : Type u_1

M : Type a

instf³: CompleteLattice M

C : Set a

instf²: Inhabited :C

Atomization : Set (AtomModel M)

instf²: ConstantizedSemilattice M C

instf : PreAtomizedSemilattice M C Atomization

AS4 : AS4_def M Atomization

AS3 : AS3_def M Atomization

a b : M

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$\psi$ : Atomization

F ($\psi$).atom_lt a \ ($\psi$).atom_lt b ... ($\psi$).atom_lt b
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Part of a proof defining Algebraic Machine Learning using the Lean 4 proof assistant (David Mendez). This method represents data and knowledge algebraically, with generalisation guarantees that require proof (as it lacks explicit generalisation mechanisms like error minimisation).

Our goal is to develop models focusing on predictability and understandability to enhance the study of animal behaviour and neuronal circuits. We use deep learning tools for insights into collective animal behaviour. For example, idtracker. ai tracks movements of individual animals in groups, idmatcher.ai tracks the same animals across different videos, and ReactNet identifies responses to stimuli. This modular approach helps us balance predictability and intelligibility in modelling collective movements.

We also apply advanced machine learning techniques to predict biological phenomena related to genetics, epigenetics, and neuronal circuits. Our lab is also exploring the development of learning systems founded on different mathematical principles. We are pioneering Algebraic Machine Learning, based on Abstract Algebra, which allows for algebraic representations of data and formal knowledge, with generalisation guarantees. We are assessing this method's impact on accuracy, transparency, parallelism, and energy efficiency.

MCNAMEE LAB

Natural Intelligence

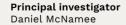
We seek algorithmic and circuit-level descriptions of flexible cognitive processing and behavioural adaptation

Theoretical

2022

Theory
Simulation
Data analysis

Human
Rodent
Bat
Adaptive agent



Postdoctoral researchers Carlos Stein Francesco Trapani

PhD students Gonçalo Guiomar (Co-Sup. J. Paton, C. Machens) Inês Laranjeira (Co-Sup. Z. Mainen) Jaime Arlandis (Co-Sup. Z. Mainen) Marcel Graetz (Co-Sup. A. Renart) Margarida Sousa (Co-Sup. J. Paton)

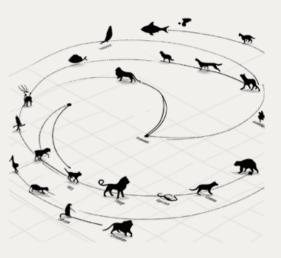
MSc students Camillo Heye Mariana Duarte Sara Monteiro

Highlights

We developed a deeper understanding of how two brain regions - the medial entorhinal cortex, which helps with navigation and memory, and the hippocampus, key for forming memories work together. We advanced new methods for studying brain function, including techniques to better understand how the brain processes complex information (involving graphical inference computations), learns about its environment in real-time, and revises its understanding of the world based on experiences. We also collaborated in improving models of memory inspired by human cognition and neural dynamical phenomena.

We have continued to strengthen our collaboration with other labs both within and beyond the Champalimaud Foundation. Furthermore, our research into brain activity patterns related to schizophrenia received wide press coverage from media outlets such as the BBC and The Guardian.

Outside the lab, Daniel McNamee participated in a round-table discussion at iMM on the impact of artificial intelligence on the research process.



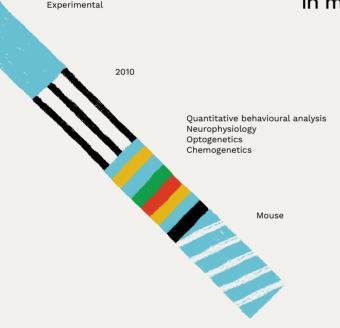
Our work on using large-language artificial intelligence models to understand human thought processing in individuals with psychosis is illustrated by this generative model's conceptualisation of semantic memory search.

The lab's interests span the internal processing of the external world to physical embodied interactions in natural systems throughout the animal kingdom, from understanding the detailed dynamics regarding how brains internally conceptualise and generate inferences to learning to optimise continuous behaviours.

CAREY LAB

Neural Circuits and Behaviour

Studying the neural circuits for learned and coordinated movement in mice





Principal investigator Megan Carey

Postdoctoral researchers Ana Machado Alice Geminiani Coralie Hérent Hugo Marques Jorge Ramirez-Buritica Jovin Jacobs Tatiana Silva

PhD students
Ana Gonçalves
Diogo Duarte
Marta Forcella
Merit Kruse
Teresa Duarte
(Co-Sup. J. Paton)

MSc student Matilde Matos

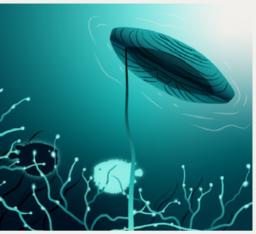
TechniciansAmma Otchere
Francesco Costantino

Highlights

We were happy to be able to publish two major papers this year. First, the final chapter of Catarina Albergaria's PhD thesis was published in Nature Communications in a collaboration with researchers from the Netherlands. This study showed how synaptic plasticity—the brain's ability to strengthen or weaken connections between neurons for learning and memory—in the cerebellar nuclei supports behavioural learning.

Second, as part of our collaboration with the Simons Emory International Consortium on Motor Control, and together with the Lima Lab, we co-authored a paper in eLife describing the utility of novel MyoMatrix probes for high-definition muscle recordings across different systems.

While we said bittersweet farewells to Jovin Jacobs and Hugo Marques, we were happy to welcome Francesco Costantino, Amma Otchere, and Marta Forcella to the lab. Francesco was the lead organiser of the 9th European Student Conference on Behaviour & Cognition, hosted by the Champalimaud Foundation. We also had several additional manuscripts accepted for publication that are currently in press – stay tuned for next year!



© Rita

The bright algae represent mossy fibres, brain connections that convey sensory and motor information to the cerebellum. These fibres interact with the cerebellum's inner part, the cerebellar nuclei, depicted as pufferfish. Above, the boat's timber patterns evoke the structure of the cerebellar cortex, the cerebellum's outer layer, connected to the depths by an anchor line, portraying the link between the cortex and nuclei.

We aim to understand how activity is orchestrated within neural circuits to give rise to behaviour. With this in mind, our research focuses on the cerebellum, a brain area that is critical for coordinated motor control and motor learning and whose circuitry is well characterised.

The lab's major achievements so far include:

1. Establishing a quantitative framework to identify specific cerebellar contributions to mouse locomotor coordination (e.g. Machado, Darmohray et al., eLife 2015; Machado et al., eLife 2020);

2. Dissecting circuit mechanisms for cerebellar learning and its modulation by behavioural state (Albergaria et al., Nature Neuroscience 2018; Silva et al., Nature Neuroscience 2024); 3. Establishing a paradigm for locomotor learning in mice (Darmohray et al., Neuron 2019).

Our ongoing work combines quantitative behavioural analysis and neurophysiology with genetic tools to understand how cerebellar circuits enable complex, coordinated movement that is flexibly adapted for a wide variety of contexts.

PARK LAB

Neural Dynamics

computation reflected in complex spatiotemporal Theoretical neural activities Statistical modelling Machine learning Dynamical systems Bavesian inference Non-human primates Computational models

Principal investigator Il Memming Park

Postdoctoral researchers André Mendonça Yves Bernaerts

PhD students

Statistical modelling

of neural code and

Ábel Ságodi Ayesha Vermani HyungJu Jeon Matthew Dowling Piotr Sokół

Technicians Carolina Filipe Nico Espinoza

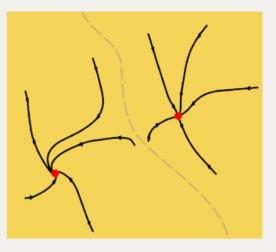
Highlights

Two new PhDs were minted: Piotr Sokół on the theory of learning signals in dynamical systems, and Matt Dowling on machine learning tools for neural signal processing. Tushar Arora completed his Masters thesis. Two postdocs, André Mendonca and Yves Bernaerts, joined the lab, along with Carolina Filipe as a research support specialist. Nico Espinoza later joined us for a sonification project with an artistic touch.

Matt published two top machinelearning papers (ICML & ICLR). We also wrote a major manuscript, currently on arXiv, on the theme of persistent learning signals without continuous attractors.

Ayesha, Matt, and Piotr presented their research at the Bernstein and COSYNE conferences, with Il Memming Park serving as the conference tutorial chair at the latter. Memming also co-organised the Cajal Course on Machine Learning for Neuroscience and the Time Research Forum 3.

The lab came together at COSYNE and the CR Retreat, where over 200 participants played a game designed by Memming and André.



Neural dynamical systems with stable attractors, such as point attractors, are thought to support behaviours requiring short-term memory. However, such memory may not produce learning signals needed for environmental adaptation. The system depicted here maintains 1-bit of memory due to its bistability, despite showing vanishing learning signals.

Our goal is to obtain an effective systemslevel description of relevant neural dynamics in the context of cognitive functions and dysfunctions. Building on the foundations of dynamical systems and stochastic processes, we study the appropriate language for neural dynamics that can explain and generate specific predictions on neural data and behaviour. To arrive at a model of neural computation tightly tied to biology and experimental observations, we work closely with experimental and clinical collaborators. We develop methods for analysing spatiotemporal neural and non-neural time series, develop theories to distil a simpler understanding hidden in noise and idiosyncrasies, and provide datadriven evidence for and against scientific hypotheses. To facilitate the scientific inference process, we develop real-time machine learning and control methods and design next-generation experiments and tools to integrate information across heterogeneous recordings.

Neuroethology

We are interested in understanding the neural circuits controlling sexual

Experimental Calcium imaging Electrophysiology Viral tracing Optogenetics Behaviour

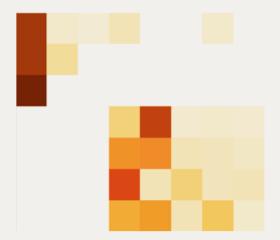
behaviour

Highlights

Our team collaborated internationally to validate Myomatrix arrays, a novel class of electrodes for recording muscle activity with unprecedented resolution (Chung et al., eLife). This technology will enable us to analyse muscle activation patterns controlling sexual behaviour in freely behaving animals for the first time.

Furthermore, Baylor Brangers and Basma Husain successfully defended their PhDs. Husain's work was published as a preprint, uncovering how sex hormones influence synaptic plasticity in the hypothalamus to flexibly control female sexual behaviour. This research challenges traditional perceptions of the hypothalamus as a hardwired and fixed regulator of innate behaviours, revealing its adaptable nature. Lab members Nicolas Gutierrez and Susana Lima co-chaired a symposium at the FENS regional meeting in Algarve (Portugal), where experts delved into the "Plasticity of innate behaviours".

Finally, PhD students Inês Dias and Ana Mendes also co-organised the 9th European Student Conference on Behaviour & Cognition (ESCBC)



Our overarching goal is to understand how the brain initiates, maintains, and terminates sexual behaviour. We have recently begun to explore this question using computational methods to gain deeper insights into the microstructure of sexual behaviour.

at the Champalimaud Foundation.



Principal investigator Susana Lima

Lab manager Margarida Duarte

Postdoctoral researchers Bertrand Lacoste Jonathan Cook Nicolas Gutierrez

PhD students

Ana Mendes Basma Husain **Baylor Brangers** Inês Dias Oihane Horno (Co-Sup. C. Machens)

Technician Liliana Ferreira Sex is pervasive in nature and plays a critical role in species maintenance, evolution and human well-being. Despite the fundamental characteristics of sex, we are still quite ignorant of the mechanisms controlling it. We take advantage of the mouse, both male and female, to understand the principles of sexual interaction that lead to its endpoint: ejaculation. We use state-of-theart methods grounded in genetics-based tools to unravel the circuits controlling this behaviour.

CHIAPPE LAB

Sensorimotor Integration

Experimental

2012

Electrophysiology
Optical imaging
Behaviour
Genetics
Optogenetics
Chemogenetics
Models
Virtual reality

Fruit fly

We study how neural circuits estimate self-motion and use this internal estimate for spatial perception and movement control

Principal investigator Eugenia Chiappe

Lab manager Nelia Varela

Postdoctoral researchers Claire Rusch Corinna Gebehart Virginia Palieri PhD students André Marques Mert Erginkaya Miguel Paço Nuno Rito Tomás Cruz

Technicians Filipa Torrão Martina Canova

Highlights

Our lab members achieved notable accomplishments in 2023. Former PhD students Tomás Cruz and Mert Erginkava secured postdoctoral positions in the labs of Silvia Arber (Switzerland) and Jan Ache (Germany), respectively. The first paper of Mert's graduate work was submitted at year's end (currently on bioRxiv) and is under revision. Tomás Cruz and Eugenia Chiappe contributed two review articles to Current Opinion in Neurobiology, focusing on the multi-level control of locomotion and self-motion computations. Corinna Gebehart received a Marie Curie Postdoctoral fellowship, while Chiappe joined the Advisory Board for the Wellcome Trust Brain and Behavior Sciences Discovery Awards.

In outreach, Nuno Rito and André Marques engaged high-school students during their visits to the Champalimaud Foundation (CF), showcasing Drosophila melanogaster as a powerful model for understanding the neural basis of behaviour through genetic and optical tools. Martina Canova participated in Ciência di Noz Manera.

On the scientific meeting front, Corinna Gebehart co-organised a symposium on movement in neuromechanical systems at the 15th German Neuroscience Meeting in Goettingen, Germany. Claire Rusch organised the webinar series "The Future of Neuroethology" hosted by the International Society of Neuroethology and helped organise the CF's first Postdoctoral Symposium. Finally, Chiappe was invited to present a Meet-the-expert talk at the 2023 Annual Meeting of the Society for Neuroscience.

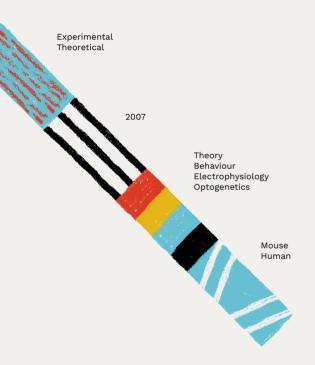


We study sensorimotor circuits that control walking, focusing on those orchestrating mechanical stability (e.g. posture control) with behavioural objectives (e.g. direction and duration). The coordination of motor function across various control levels remains poorly understood in all animals.

Behaviour is the result of many different movement control systems that are orchestrated as a function of the current circumstances of the animal, its behavioural goals and previous experience. However, how this orchestration is organised within the activity of neural circuits distributed across the central nervous system is poorly understood. To address this question, we perform quantitative analysis of behaviour and neural activity to understand how the body and brain interact to support goaldirected walking in adult flies as they explore novel environments and interact with conspecifics.

MAINEN LAB

Systems Neuroscience



How the brain uses perceptual information to create and act on models of the world, and the role of confidence, uncertainty and neuromodulators in these processes

Principal investigator Zachary Mainen

Lab manager Catarina Pimentel

Postdoctoral researchers Adrian Sandru Elisabete Augusto Eric Lacosse Guido Meijer Scott Rennie

PhD students

Giorgio Gristina
(external: ICS-UL)
Inês Laranjeira
(Co-Sup. D. McNamee)
Jaime Arlandis
(Co-Sup. D. McNamee)
Kcénia Bougrova
Solène Sautory
(Co-Sup. L. Petreanu)
Tiago Quendera
(Co-Sup. A. Oliveira-Maia)

MSc students José Teixeira Stefan Hajduk

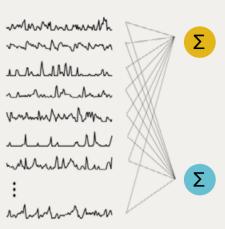
Technicians
Joana Catarino
Joshua Stern
Laura Silva
Leonardo Leitão
Lydia Fettweis Neto
Magdalena Paluchowska
Margarida Duarte
Zuzanna Dedyk

Highlights

Our lab published a study in Nature Neuroscience that discovered how neural ensembles in the neocortex can simultaneously represent multiple decisionmaking strategies. Additionally, we contributed to several publications by the International Brain Laboratory, a large-scale collaboration to study the brainwide basis of decision-making. Our team also helped design and execute a clinical trial with the Breast Unit of the Champalimaud Clinical Centre, investigating whether virtual reality meditation can alleviate stress before surgery.

Lab members actively participated in a number of events, including Metamersion, an exhibition blending science, technology, and art. This involved the production of an interactive art installation using generative artificial intelligence to create personalised virtual environments. Members also co-organised the workshop Science: between literal and metaphorical meanings, exploring future directions of science and philosophy, and participated in the revival of the Ar series, organising an event on Al. Zach Mainen coorganised the CR Symposium.

We bid goodbye to several members: Catarina Pimentel (now project manager of the Digital Therapeutics Programme), Elisabete Augusto, Guido Meijer, Joana Catarino, José Teixeira, and Joshua Stern. Meanwhile, we welcomed new ones: Lydia Neto, Zuzanna Dedyk, Leonardo Leitão, and Magdalena Paluchowska, all technicians who will help expand the lab's human studies, as well as MSc student Stefan Hajduk.



In the premotor cortex of mice, we discovered a reservoir of parallel computations for foraging decisions ("should I stay, or should I go?"). Our findings reveal that multiple decision-making strategies may be decoded simultaneously from the same neural population activity.

We are interested in understanding the principles underlying complex adaptive behaviour. Starting with quantitative observations of behaviour, we aim to integrate quantitative cellular and systems level experimental analysis of neural mechanisms within a theoretical and ecological context. Mice provide a flexible animal model that allows us to monitor and manipulate neural circuits using electrophysiological, optical and molecular techniques.

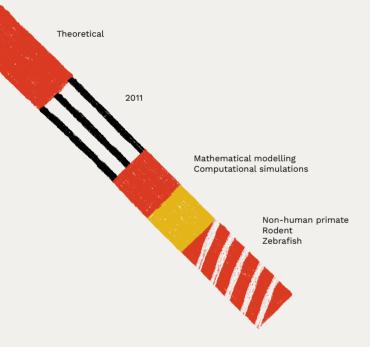
We have begun to translate these studies into humans, with the aim of studying naturalistic behaviour. We are using tools including virtual reality and artificial intelligence to design naturalistic yet controlled settings for these experiments. Projects in the lab are wide-ranging and continually evolving. Current principal topics include:

- 1. Serotonin signalling in adaptive behaviour;
- 2. Serotonin and the modulation of neural population activity states;
- 3. Dynamics of biological and machine learning;
- 4. Cognitive maps and latent state spaces;
- 5. Shared attention/experience.



Theoretical Neuroscience

We seek to understand how neurons interact to process information





Principal investigator Christian Machens

Postdoctoral researchers

Adrien Jouary
(Co-Sup. M. Orger)
Bertrand Lacoste
(Co-Sup. S. Lima)
Caroline Haimerl
(Co-Sup. J. Paton)
Francesca Mastroguiseppe

Matthijs oude Lohuis (Co-Sup. L. Petreanu) Raphael Steinfeld (Co-Sup. A. Renart) Severin Berger William Podlaski

PhD students

Gonçalo Guiomar (Co-Sup. J. Paton) Joana Carmona Michael Pereira (Co-Sup. R. Costa) Oihane Horno (Co-Sup. S. Lima)

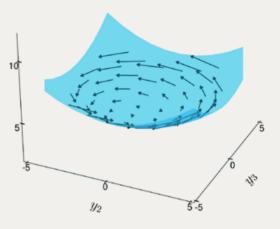
Technicians

Guillermo Martin

Highlights

We published three key papers. First, in work published in Current Biology with Claudia Feierstein and Michael Orger, we discovered that neurons in the zebrafish hindbrain organise into distinct functional groups based on eye movement—either moving both eyes to the left or right during turns, or converging the eyes while swimming forward. Second. William Podlaski addressed a heretofore unresolved challenge in neuroscience by explaining and visualising the dynamics of circuits containing 10-100s of spiking neurons. This theoretical and simulation work was published in Neural Computation. Third, together with Byron Yu (Carnegie Mellon, Pittsburgh) and Adam Kohn (Albert Einstein College, New York), we introduced a novel statistical approach for analysing concurrent signal flow across multiple brain regions, presented at the Neurips machine learning conference.

The lab had multiple reasons to celebrate in 2023. Francesca Mastroguiseppe received the transition-to-independence award from the Simons Foundation, and Matthijs oude Lohuis secured a postdoctoral fellowship from EMBO. Christian Machens won a Culmination Award from the Simons Foundation. Additionally, students Joana Carmona and Guillermo Martin helped organise the 9th European Student Conference on Behaviour and Cognition, hosted by the Champalimaud Foundation.



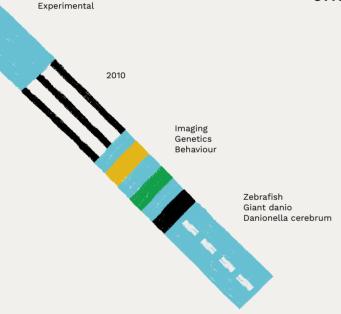
Understanding the messages neurons send when firing action potentials is key in neuroscience. We built a theory suggesting each spike (depicted as a vector) moves neural population activity within an abstract "latent" space. Different neurons' spikes create a flow-field (shown as an oscillation).

Our lab is interested in understanding how neurons communicate and process information. We study a range of systems, from the brain stem of the zebrafish to subcortical and cortical areas of the rodent and primate brains. We first analyse the activities of neuronal populations, based on recordings of 100s-10000s of neurons, using modern data analysis tools such as dimensionality reduction. We then build models of neural networks that agree with these recordings. Finally, and abstracting further, we seek common principles of neural computations that apply to all of these very different brain circuits.

ORGER LAB

Vision to Action

Investigating the structure and function of whole-brain circuits underlying behaviour





Principal investigator
Michael Orger

Postdoctoral researchers Adrien Jouary Gokul Rajan Sabine Renninger

Senior technicians Aaron Ostrovksy Alexandre Laborde PhD students

Elena Collins Joaquim Contradanças Lucas Martins Pedro Silva Thomas Mullen

MSc students Catarina Matos David Pereira Gonçalo Oliveira Maria Vieira Interns

Fábio Studart Miguel Rodrigues

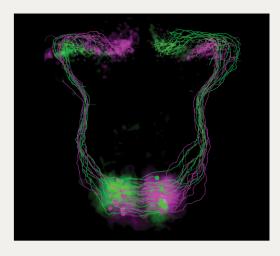
Consultant Edite Figueiras

Research associates Claudia Feierstein Ruth Diez del Corral

Highlights

Lab members presented talks and posters at several international conferences, including the Focus on Microscopy Meeting (FOM2023, Porto), the Marie Curie Alumni Conference (MCAA, Cordoba), the Simulated Body Conference (Janelia Farm), and the European Student Conference on Behaviour and Cognition in Lisbon, where Elena Collins received the 'Best Oral Presentation' award.

In research conducted by Claudia Feierstein, in partnership with the Machens Lab and published in Current Biology, we explored the role of the zebrafish hindbrain in visuo-motor behaviour. By applying dimensionality reduction to neuronal activity data, we uncovered how neuronal responses in the hindbrain relate to eye movement and swimming behaviours in response to visual stimuli. Our findings reveal that a large fraction of population activity can be attributed to iust two features, leading to the identification of three distinct functional clusters. This work advances our understanding of the functional organisation within the zebrafish hindbrain and its implications for visuo-motor transformations. It also provides a flexible approach for understanding the relationship between behavioural data and population neural activity.



Mapping of neuron pathways from the Inferior Olive to the cerebellar cortex in larval zebrafish. Image made by Rita Félix for Félix, Markov et al., Journal of Neuroscience (2024, in press).

Our lab aims to uncover the rules governing neural circuit design and activity and their influence on behaviour, considering the brain as a whole. We primarily use zebrafish, with additional studies in Danionella cerebrum and Giant danio. We focus on how brains process sensory inputs, internal states, and past experiences to select and execute actions.

Deciphering this process is challenging as even simple behaviours involve neuron networks across many brain areas. Zebrafish's small size, transparency, and genetic tractability allow us to observe and manipulate neuron activity throughout the brain non-invasively. Their brains share many features with complex vertebrates, including architecture, cell types, and circuit motifs. Early in life, zebrafish explore their environment and display instinctive behaviours like hunting, evading predators, and movement stabilisation. We aim to understand the neural circuitry behind these behaviours through a comprehensive approach that combines computational behaviour analysis, wholebrain imaging, and genetic and optical neural circuit manipulation.

Research associates

Research Associates are senior investigators who manage independent projects in association with particular labs at CR.

Claudia Feierstein

NEURAL CIRCUITS FOR VISUOMOTOR BEHAVIOUR

Associated with the Vision to Action Lab

How does our brain use information to select appropriate behaviours? This is a question that can be addressed by looking at zebrafish larvae. Because they are small and transparent, we can easily peek into their brains non-invasively. Using state-of-theart microscopes, we can image the activity of the whole brain, and simultaneously track their behaviour. We can then ask: how can the larva's behaviour, or its sensory environment, explain the neuronal activity that we measure? In collaboration with the Theoretical Neuroscience Lab, we develop and apply analysis tools to understand what type of information is carried by populations.

Eric DeWitt

COMPUTATIONAL COGNITIVE DECISION SCIENCE

Associated with the Systems Neuroscience Lab

Our team uses computer models to study how humans and animals learn and make decisions. We focus on the role of neuromodulators, key players in learning and decision-making, and their influence on different brain areas. We hope this research will enhance our understanding of human behaviours and psychiatric disorders. In addition to this, we are fostering interdisciplinary collaborations, from psychiatry to artificial intelligence to hardware and software development. We believe this innovative approach is necessary to fully understand the brain and apply that knowledge to benefit health and society.

Maria Luísa Vasconcelos

INNATE BEHAVIOUR

Postdoctoral researcher Nuno Machado Technician Cristina Ferreira PhD students Saheli Roy MSc student Sara Santos

To understand how neurons organise behaviour, we focus on reproductive behaviours. Reproductive behaviours are not only central to the survival of the species but also quite complex, providing insight into different levels of organisation. To address our questions, we use a combination of genetic manipulation, behaviour assays and calcium imaging in the fruit fly.

Ruth Diez del Corral

DEVELOPMENT OF NEURAL CIRCUITS
Associated with the Vision to Action Lab

MSc student Leonor Novais

We study how neural circuits form during development by examining how the brain generates neurons with the appropriate subtype identities and connections. With the Vision to Action Lab, we characterise neuronal subpopulations involved in visually guided behaviours in zebrafish. Our focus is on the diencephalon, a brain region that processes sensory stimuli and directs neuronal signals to areas controlling motor behaviours. We use transgenic lines with fluorescent reporters to track neuronal projections in the whole embryo with light-sheet microscopy.

Adjunct scientists

John Krakauer

COGNITIVE-MOTOR INTERFACE

Affiliation Johns Hopkins University Visiting scientist since 2014

Our main areas of investigation are:

- 1. Experimental and computational studies of motor control and motor learning in humans;
- 2. Tracking long-term motor skill learning and its relation to higher cognitive processes such as decision-making;
- 3. Prediction of motor recovery after stroke;
- 4. Mechanisms of spontaneous motor recovery after stroke in humans and in mouse models:
- 5. New neuro-rehabilitation approaches for patients in the first 3 months after stroke.

In addition to research labs located at the Champalimaud Centre for the Unknown, CR also has adjunct scientists, who work on complementary research areas.

Rui Oliveira

SOCIAL NEURO ENDOCRINOLOGY

Affiliations Instituto Gulbenkian de Ciência, ISPA – Instituto Universitário

We are interested in understanding the neuroendocrine mechanisms of social behaviour and how the social environment affects the neuroendocrine system. In particular, we are interested in the role of hormones as key physiological mediators underlying social plasticity.



CORREIA LAB

Cancer Dormancy & Immunity

Experimental

2

2021

Genetic models Flow cytometry Cell/molecular biology Imaging Single-cell/spatial transcriptomics Computational biology

Mouse

We investigate what brings disseminated tumour cells in and out of dormancy, and how these dormant cells can be targeted



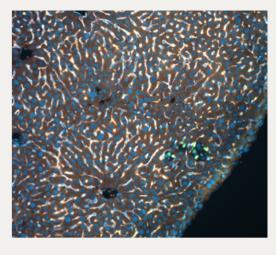
Postdoctoral researchers Bruna Garcia Miguel Fuzeta

PhD student Andreia Gonçalves Research assistant Margarida Braga

Highlights

Ana Luísa Correia received an EMBO Installation Grant for her project on Tissue-specific immune regulation of disseminated tumour cell dormancy. She also published a perspective piece in Nature Reviews Immunology, arguing that site-specific differences in the immune system significantly hinder the growth of DTCs. The article makes the case that harnessing tissuespecific immunity is essential for advancing immunotherapy to reliably prevent metastasis. In addition, Correia co-authored a Viewpoint for Nature Reviews Cancer on the current landscape of dormancy research and the challenges in translating new findings to the clinic.

Three new members joined the team: Andreia Gonçalves, Margarida Braga and Bruna Garcia. Together with Bruno Costa-Silva, Correia has been highly active in the education committee, contributing to the development of the Champalimaud Cancer PhD Programme. Correia has been involved in many initiatives by the American Association for Cancer Research (AACR), the European Association for Cancer Research (EACR), the Metastasis Research Society (MRS), and the Portuguese Association for Cancer Research (ASPIC), in a joint effort to make cancer a more tractable problem.



Section of a mouse liver. The blue dots represent the nuclei of healthy cells, while the white lines indicate tiny blood vessels branching from larger ones, shown as black circles. Dormant breast cancer cells are highlighted in green.

Our lab investigates metastasis, the process where cancer spreads from the primary tumour site to other body parts. Metastases cause most cancer-related deaths. In many patients, metastases appear long after successful primary tumour treatment because disseminated tumour cells (DTCs) remain dormant at distant sites, awakening years or decades later to initiate metastases. This pause in cancer progression offers a therapeutic window to prevent future metastases.

We focus on breast cancer dormancy, which often spreads to bones, liver, lungs, brain, and lymph nodes. Our goal is to dissect DTC interactions with the unique microenvironment at each distant site, providing a roadmap of tissue-specific vulnerabilities for therapeutic exploration. We're particularly interested in how tissue immunity shapes metastatic progression, as immune cells are first responders to tissue damage and DTCs arriving at distant sites. Using multiple complementary approaches, we aim to develop strategies to prevent metastases from forming.



SÁNCHEZ-DANÉS LAB

Cancer and Stem Cell Biology

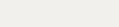
Experimental

201

Mouse models of cancer 3D cell culture systems Lineage tracing Microscopy

Mouse

Our research is focused on uncovering the biology of solid paediatric cancers with the aim of developing novel therapeutic approaches for paediatric cancer patients



Principal investigator Adriana Sánchez-Danés

Senior researcher Patrícia Borges

Postdoctoral researchers Ana Rebelo Raquel Tomás Sara Canato PhD students
Ana Marques
Angelina Sanderson
Sara Ferreira

MSc student Maria Pacheco

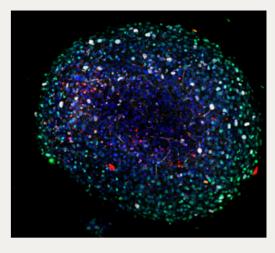
TechnicianRaquel Soares



The collaboration between the Sánchez-Danés and Carey Labs is yielding valuable insights into the impact of paediatric brain tumour development on locomotion. This cross-disciplinary project underscores the benefits of collaborations between the Neuroscience and Physiology & Cancer Programmes to better understand how paediatric cancer alters brain function.

We welcomed a new member to our team: PhD student Angelina Sanderson. Angelina will study the mechanisms that drive cancer formation in Medulloblastoma, one of the most prevalent paediatric brain tumours. Meanwhile, Maria Pacheco successfully defended her MSc thesis on pioneering 3D models of skin cancer.

Additionally, three lab members now serve on the CR Council, each representing various sectors of our community: Adriana Sánchez-Danés represents the Physiology & Cancer Faculty, Sofia Marques represents our PhD students, and Ana Rebelo represents our postdoctoral researchers.



Tumoursphere: tumour cells organised in a 3D structure.

Our lab has two main goals. The first is to uncover the differences between paediatric and adult cancers. Cancer is one of the leading causes of death in children and adults. Paediatric cancers arise during development when tissues are growing. In contrast, cancer in adults develops from tissues that have reached their final size. Additionally, paediatric cancer responds differently to cancer therapy and is more lethal compared to cancer in adults, however, the reasons for these differences are not fully understood. Combining grafting experiments and transcriptomic analysis, we aim to understand the similarities and differences in cancer progression and response to therapy in both paediatric and adult cancers, using melanoma as a cancer model.

Our second goal is to unveil the biology of the most common solid paediatric cancers. Medulloblastoma and Neuroblastoma are among the most common solid tumours and a leading cause of paediatric death. However, their biology is not well understood due to a lack of mouse models that faithfully recapitulate the human disease. To address this, we are developing novel mouse models for these widespread paediatric cancers, which promise to shed light on their underlying biology, and to serve as valuable tools for assessing drug effectiveness and formulating new treatments.



VEIGA-FERNANDES LAB

Immunophysiology

Experimental

2017

Genetically tractable organisms Flow cytometry Cellular Biology Molecular Biology Imaging

Mouse

Neuroimmune interactions in the prevention and resolution of disease



Lab manager Hélder Ribeiro

Postdoctoral researchers Cristina da Silva David López Maria Aliseychik María Martínez Marko Sestan Patrícia Bastos Roksana Pirzgalska

PhD students
Ana Rasteiro
Kristin Fischer
Miguel Rendas
Raquel Silva

MSc students Beatriz Alves Lynn Vermeer Madalena Pereira Miguel Patrício

TechniciansBruno Raposo
Inês Godinho

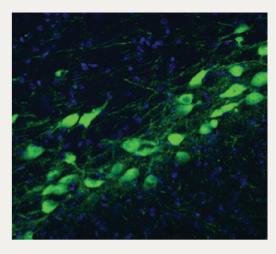
Highlights

We published two papers. The first paper, a review in Circulation Research, investigated the complex interplay between the cardiovascular system and the brain. It focused on the artery-brain and heart-brain circuits and their roles in heart disease, and introduced a novel hypothesis on neuroimmune cardiovascular circuits.

Our second paper, a perspective piece in Immunity, discussed how type 2 immune responses, traditionally associated with allergies and parasitic infections, impact physiology through neuroimmune circuits. It highlights the importance of these circuits in health maintenance and how their dysfunction can lead to various diseases, including cancer.

Our lab received an ERC Advanced Grant from the European Commission for the Architecture of Peripheral Neuroimmune Circuits and Synapses project. This grant supports our continued research into how the immune and nervous systems collaborate to maintain tissue health, employing new intercellular labelling techniques to study these interactions in detail.

Cristina Godinho da Silva received a highly competitive six-year FCT Assistant Researcher grant, ranking 1st in the selection process, and contributed as Invited Lecturer to the Master in Biopharmaceutical Sciences programme at Faculdade de Farmácia da Universidade de Lisboa. Additionally, three of our MSc students, Beatriz Alves, Lynn Vermeer, and Miguel Patrício, successfully defended their theses.



Neurons linking the body to the brain's reward system.

The Immunophysiology Lab explores the role of cross-talk between neurons and the immune system in the prevention and resolution of disease. To that end, the team focuses on organs that have a complex and dense network of neuronal and immune cells, including the intestine, lung and pancreas. This combination of features makes these organs an optimal site to reveal how the neural and immune systems work together to preserve health.

Using this approach, the lab has been exploring the surprising role of the neural network that surrounds these organs: immune regulation. The team discovered that while the immune system actively fights infection and cancer, it is the neurons that detect the invasion of tumour cells, setting the immune response in motion. These findings may have tremendous potential in the design of novel therapeutic approaches to disease as they pinpoint new selective targets that can be harnessed in infection, metabolic disorders and cancer.

MINUTTI LAB

Immunoregulation

Experimental

2023

Flow Cytometry Single-cell RNA sequencing Microscopy Spatial transcriptomics Genetic lineage tracing Intersectional genetics

Regulation of adaptive immune responses by dendritic cells





Principal investigator Carlos Minutti

Postdoctoral researcher Maria Iliopoulou

PhD students Paula Antón Robert Baber

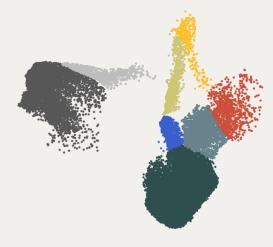
Technicians Miguel Patrício Vasco Correia

Highlights

In 2023, the lab's inaugural year, our team was awarded an ERC Starting Grant to investigate the ecology (within tissues), diversity, and function of conventional dendritic cells (cDCs). Additionally, we initiated a collaboration with a consortium of Spanish laboratories to apply for a la Caixa project and to explore the more translational facets of our research.

Carlos Minutti postdoctoral research has been accepted for publication in Nature Immunology, with some of his joint research also appearing in Cell Reports and Cell Stem Cell.

We have welcomed five members to our lab, successfully imported numerous mouse strains, equipped our laboratory, and started collaborative experiments. Minutti, along with Caroline Haimerl and Elena Collins, established the Queers & Allies group, dedicated to queer people in science and healthcare at the Champalimaud Foundation, along with their allies. Focused on promoting diversity and visibility in science, they hosted a stand during the European Researchers' Night event.



Using a technique called flow cytometry, this analysis highlights the diverse types of cells in the dendritic cell family, showing their range and differences.

The activation of the adaptive immune response critically relies on conventional dendritic cells (cDCs), which monitor our tissues for any disturbances in homeostasis. cDCs can induce various adaptive immune responses, sometimes counterproductive in diseases like cancer. The mechanism by which cDCs determine the appropriate response is unclear. Research by Carlos Minutti shows that different cDC progenitors originate in the bone marrow, which may influence their functions in peripheral tissues.

Consequently, our lab is exploring how tissues under attack (from infection or cancer) communicate with the bone marrow—likely through the blood or nervous system—to influence cDC production. We are also developing advanced mouse models to test the hypothesis that different cDC types are needed to trigger specific adaptive immune responses, which can be either protective or harmful. We propose that the communication between affected tissue and bone marrow fine-tunes cDC production and determines the type of adaptive immune response.

RHINER LAB

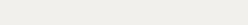
Stem Cell and Regeneration

Experimental

2016

Genetics Lineage-tracing High-end imaging Cell Biology scRNAseq Behaviour

Fruit fly Mouse We study the role of regenerative circuits in tissue repair and disease development



Postdoctoral researchers Anabel Simões Juan Sánchez

Christa Rhiner

Principal investigator

PhD students Catarina Costa Margarida Caio **MSc student** Ekaterina Popova

Visiting researcher Catarina Dias

TechnicianCarolina Alves

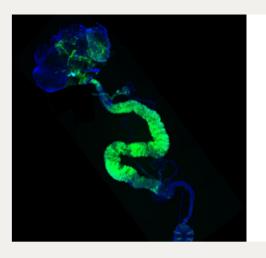
Highlights

Our proposal to explore injury-driven circuits in the brain received funding in the 2023 la Caixa Research Health call. For this project, we initiated a close collaboration with a partner lab at the Achucarro Basque Neuroscience Center, enhancing our capacity to extend our findings to pre-clinical mouse models. Additionally, our BrainsySTEMic project was awarded funding from the ERC-Portugal programme to elucidate the basis of brainsystemic effects.

Early in 2023, Anabel Simões successfully defended her PhD thesis. Following this, she trained at EPFL Lausanne, backed by a QuantoCancer exchange grant, and established a new *in vivo* model to study intestinal plasticity for the lab.

Juan Sánchez joined us from Argentina as a postdoc in March. Meanwhile, postdoc Catarina Dias received a poster prize at the EMBO Neural Remodelling workshop in Israel and published a perspective piece on neural membrane repair in regeneration.

Our team members were also engaged in scientific outreach, with Catarina Dias taking roles as organiser and speaker at Pint of Science Portugal 2023 and participating in Ciência di Noz Manera. PhD student Margarida Caio contributed to the creative Science on the Walls outreach project and co-organised the CR Student Retreat. Christa Rhiner co-organised the Stem Cell Techniques PhD course, held at the Champalimaud Foundation, Faculty of Pharmacy, and Tagus Park, which merged knowledge from biology, engineering, and medicine.



Brain and digestive tract of a fly. The green signal indicates activation of stress signalling in response to brain tissue damage on the right side.

Our lab studies how tissues adopt a regenerative programme following injury, which can be conducive to tissue repair or cancer formation. The team uses brain tissue damage as a model to study both local brain repair and how it triggers responses in tissues distant from the injury. Crucially, injury induces factors that stimulate stem cell activation, cell division and growth, impacting both regeneration and cancer formation.

Using the genetic versatility of fruit flies, we aim to identify key factors that promote repair and restore balance. We discovered that neurons and glial cells cooperate to deliver vital growth factors to dormant neural stem cells, enabling them to resume division and generate new cells in the adult brain after injury. This regenerative response is regulated by hypoxia and oxidative stress in the local tissue.

We also investigate how brain injuries affect peripheral organs. Our findings show that fruit flies experience changes in intestinal function after brain injury, similar to mammals. Using genetic tools in fruit flies, we plan to further explore the mechanisms behind this inter-organ communication.

COSTA-SILVA LAB

Systems Oncology

Experimental

2016

Vesicle flow cytometry Protein-protein interactions In vivo models of tumour growth and metastasis

Mouse

Identifying cancer biomarkers and unravelling the mechanisms of cancer metastasis



Principal investigator Bruno Costa-Silva

Postdoctoral researchers Ana Cruz Luís Rocha Maria Moraes PhD students

Adrianna Bielowka Julia Elwanowska Raquel Sequeira

MSc student Inês Saldanha

TechnicianCatarina Pereira

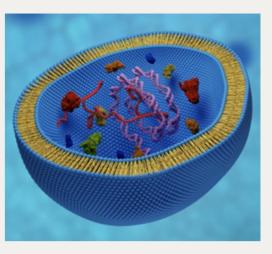
Highlights

We published three papers on the role of extracellular vesicles (EVs) in cancer and beyond. First, our review in Food & Function asked: can health benefits of certain dietary compounds, like (poly) phenols in fruits and vegetables, be transferred between cells through exosomes, a type of EV? Such compounds might not need to directly reach their target cells to have an effect. Instead, they could initiate a chain reaction where cells communicate protective signals to one another, potentially offering a novel way to boost our health span through our diet.

Our research article in PNAS focused on a specific protein, Syndecan-4, and its critical role in the spread of gastric cancer. Our research revealed that this protein, when present on EVs, could dictate the spread of cancer to specific organs, highlighting its potential as a target for new treatments.

Our third paper introduced a method for isolating EVs directly from brain tissue. This technique has important implications for understanding how the brain responds to stress and could open new avenues for studying and potentially treating stress-related conditions like depression and Alzheimer's disease.

Beyond publications, postdoc Ana Rita Cruz was honoured with the Maria de Sousa Award, recognising her as one of Portugal's promising young researchers. Ana also secured a Marie Curie Individual Fellowship for her project on how Melanoma cells evade immune detection and therapy. Additionally, our MSc student, Inês Saldanha, defended her thesis on the potential of EVs as biomarkers for detecting pancreatic cancer spread to the liver.



Cross-section of an extracellular vesicle (EV). EVs transport proteins and microRNA throughout our bodies. We have developed a new method to isolate brain-derived EVs, which may influence the initiation, progression, and treatment resistance of multiple diseases.

Since 2016, our lab has been dedicated to developing new technological platforms to study EVs - tiny particles released by cells - as disease biomarkers in a clinical context. Biomarkers are molecules that can signal the presence of diseases like cancer. We have pioneered a vesicle flow cytometry method for rapid analysis of EVs in unprocessed biofluids, leading to the discovery of significant EV biomarkers in breast, colorectal, and clear cell renal cell carcinomas. Our research has highlighted the crucial role of cancer EVs in forming pre-metastatic niches and as metastasis biomarkers, as well as their importance in monitoring pancreatic cancer patients' response to therapy.

Currently, we are assessing whether specific EV biomarkers we have identified from colorectal cancer liver metastases and stroma can predict or detect early metastasis in patients. Additionally, we are investigating whether cytokine receptors on cancer EVs compete with cell surface receptors for cytokine binding to further our understanding of their role in cancer progression.

VAN GISBERGEN LAB

Tissue Immunity

Experimental

202

2023

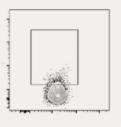
In vivo tumour models
In vitro culture
Flow cytometry
Fluorescence microscopy
Transcriptomics

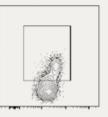
Mouse

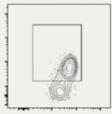
Defining developmental pathways and instructive cues of T cells that arise in local tissues after infection or at the tumour site



Over the summer, we relocated our lab from Amsterdam to Lisbon. Our new space at the Champalimaud Foundation is now operational, and we've already grown our team to five members. We eagerly anticipate the new challenges, opportunities, and collaborations that await us in our study of tissue immunity at this new venue.









After an infection is cleared, special immune cells called memory CD8 T cells remain in various parts of the body. We found that a protein called Hobit distinguishes memory T cells residing in the body's tissues (e.g. liver, small intestine) from those circulating through lymphoid tissues.

We focus on the differentiation and activation of T cells, essential for specific immune responses against infections and cancer. Understanding T cells is crucial for advancing cancer immunotherapies. Recent findings emphasise the importance of local T cells within tumours in combating tumour growth, making the study of T cell development and function within tumours vital.

We identified key transcriptional regulators for the differentiation of resident memory T cells in local tissues, establishing them as an independent lineage. Our lab has developed tools to observe and manipulate these cells, shedding light on their development in peripheral tissues and response to antigen rechallenge. We've also discovered mechanisms that temper their proinflammatory actions, which may help to protect healthy tissues.

Given their crucial role in opposing tumour growth, our current research aims to understand resident memory T cells' development within the tumour site.

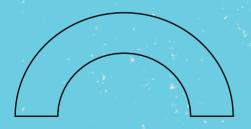


Principal investigator Klaas van Gisbergen

Senior researcher Inês Ramos

PhD student Maria Keridon Technicians Lynn Vermeer Sara Correia

SCIENTIFIC & TECHOLOGICAL PLATFORMS



SUPPORT UNITS

research

support

The work of CR investigators is supported by two structures: the Scientific and Technological Platforms, which handle technical aspects of research, and the CR Support Units, which provide administrative services.



Scientific & Techological Platforms

The Scientific and Technological Platforms consist of nine individual units that support the work of researchers and clinicians at CF. The platforms operate across a wide range of areas, from the development of sophisticated technologies in animal and cellular models, imaging tools, hardware and software, to managing resources and research infrastructures.

Advanced Biolmaging and BioOptics Experimental (ABBE)

Coordinator Davide Accardi Microscopists and imaging specialists Anna Pezzarossa, Pedro Campinho

The Advanced BioImaging and BioOptics Experimental (ABBE) Platform equips Champalimaud Foundation researchers with the tools and expertise necessary to acquire high-quality microscopy data. It assists users across the entire imaging pipeline, from initial discussions to determine the most appropriate imaging strategy, through to in-depth technical training and support in image processing, analysis and visualisation.

The ABBE Platform is managed by an international team with multidisciplinary backgrounds in biophysics and physics, with extensive experience ranging from light-sheet microscopy to superresolution imaging. This allows for a broad spectrum of imaging capabilities, from imaging protein interactions to whole organisms. Additionally, the team represents the Champalimaud Foundation globally, participating in conferences and committees, and acts as a liaison with microscopy companies, not only for equipment maintenance, service, and troubleshooting, but also for fostering long-term partnerships.

Highlights

We upgraded hardware and software, including custom multi-slide adapters and faster tile image acquisition with the UltraMicroscope. Demonstrations of the Spinning-disc confocal BC43 and Light-Sheet TRANSLUCENCE kept CR researchers at the forefront of imaging technology.

We improved fluorescent signal differentiation with "Spectral Imaging" and "Linear Unmixing" methods. At the Spanish & Portuguese Advanced Optical Microscopy 2023 workshop, we showcased fast volumetric imaging with the ZEISS light-sheet system, a technique by Davide Accardi. We also attended the Global Photonics Meet-UP in Braga.

We are finalising a manuscript on the "Casper Chamber" for better drug testing in light-sheet microscopy and exploring AI-based analysis for improved colon cancer diagnosis. Our educational efforts included leading courses at NOVA University, ITQB, iMM, IGC, and CF.

Outreach efforts included participation in MICRODia, European Researchers' Night, Ciência di Noz Manera, and teaching ISPA students about the duality of light, blending theory with demonstrations.

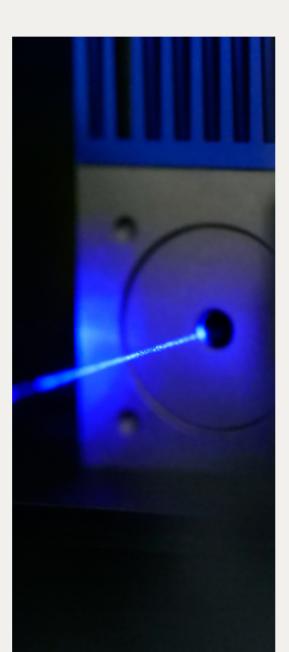
Humai Cell: The Biophotonics Platform focuses on the development of innovative optical tools and methods for clinical applications. Our goal is to provide clinicians with effective diagnostic tools to aid in decision-making, ultimately enhancing early cancer detection, intraoperative margin assessment, and post-treatment monitoring.

Our multidisciplinary team at the Biophotonics Platform brings together expertise in engineering, physics, biochemistry, and medicine. Our activities are closely coordinated with the various clinical units and the Pathology Service at the Champalimaud Clinical Centre, ensuring a strong connection between research, technological advancements, and clinical practice.

Highlights

The Biophotonics Platform spearheaded a collaborative initiative with the Digestive and Gynaecological Units to conduct a series of clinical studies. The primary objective was to showcase the effectiveness of a prototype imaging system developed in-house. This advanced system is not only capable of distinguishing between benign and malignant tissues, but also provides additional quantitative data to assist clinicians in their diagnostic and treatment decisions. These efforts promise to greatly enhance medical diagnostics and patient care, and have led to the creation of a novel endoscopic imaging system.

Experimental



The Flow Cytometry Platform is equipped with state-of-the-art equipment, enabling our team to offer optimal solutions to researchers both within and outside our institution. Alongside research equipment, we possess specialised devices used by clinical haematologists for diagnosis and clinical assays. Our advanced equipment can characterise single cells at rates of thousands per second, with select devices capable of physically isolating specific cell populations for in-depth analysis.

We provide comprehensive training covering a wide range of areas—from the fundamental principles of flow cytometry and experimental design to hands-on instrument operation and sophisticated multiparametric data analysis.

Highlights

This was a particularly active year for the Flow Cytometry Platform. It began with the addition of a new team member, Íris Ramos. A few months in, we hosted the 4th edition of the FLxFlow course at the Champalimaud Foundation, attracting over 140 registrations. Due to the practical nature of the sessions and our commitment to high-quality training, we were able to accommodate only 75 participants. This diverse group comprised researchers from the Lisbon region and international attendees, culminating in a week of intensive training sessions that garnered very positive feedback.

This year, we enhanced our facility with the addition of a flow cytometer capable of detecting small particles, making this highly sensitive equipment available to both internal and external research groups.

The Flow Cytometry Platform made its mark at various national and international conferences, with notable participation in the SIC (Iberian Cytometry Society) in Madrid and CYTO (International Society for Advancement of Cytometry) in Montreal, and also participated in European Researchers' Night.

Closing the year, we transitioned to a shared office space with the dynamic ABBE Platform team, leading to improved communication and collaboration between both groups.

Humai Cell:

Experimental



Human Cells

Glass Wash and Media Preparation (GWMPP)

Coordinator Cátia Feliciano Head Maria José Vito Technicians Diogo Martins Madalena Martins, Soraia Rodrigues Hardware and Software

Coordinator Artur Silva Hardware developers Artur Silva. Filipe Mendes, Paulo Carriço Hardware technicians Dario Bento, Mário Inácio Software developer Luís Teixeira

Glass wash and media preparation are core functions, and essential for any research institution. The Glass Wash & Media Preparation Platform (GWMPP) supports CF's investigators and laboratories by providing sterilised labware such as glass, plastics and instruments, as well as preparing high-quality tissue culture and bacteriological media required for standard research protocols.

Highlights

CR Labs and the Botton-Champalimaud Pancreatic Cancer Center Programme, in addition to supporting established CR Labs and Platforms, along with three Champalimaud Clinical Centre units: Oncology Services. Our team continued to diligently adhere to procedures and protocols and maintain records to ensure The Hardware and Software Platform supports scientific and technological innovation at CF by providing expertise in the design and development of new applications in electronic, robotic, software, and mechanical engineering.

Our team, with diverse hardware and software skills, collaborates with researchers and clinicians to create technological solutions for advanced research and health services.

We offer comprehensive hardware and software development services, covering requirement analysis, design, development, implementation, validation, and testing. We support CF members with 3D printing, custom electronic hardware, and management of both the electronic and mechanical workshops. Additionally, we contribute to open-source projects and share advancements with the research community.

Highlights

This was a year marked by significant milestones in spreading our homegrown hardware and software, expanding our production capabilities, and initiating new partnerships to develop novel technological tools. We solidified our position as a key contributor to the advancement of scientific open-source hardware, enhancing our opensource tool offerings and updating our website for easier access by the research community. Our commitment to global outreach was demonstrated through the production and distribution of over 500 devices worldwide.

At the 2023 Society for Neuroscience (SfN) annual meeting, we showcased several of our devices and tools. Additionally, we continued the development of our friendly winged robot, Wingy, by integrating the latest in AI technology. Wingy earned acclaim at the Metamersion exhibition and garnered significant media coverage, even co-hosting the António Champalimaud Vision Award ceremony.

We established a complete production line for robotic mobility solutions, tailored for healthcare applications, demonstrating our ability to manufacture complex electromechanical systems in-house. Our research collaborations bore fruit in the publication of two peer-reviewed papers, highlighting our platform's innovative technological contributions in hardware and software development.

The GWMPP delivered daily services to new Nuclear Medicine, Pharmacy, and Radiation the safety and efficiency of our operations.

Experimental

Experimental Theoretical

Computationa



Histopathology

Coordinator & experimental pathologist
Tânia Carvalho
Histotechnologists Maria Romano,
Sérgio Casimiro
Digital pathology scientist
Mariana Monteiro

The Histopathology Platform provides a number of high-quality services to the CF scientific community, including: fit-for-purpose histological procedures for specific experimental questions and appropriate methods for collection, fixation and analysis; preparation of biological samples for routine or special procedures; training of CF members; drawing up written reports and supporting manuscript/grant preparation.

Highlights

The Histopathology Platform processed over 4,000 tissue samples from mouse, rat, and zebrafish models. Our services. ranging from paraffin-embedding and cryoembedding to sectioning, staining, immunolabeling, and RNAscope assays, supported more than 60 users across 22 different groups at CF, as well as academic and industry partners. Given that well over half of CF's research involve animal studies or human sample analyses, our platform is proving an indispensable resource for tissue analysis, offering crucial morphological data to complement genetic, molecular, and biochemical research.

Our recent publications showcase our diverse research contributions and exemplify our commitment to advancing the fields of histology and pathology. We also actively engaged in education and outreach, organising and leading a Mouse Dissection Workshop at CF, and coorganising the 2023 ECVP/ESVP/ECVCP/ESVCP Veterinary Pathology Joint Meeting at the Centro de Congressos de Lisboa.



Experimental



Human Rodent Cells Fish

Animal Model Platforms

Fish

Coordinator Ana Catarina Certal Platform manager Joana Monteiro Research technicians Inês Gonçalves, Inês Oliveira, Pedro Seco, Aquaculture technicians Dionísio Sousa, Joana Castro Animal technician Oroquia Sokhona

The Fish Platform is responsible for state-of-the-art housing and husbandry of CR fish models, adhering to the highest standards of health and welfare. Beyond its core responsibilities, the platform provides a comprehensive suite of research support services, including the creation of transgenic and gene-edited fish. Working closely with researchers, it tailors its services to best meet the community's specific needs.

Dedicated to advancing scientific and technological progress in fish husbandry, welfare, and applied technologies, the platform has embarked on various projects. These efforts, both in-house and in partnership with national and international institutions, have led to several peerreviewed publications and presentations at international meetings, earning the platform widespread recognition. The platform also offers its services, training and expertise to both national and international communities

Highlights

Highlighting the platform's academic contributions to the field, research technician Inês Gonçalves and platform manager Joana Monteiro authored an invited book chapter titled "Colony Management at Zebrafish Facilities", published in the book "Zebrafish Research - An Ever-Expanding Experimental Model" by IntechOpen.

Fly

Coordinator Isabel Campos Manager Liliana Costa Technicians Ana Reis, Carina Monteiro, Catarina Craveiro, Patrícia Valentim, Zichiena Zovo

The Fly Platform offers state-of-theart conditions for breeding, upkeep and manipulation of fruit flies, accessible to both CR researchers and external users. Beyond overseeing all shared equipment and spaces, the platform's staff provide a range of technical services. These include core tasks such as medium production and stock maintenance, as well as more technically demanding procedures, namely organ dissection, staining, embryo microinjection and the creation of transgenic lines.

Highlights

The assisted reproduction team of the Rodent Platform and the Fly Platform collaborated to optimise a method for cryopreserving fruit fly embryos, leveraging in-house expertise in rodent germplasm cryopreservation. This protocol promises to transform fly research labs, institutes. and stock centres globally by reducing resources needed to maintain thousands of unique fruit fly stocks. This collaboration culminated in Ana Pereira's MSc thesis. Fly Platform Technicians expanded their collaborations through various educational and outreach initiatives. Team members Liliana Costa and Patrícia Valentim continued as guest lecturers for the Developmental Biology course at the Faculty of Science and Technology, conducting practical sessions on fruit fly genetics. Additionally, the Fly Platform participated in European Researchers' Night and welcomed students and teachers from several schools to visit our lab and learn about our model organism.

Rodent

Coordinator Isabel Campos
Veterinarian Dolores Bonaparte
Service manager Ana Vaz
Operational manager João Pereira
Animal health & welfare technicians
Bruno Novais, Carlos Silva, Catarina Carvalho
(veterinarian)
Assisted reproduction technicians Ana Rita
Pereira, Catarina Craveiro

Colony managers Carolina Quadrado, Erineo Silva, Filipa Nascimento, Laura Carvalho, Rodolfo Águas, Sara Oliveira

Animal technicians Irina Moreira, Leonor Gomes, Wilcilaya Pontes, Pedro Franqueira Technicians Alexandre Leite, João Rodrigues, Rodrigo Santos

The Rodent Platform ensures the welfare and veterinary care of all CR rodent models, complying with European and national regulations, as well as welfare guidelines. Our team oversees shared facilities, delivers daily care to animals, supervises their use for scientific research, and offers specialised services including colony management, assisted reproduction, and contract research, among others. Additionally, the Rodent Platform staff plays a key role in the institutional Animal Welfare Body (ORBEA) and in training researchers in Laboratory Animal Sciences.

Highlights

The Rodent Platform initiated a partnership with external partners Vectorb2b and DNAtech to establish a multi-site facility for conducting preclinical studies. A major milestone in this process was reached when we successfully underwent an INFARMED inspection, ensuring our studies adhere to the Good Laboratory Practices (GLP) framework. We are currently being approached by biomedical companies interested in conducting their GLP-certified preclinical studies with us.

Additionally, this year marked a surprise inspection by the Direção Geral de Alimentação e Veterinária (DGAV), the Portuguese veterinary authority responsible for authorising establishments, users, and projects involving animal use for research purposes. DGAV inspectors were impressed with our processes and practices, highlighting our efforts in enhancing national standards in establishing and maintaining a culture of care that benefits both animal welfare and the quality of research outcomes.

The Rodent Platform was also heavily involved in educating researchers on Laboratory Animal Science (LAS) modules, essential for acquiring DGAV licences for animal experimentation and project design. In 2023, we conducted three LAS course editions, training a total of 68 researchers across various requisite modules.

Human Rodent Fish Fly

The Molecular and Transgenic Tools Platform (MTTP) specialises in advanced molecular cloning, gene editing, and viral production, offering services from the initial design phase to final product delivery. Our team of experts supports a wide range of molecular biology strategies, from basic services to the complex cloning of knock-out and knock-in constructs for creating new cell, zebrafish, fly, or mouse models. Additionally, the MTTP harbours a viral-vector production service and engages in ongoing collaborations to develop and introduce new viral systems. The platform also provides regular genotyping services for several animal models and serves as a central resource and expertise hub, supporting not only the CR community but also national and international research communities, across both academia and industry.

Highlights

The MTTP successfully conducted the second edition of the "Hands-on Molecular Tools" Workshop. This crash course, aimed at beginners, covered the fundamental concepts of molecular biology and genetic engineering. Over five days, we welcomed 14 participants from a diverse array of institutions and backgrounds, including biologists, biomedical scientists, medical doctors, and clinical technicians. The workshop combined lectures and hands-on laboratory sessions, equipping students with the skills to execute and troubleshoot basic cloning processes.

Experimental

Coordinator Ana Catarina Certal Platform manager and senior scientist Ana Raquel Tomás

Senior research technicians Filipa Dias, Marta Barbosa

Research technicians Alexandra Teixeira, André Monteiro, Mariana Velez, Renato Ferreira



Multimedia Platform

Coordinator Pedro Garcia da Silva Multimedia producer Alexandre Azinheira

The Multimedia Platform produces multimedia content for CF, encompassing:

- 1. Production of institutional videos;
- 2. Video production tailored for scientific. medical, preclinical, and clinical projects;
- 3. Social media content creation;
- 4. Research methods videos for scientific publications:
- 5. Clinical procedure videos for educational and methodological use;
- 6. Promotional videos for outreach and internal events;
- 7. Photography for diverse communication materials, including group photos, staff portraits, and architectural imagery;
- 8. Managing an up-to-date multimedia archive for use across social and mainstream media, press releases, and events.

Highlights

The Multimedia Platform produced a variety of impactful videos showcasing CF's commitment to cutting-edge research and exceptional patient care.

Among the highlights were two episodes from the Science Snapshots series, brief videos that spotlight discoveries by our researchers. The episodes covered the impact of brain states on decision-making, and insights into the brain's internal clock and its implications for time perception and action coordination. Additionally, the platform produced Cinderella - A Breast Cancer Story, as well as a Welcome Video for the Champalimaud Clinical Centre, guiding patients through their journey at the Centre.

Through these diverse projects, the Multimedia Platform not only contributed to the public dissemination of scientific knowledge but also reinforced the CF's mission to improve patient care and wellbeing.







CR Support Units

The CR Support Units (CRSU) are responsible for providing comprehensive administrative and operational assistance, including budget and financial management, purchasing, procurement, and services within the people and culture area. Accompanying the evolution and growth of CR, the support provided to CR's scientists also continuously grows in organisation and capacities.

The vision of the CRSU is to be an exemplary resource in the field of research management and administration by providing tools and exceptional support to enhance the work of scientists, maximising their time spent in research.

CR Managing Direction

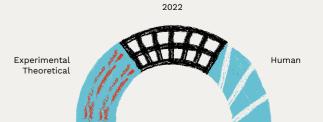
Managing director Philipp Tsolakis

Deputy managing director João Cruz

The CR Managing Direction team serves as the primary point of contact for any problem-solving needs within CR, providing advice on the resources available for the CR community. The team liaises with multiple departments across the institution and focuses on optimising processes, identifying and addressing general problems and deficiencies, and recommending and implementing solutions. Additionally, the team is responsible for budget development and control, as well as coordinating support units.

Highlights

We expanded our support to include assistance with managing the scientific evaluation panel and advisory board. Throughout this significant year, we welcomed many new members to our Support Units, while bidding farewell to valued colleagues. We are grateful for the dedication and contributions of each member and look forward to the fresh perspectives and insights our newcomers will bring.



Communication, Events & Outreach (CEO)

Team coordinator (science communication & outreach) Catarina Ramos Team coordinator (institutional communication & events) Teresa Fernandes Science & community events coordinator António Monteiro

Events & digital manager Diana Cadete Science writer & content creator Hedi Young Communication consultant John Lee Designers Carla Pereira, Marta Correia Audiovisual technician João Van Zelst

A leading clinical and scientific institution should share its achievements with the public in an accessible way. Our mission is to engage society in science and innovation while effectively communicating CF's healthcare, research, and institutional activities.

Our interdisciplinary team blends traditional and innovative strategies and collaborates closely with our community to:

- 1. Promote CF's initiatives and values through internal communication and facilitate community interaction and synergy (Internal Comms);
- 2. Boost internal collaboration and societal engagement by developing science communication skills (Training);
- 3. Design impactful events for healthcare professionals and the scientific community
- 4. Raise public awareness of CF's activities and culture (Visibility);
- 5. Foster scientific and health literacy through educational initiatives (Outreach).

Highlights

We led educational programmes to make science accessible to diverse audiences. Highlights included the high school contest Metamorfoses, integrating bionic creations with storytelling; mentoring underserved students through Ciência di Noz Manera: and the Neuronautas summer academy for teens interested in neuroscience, fully onsite at CF.

The Conversations with Scientists campaign won the 2021-2023 Best European Campaign award for bridging the sciencepublic gap on COVID-19 vaccines. European Researchers' Night attracted nearly 2000 participants, while the Science on the Walls X RAISE Summer Camp combined science, art, and environmental awareness for children from disadvantaged backgrounds. The Ar Event, The Roots of AI, explored the history of artificial intelligence.

Online, the Zoom-In on Champalimaud series highlighted community connections to global celebratory days. New formats included our first audiogram on psychiatric research, and the PhD student video diaries, which provided a glimpse into the PhD journey at CF. We collaborated with international partners to enhance awareness and early detection of pancreatic cancer. Finally, we closed the year with a playful Lego-based stopmotion Winter Holiday Card.

Fellows Support Office

Coordinator Teresa Carona **Assistant** Pedro Alves

The Fellows Support Office provides comprehensive human resources assistance to the CF's research community, numbering around 500 in 2023. This includes everything from recruitment to follow-up of former CF members. In close collaboration with Human Resources and other support units and platforms at CF, we ensure that the Foundation fulfils its commitments to its researchers. We continuously refine HR policies, processes, and procedures to streamline and enhance the experience of our researchers. Our priority is to foster the success and well-being of all researchers and staff at CF, ensuring a nurturing and respectful environment.

Highlights

We continued to provide extensive support to our research community. Our assistance took various forms, including processing 95 statements, 120 onboarding requests, 30 offboarding processes, and over 100 liaisons with Portuguese government offices. Looking ahead, we aim to focus on enhancing mentorship, networking opportunities, and resources for professional development to further assist our researchers.







Graduate Programme Office

Coordinator Isabel Palmeirim Officers Maria Teresa Dias, Mette Kienhorst

The Graduate Studies Office (GSO) supports CR PhD students by promoting academic excellence and fostering community through various activities and initiatives.

Operating mainly from the Teaching Lab and Classroom, we oversee the administrative and logistical aspects of the International Neuroscience and Cancer Doctoral Programme IN(C)DP, the CAJAL Programme, the Fundamentals of Medicine course, and other educational events.

We also manage the CR Library, Teaching Lab, and Classroom bookings, support student social activities, and host the annual IN(C)DP Student Advisory Board meetings.

Looking ahead, the GSO aims to expand graduate education to better integrate the cancer research community and address issues like mental health support. With the growth of Champalimaud Foundation's PhD student community, we focus on enhancing administrative efficiency to ease the burden on students and faculty.

Highlights

The GSO continued to play a central role in the admissions process for the IN(C)DP, coordinating with the programme's leadership to review applications, communicate with candidates, streamline enrollment, and maintain transparent selection criteria. The GSO provided essential support to IN(C)DP students, offering administrative help, academic advice, and assistance with theses and dissertations.

We actively sought PhD funding opportunities from organisations like Fundação para a Ciência e Tecnologia (FCT), Boehringer, and la Caixa, advising on grant applications and managing scholarships and fellowships.

The GSO also supported the summer CAJAL courses and organised various workshops and seminars to enhance students' research skills. To promote translational research, we continued our support to the Universidade do Algarve's Fundamentals of Medicine postgraduate programme, an advanced course designed to acquaint researchers with key medical concepts and issues.

Furthermore, we fostered community and networking among graduate students through numerous events, including the annual student retreat and social gatherings, enhancing their sense of belonging and collaborative spirit.







Health & Science

Coordinator Teresa Fernandes Health & science writer Ana Gerschenfeld

As the clinical research activities at the Champalimaud Clinical Centre continue to grow and diversify, there is a growing need to increase communication efforts, especially for work by the Clinical and Experimental Research Programme's research groups. This includes creating content to bridge the gap between clinical research and the general public.





Lab Administration

Coordinator Raquel Gonçalves Lab administrators António Raposo. Catarina Ferreira, Margarida Nunes, Mariana Sampaio, Sara Correia, Vesna Petojevic

The Laboratory Administration Unit assists CR scientists, enabling them to focus on their research by undertaking a variety of daily tasks. The team works closely with principal investigators, lab managers and members, providing support in ordering, budgeting, travel arrangements, and other essential tasks. Our Lab Administrators frequently collaborate internally with other CR support units, platforms, and departments, including post-award, logistics, and accounting, and engage with external suppliers, service providers, shipping companies, and brokers. Our focus is on serving the best interests of the CR community and enhancing organisational efficiency.

Highlights

Following the global pandemic, the Lab Administration team continued to show resilience and dedication, addressing the evolving needs of the expanding CR community. Committed to excellence both individually and collectively, we maintained our focus on offering timely support and collaborating effectively with CR scientists.

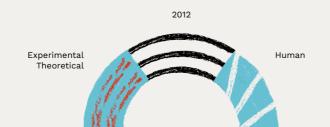
Operations

The Operations Unit ensures smooth daily operations of labs by providing timely and effective assistance and managing infrastructure, maintenance, equipment, and space issues. Collaborating with the CR Direction team, we develop and implement policies and procedures. We also assist PIs in resource planning, equipment acquisition and installation, and offer general guidance.

Embedded within the Operations Unit, the Health and Safety Unit maintains optimal lab health and safety standards. It offers initial inductions and training, and the CR SafeLab website serves as a hub for health and safety resources, including a chemical safety database, safety protocols, waste management guidelines, and information on common laboratory hazards.

Highlights

Working with Directors and key stakeholders, the Operations Unit was instrumental in launching the Botton-Champalimaud Pancreatic Cancer Centre Programme, and continues to support its research endeavours. This facility aims to develop innovative treatments for pancreatic cancer. A multidisciplinary team, including surgeons, clinicians, clinical trial specialists, cancer researchers, genomics experts, and computational biologists, collaborates to set new standards in patient care.







Coordinator Cátia Feliciano

Officer Vasco Correia

Office for Sponsored Programmes (OSP) Post-Award

Coordinator José Mário Leite Project manager Francisco Semedo Project officers Gisele Kaminsk, Helena Duarte, Henrique Moreira, Inês Bonifácio, Jandira Vaz, Pedro Monteiro, Rizwana Mahomed, Sandra Jacinto, Sofia Venâncio, Vanda Vicente

The Office for Sponsored Programmes (OSP) - Post-Award provides assistance and support related to grant reporting (financial and scientific), grant management, execution and administration, and cost eligibility. Additionally, the OSP serves as a facilitator. bridging the gap between the CR scientific community and the bureaucratic aspects of grant management.

Highlights

In a notably active year for the OSP, we helped to manage approximately €50M allocated across 138 different projects. Our team submitted 172 financial and 70 scientific reports to numerous funding agencies on behalf of the research community.

The QuantOCancer **Project**

Era chair Adriana Sánchez-Danés **Project coordinator** Celso Matos **Project manager** Philipp Tsolakis

QuantOCancer is an EU-funded European Research Area (ERA) Chair project aiming to increase research capacity and collaborations within and beyond CR. QuantOCancer provides formal and informal training opportunities for researchers, clinicians, and support staff, engages a Responsible Research and Innovation culture and develops institutional strategies towards an equitable working environment. Adriana Sánchez-Danés, principal investigator of the Cancer & Stem Cell Biology Lab in the Physiology and Cancer Programme, holds the position of ERA Chair.

Highlights

QuantOCancer conducted an array of initiatives throughout the year, focusing on internationalisation, gender equity and science education. By the end of 2023, the programme had funded eight early-stage researcher secondments and staff knowledge exchanges with institutions across the US and Europe.

Strategic Research Development

Coordinator Joana Lamego Grant managers Ana Ayash, Andreia Tavares, Bruno Ceña, Filipa Cardoso

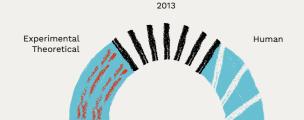
The Strategic Research Development Team is responsible for fundraising initiatives related to research, innovation, and technology development at CF. We achieve this by identifying policy, funding, and collaboration opportunities, as well as codesigning, co-developing, and co-launching strategic programmes and projects.

We collaborate closely with the CF community to continuously enhance our framework and team culture, fostering effective strategies for successfully securing research funds. The diligent efforts of the CF research ecosystem over the past seven years have been rewarded with over €75 million in external research funds, with more than two-thirds coming from international sources.

Highlights

This proved to be another dynamic and fruitful year for our team. We disseminated 277 funding opportunities and supported 99 application submissions across more than 40 different sponsors. Over 90% of the funds secured by the CF research community in 2023, amounting to over €13 million, came from international sponsors. This remarkable accomplishment underscores and further strengthens the global orientation and stature of the CF research programme.

Ana Ayash has taken on an exciting new challenge with the Lisbon Unit of the European Laboratory for Learning and Intelligent Systems (ELLIS), enhancing our team's alumni network. This endeavour once again placed upon us the critical responsibility of identifying promising talent that aligns with our core principles and embodies our spirit of teamwork. After a highly competitive international recruitment process, we are thrilled to welcome Cátia Figueiredo, a seasoned scientific researcher, to our team. Eager to change gears, Cátia is set to join us in early 2024, infusing our fundraising and research management efforts with her passion, energy, and expertise.



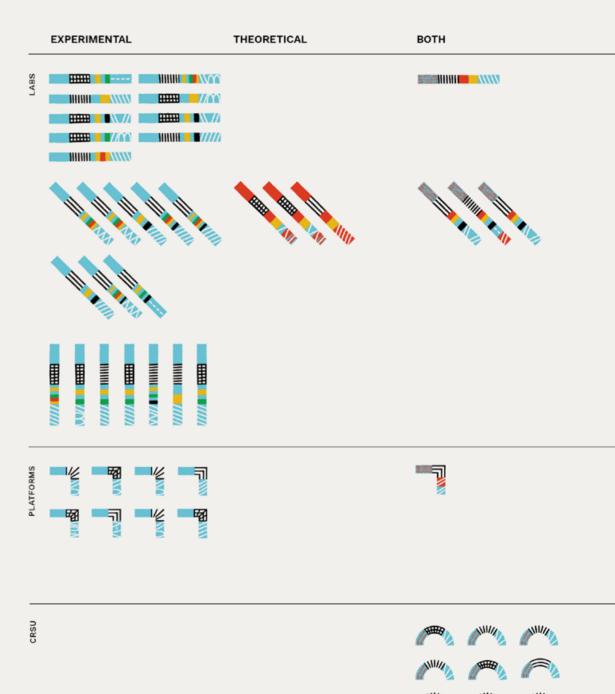


Community decoded

Mostly
experimental with
a sprinkle of theory
and hybrid flavours,
our neuroscience
labs especially like
to mix things up.

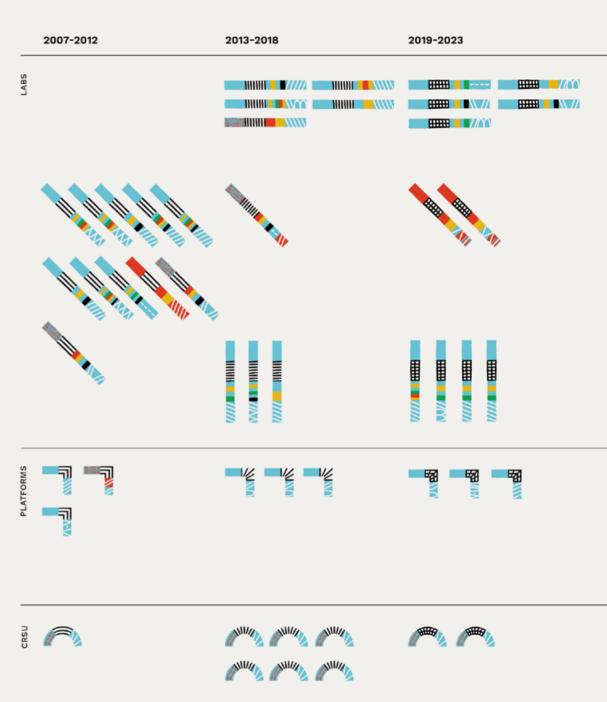
CODE 1 ACTIVITY TYPES





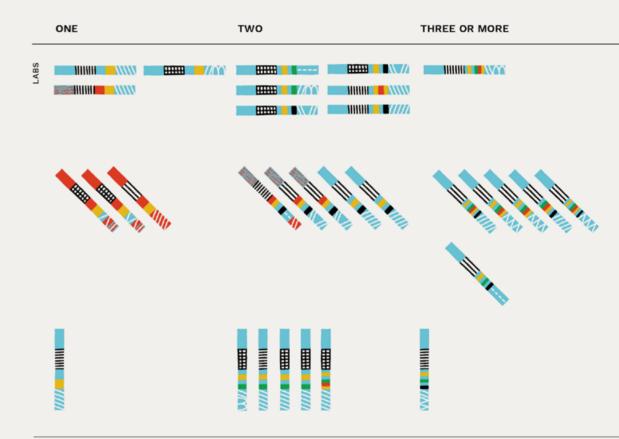
While our community has grown steadily over 16 years, 2013-2018 marked the period of peak expansion. In particular, 2017 was a bumper crop year, bringing in more fresh faces than any other.

CODE 2 FOUNDING YEAR



111

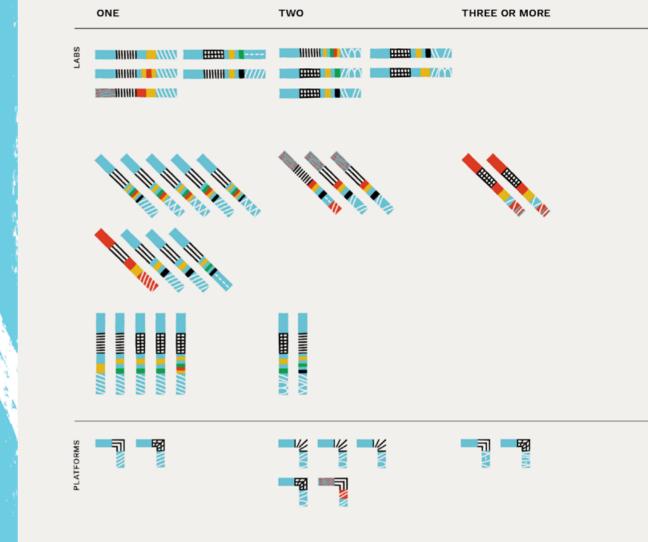
Imaging techniques, followed by genetic tools, form the bread and butter of our research approach.



PLATFORMS

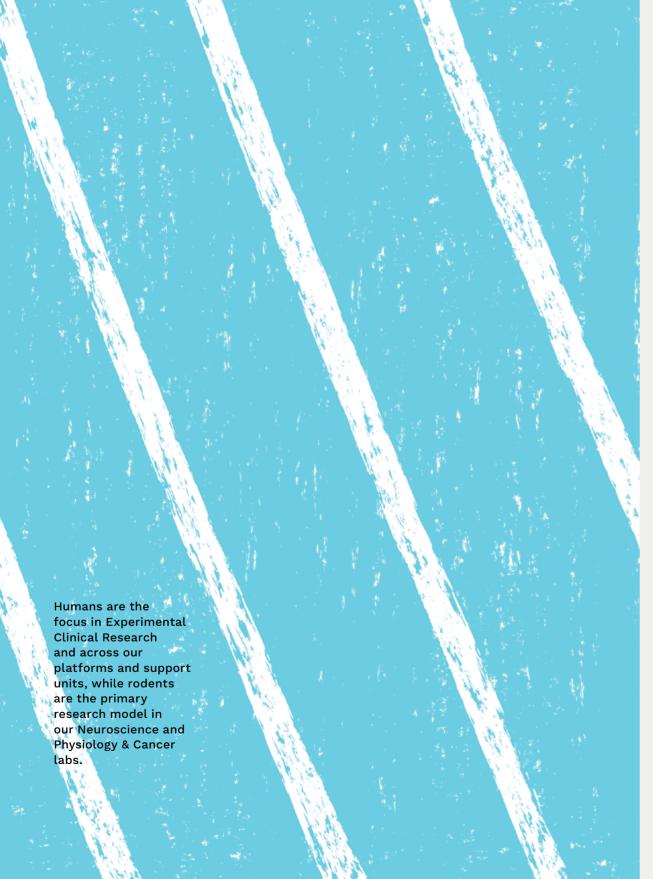
N S

^{*} Imaging & Visualization - Genetic & Molecular - Computational & Statistical - Neuroscience & Behavioural



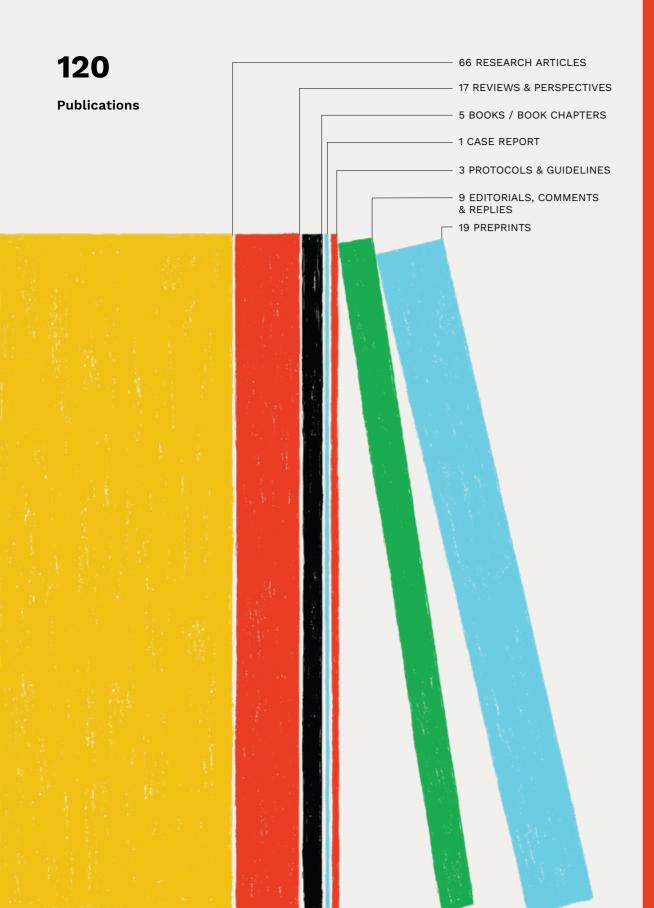


^{*} Human - Rodent - Fish - Fly - Cells - Computational - Other



It's not just about the pieces but how they work together





publications

In 2023, CR's publications encompassed new discoveries in both fundamental research topics and translational and clinical fields. Many of these publications resulted from collaborative efforts among various groups within the Champalimaud Foundation. The featured publications below provide an overview of CR's extensive research spectrum.

A New Option for Patients with Treatment-Resistant Depression

Esketamine Nasal Spray versus Quetiapine for Treatment-Resistant Depression

Reif et al.The New England Journal of Medicine

Depression is a silent epidemic, affecting millions worldwide. For a subset of patients with Treatment-Resistant Depression (TRD), the journey to recovery is fraught with failed medications and dwindling hope. Researchers from the Neuropsychiatry | Oliveira-Maia Lab explored the efficacy of esketamine nasal spray (NS), a novel antidepressant approved in the EU and US but with limited accessibility. They compared esketamine NS to quetiapine extended-release (XR), a common TRD medication.

Esketamine NS combined with a conventional antidepressant proved more effective than quetiapine XR in treating TRD. After 8 weeks, 27% of esketamine users achieved remission – a significant reduction in depression symptoms – compared to 18% of quetiapine users, with long-term results showing sustained remission without relapse in a higher proportion of the esketamine group. Despite a higher frequency of side effects in the esketamine group, it was found to be more tolerable than quetiapine, suggesting its potential as a viable option for those struggling with the debilitating effects of TRD.

Brains at the Checkout: Navigating Multiple Decision Paths

A reservoir of foraging decision variables in the mouse brain

Cazettes et al. Nature Neuroscience Making a choice, such as selecting the quickest checkout line at the supermarket, might seem straightforward but actually involves complex brain processes that evaluate multiple factors like the number of people in line or the items each shopper has. Researchers from the Systems Neuroscience | Mainen Lab and Circuit Dynamics and Computation | Renart Lab revealed that the brain is capable of computing several potential decision-making strategies at once, rather than sticking to just one.

In experiments with mice navigating a virtual world to find water, they observed that while mice tended to stick to their preferred strategy for deciding when to switch locations in search of water, their brains simultaneously processed both used and unused strategies. This simultaneous computation was visible in the premotor cortex, where brain activity patterns matched different decision-making processes. This ability to precompute multiple possible strategies could enhance cognitive flexibility and learning, offering insights into decision-making processes and potentially guiding the development of advanced machine learning systems.

Enhancing Prostate Cancer Diagnosis with AI

Value of handcrafted and deep radiomic features towards training robust machine learning classifiers for prediction of prostate cancer disease aggressiveness

Rodrigues et al. Scientific Reports Prostate cancer is one of the most common cancers among men worldwide and is a leading cause of cancer-related deaths. Researchers from the Computational Clinical Imaging | Papanikolaou Lab explored how artificial intelligence (AI) could improve prostate cancer diagnosis and treatment by enhancing the accuracy of machine learning algorithms used to predict disease severity. One significant challenge in this area is that different radiologists might outline (or "segment") tumours differently, leading to inconsistent AI predictions.

To address this, various strategies were tested to train more robust models. The study found that AI systems trained on a mixed dataset, randomly selecting interpretations from different radiologists for each patient, resulted in the most reliable predictions with the lowest error rates. Conversely, models trained by removing less consistent features performed worse. Additionally, combining traditional imaging data (radiomics) with features derived from advanced AI (deep learning) to create a hybrid model did not significantly improve performance over the radiomics model alone. This research underscored the potential of using heterogeneous data and the challenges of integrating deep learning features for enhancing prostate cancer diagnosis accuracy.

Locally Sourced: Site-specific Immune Barriers to Metastasis

Locally sourced: site-specific immune barriers to metastasis

Correia

Nature Reviews Immunology

While cancer cells can migrate early from their origin to distant sites, they often remain dormant for years or never develop into detectable metastases (new cancer growths in different parts of the body). This delay suggests there are obstacles that prevent these wandering cancer cells, known as disseminated tumour cells (DTCs), from growing in new locations. While some of these obstacles could be traits within the DTCs themselves, recent research points to the surrounding environment at these new sites, especially the immune system, playing a pivotal role in hindering their growth.

This Perspective piece by Ana Correia (Cancer Dormancy & Immunity Lab) explores how differences in the immune system at various locations in the body can significantly impact the growth and spread of DTCs. Correia argues that understanding these site-specific immune barriers is crucial for developing the next wave of immunotherapies aimed at preventing metastasis.

New Potential Target for Gastric Cancer Therapy

Syndecan-4 is a maestro of gastric cancer cell invasion and communication that underscores poor survival

Poças et al. PNAS Researchers from the Systems Oncology | Costa-Silva Lab, in partnership with Instituto de Investigação e Inovação em Saúde da Universidade do Porto (i3S) and IPO-Porto, discovered that Syndecan 4, a molecule prevalent in gastric tumour cells, is associated with more aggressive cancer forms and worse patient prognosis. This molecule, carried by extracellular vesicles (tiny particles used for cell communication) released by tumour cells, directs these vesicles to the liver and lungs—the organs most often affected by stomach cancer metastasis.

The presence of Syndecan 4 in extracellular vesicles influences their uptake by liver and lung cells, facilitating metastasis. However, removing Syndecan 4 from these vesicles blocked their entry into these organs, suggesting a possible strategy for preventing cancer spread. Thus, the study, part of a broader effort to understand the role of cell surface sugars in gastric cancer development, identified Syndecan 4 not only as a potential biomarker for assessing the aggressiveness of gastric cancer but also as a promising target for new anti-cancer therapies.

Old Brains, New Tricks: Surprising Plasticity in Adult Vision

Extensive topographic remapping and functional sharpening in the adult rat visual pathway upon first visual experience

Carvalho et al. PLOS Biology

Researchers from the Preclinical | Shemesh Lab developed a method to deliver complex visual stimuli to rodents within the limiting confines of an MRI scanner, demonstrating that adult brains can reorganise and adapt their visual pathways. The experiment showed that adult rodents, deprived of light since birth, initially had unorganised responses to visual stimuli. However, after exposure to light, the brain began to show organised responses similar to those of healthy controls, indicating a high degree of plasticity.

Much like young children who swiftly acquire languages in their early years, our visual system also has a "critical period" during the first few years of life where rapid development occurs. After this time, changes become more difficult, following the old adage, "You can't teach an old dog new tricks". This study challenges the long-held belief that significant changes in the brain's visual system are limited to early development, and suggests broader implications for treating conditions like Parkinson's disease, in which visual symptoms can manifest early in the disease process.

Rethinking the Cerebellar Nuclei's Role in Learning

Synaptic mechanisms for associative learning in the cerebellar nuclei

Broersen et al.
Nature Communications

This paper came from a collaborative effort between the Neural Circuits and Behaviour | Carey Lab and scientists in the Netherlands. They studied how mice learn to link two stimuli—a light flash followed by a puff of air— so that they can anticipate the air puff, closing their eyes at the sight of the light. Traditionally, it was believed that the cerebellar cortex—the outer layer of the cerebellum (located at the back of our brains)—was primarily responsible for learning such reflexive responses. However, this study reveals that the cerebellar nuclei, the cerebellum's inner part, significantly contributes to the learning process.

The researchers found that direct stimulation of connections in the cerebellar nuclei could induce the mice to close their eyelids at appropriate times, indicating that the cerebellar nuclei can support well-timed learning. Additionally, the researchers observed that associative learning strengthened these connections to the nuclei. This work not only sheds light on the cerebellum's role in learning and timing but also suggests potential new approaches for treating cerebellar damage in humans and improving motor skill learning through targeted stimulation.

The Timekeeper Within: New Discovery on How the Brain Judges Time

Using temperature to analyze the neural basis of a timebased decision

Monteiro et al. Nature Neuroscience As Einstein quipped, "Put your hand on a hot stove for a minute, and it seems like an hour. Sit with a pretty girl for an hour, and it seems like a minute". This paper from the Learning | Paton Lab shed light on how the brain perceives time, focusing on the brain's "internal clock". By increasing or decreasing the temperature of a specific brain region in rats known as the striatum, they were able to speed up or slow down the animals' perception of time, respectively.

The study not only enhanced our understanding of time perception, but also provided insights into how the brain processes and coordinates actions. The team's findings suggest that the striatum is critical for determining what action to perform and when, rather than how to control continuous movement, which may involve other brain areas like the cerebellum. This research may have important implications for diseases like Parkinson's and Huntington's, which involve the striatum and time-related symptoms. By highlighting a more specific role for the striatum in discrete, as opposed to continuous, motor control, the results could guide future therapeutic approaches and advancements in robotics and learning algorithms.

€48.9M

Competitive External Funds active during 2023



SIMONS

competitive

external

Since the establishment of the research programme, CR scientists have received significant support for their work through competitive external funding schemes. Counting all newly awarded and previously secured projects, a total sum of €48.9M was active at CR during 2023. These funds were awarded by a diverse group of national and international organisations. Among these, the major contributors were the European Commission and the National Portuguese Science Foundation.

funding

138 projects

7 Simons Foundation 12 la Caixa 43 Fundação para a Ciência e a Tecnologia 48 Others 28 European Commission

In 2023, the CF research community secured over €13M in funding, with more than 90% of this amount coming from international sponsors, highlighting the Foundation's strong global presence. This significant financial support was distributed among more than 20 research groups, reflecting the breadth of research conducted at CF: 49% of funds were dedicated to Physiology and Cancer, 38% to Neuroscience, 11% to Experimental Clinical Research. and 2% to activities within the Champalimaud Clinical Centre. This distribution showcases the Foundation's commitment to a wide range of scientific inquiries, from fundamental biology to clinical applications.

European Commission Grants

64% of these funds were provided by the European Commission. Among the notable awards were three European Research Council (ERC) grants bestowed upon researchers across various stages of their careers: Carlos Minutti received an ERC Starting Grant, Eugenia Chiappe an ERC Consolidator Grant, and Henrique Veiga-Fernandes an ERC Advanced Grant.

Additionally, CF are key players in two consortia funded under the Horizon Europe Destination Health programme. Albino J. Oliveira-Maia's team is a member of a consortium headed by UMC Groningen in The Netherlands, focusing on developing psilocybin therapy for alleviating psychological distress in palliative care patients. Meanwhile, the Breast Unit is collaborating with a consortium led by the Universitair Medisch Centrum Utrecht, working at the interface of artificial intelligence and early detection of noncommunicable disease risks in individuals with breast cancer.

Diverse European Funders

Beyond the European Commission, CF attracted funding from a variety of European sources. The la Caixa Foundation supported research projects by the Renart, Ribeiro, and Rhiner Labs, while Matthjis Oude Lohuis (Petreanu Lab & Machens Lab) earned a Rubicon grant from the Dutch Research Council, and Andreia Maia received an EHA Research Mobility Grant from the European Hematology Association.

International Sponsorship

International grants outside Europe, from six sponsors, accounted for 13% of the total funds. These included an NIH BRAIN Initiative R01 grant awarded to Il Memming Park in collaboration with Princeton University, a Parkinson's disease research grant to the Paton Lab from the Michael J. Fox Foundation, and a Simons Collaboration on the Global Brain (SCGB) Culmination Award to the Machens Lab for studying neural communication.

Additionally, Gonçalo Cotovio (Oliveira-Maia Lab) received a Young Investigator Grant from the Brain and Behavior Research Foundation; the Fior Lab won a CRI Technology Impact Award from the Cancer Research Institute for developing a discovery platform aimed at finding innate immune modulators for cancer immunotherapy; and Luísa Lemos (Seabra Lab) earned a Randy Wheelock Award from the Choroideremia Research Foundation to investigate retinal pigment epithelium degeneration in choroideremia.

National Funding Achievements

On the national level, CF researchers were recognised by various organisations. The BIAL Foundation awarded Jaime Grácio (Oliveira-Maia Lab) a grant to explore how cardiac activity could predict freezing behaviour in humans. This project benefits from collaborative efforts with the Moita Lab, bridging the Neuroscience and Experimental and Clinical Research programmes at CF. Other recognitions included the AstraZeneca Foundation's FAZ Science Award for Adriana Sánchez-Danés, an oncology research grant for Rita Fior from the Portuguese League Against Cancer (Liga Portuguesa Contra o Cancro), and a Multiple Myeloma research grant for the João Lab from the Portuguese Association Against Leukaemia (Associação Portuguesa Contra a Leucemia).

Moreover, Ana Correia secured an ERC-PT grant in the inaugural call by the Foundation for Science and Technology (Fundação para a Ciência e a Tecnologia, FCT), designed to acknowledge researchers who, despite high scores from the international ERC programme, were not funded due to budget constraints. The FCT further funded five projects (including three exploratory projects) to various research groups at CF, and awarded a RESTART grant to Andrada lanus (Shemesh Lab).

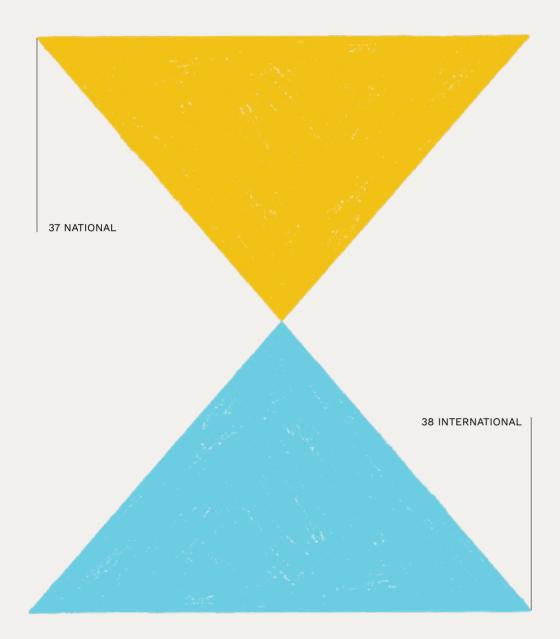
Nurturing Emerging Talent

Up-and-coming researchers at CF continued to make their mark by securing individual grants from national, European, and other global sponsors. Francesca Mastrogiuseppe secured the SCGB Transition to Independence Postdoctoral Award. The European Commission honoured four researchers with Marie Skłodowska-Curie Actions/ European Research Area fellowships: Corinna Gebehart (Chiappe Lab), Ana Rita Cruz (Costa-Silva Lab), Ana Lúcia Rebelo (Sánchez-Danés Lab), and Nuno Machado (Vasconcelos Group). Finally, Matthijs Oude Lohuis (Petreanu Lab & Machens Lab) received an EMBO postdoctoral fellowship. while Filipa Barros was recognised with a postdoctoral fellowship by the Dystonia Medical Research Foundation and a Call to Scientific Employment Stimulus (CEEC) contract from FCT.



75

PhD Students



Austria - Brazil - Canada - Chile - Estonia - France Germany - India - Italy - Netherlands - Poland - Portugal Russia - South Africa - South Korea - Spain Switzerland - Turkey - United Kingdom - Vietnam Since its inception, CR has regarded educating scientists as one of its key strategic objectives. To this end, CR has devoted considerable efforts to the development and implementation of outstanding educational programmes, advanced courses, and workshops.

Among these, three main endeavours are the International Neuroscience & Cancer Doctoral Programme, the Fundamentals of Medicine Course, and the CAJAL Advanced Training Courses.

education

The International Neuroscience and Cancer Doctoral Programme - IN(C)DP

Directors Joe Paton (until September), Megan Carey and Il Memming Park (from September)

Education committee Ana Luísa Correia, Bruno Costa-Silva, Susana Lima and Alfonso Renart (until August)

Graduate studies coordinator Miguel Seabra (until June), Isabel Palmeirim (from June) Graduate studies officers Maria Teresa Dias, Mette Kienhorst

Scientific advisory board Alessandro Treves, International School for Advanced Studies, Italy; Darcy Kelley, Columbia University, US; Gilles Laurent, Max Planck Institute for Brain Research, Germany; Maria Leptin, EMBO, Germany The IN(C)DP aims to provide students with a broad and integrative education in neuroscience, physiology and cancer, with a focus on the neuronal and circuit basis of behaviour, and organismal biology.

A main goal of the programme is to foster and encourage active participation, independence, and critical thinking among students as they forge their paths to becoming innovative scientists and researchers. IN(C)DP students come from all over the world with diverse backgrounds, including life sciences, physics, psychology, mathematics, and computational sciences.



Twelve students were recruited in the IN(C)DP23 call 10 out of 12 international students

Ana Martins CA
Arina Dygay RU
Arjun Aji Reeja IN
Ayesha Vermani IN
Beatriz Sebo PT
Devanshi Shah IN
Guillermo Martín ES
Kerem Sarikaya TR
Madalena Bettencourt PT
Miguel Donderis ES
Prannay Reddy IN
Robert Baber DE

The final part of the recruitment process for the 2023 student cohort was conducted in a hybrid format (in-person and online) on 16 & 17 February, involving 30 candidates selected from a pool of 200 through curriculum evaluation. From 11-15 September, the Graduate Studies Office (GSO) organised the third edition of IN(C)DP Orientation Week, initiating the curricular part of the doctoral programme.

Students attend courses that cover basic topics in contemporary biology and neuroscience, and include a strong practical and quantitative skills component. In the first year, students also participate in laboratory rotations. This allows them to become acquainted with the research conducted in various labs and select the lab in which they will conduct their doctoral research.

Throughout their PhD, students are supported by a thesis committee that monitors their progress and provides guidance. The IN(C)DP is an accredited programme and degrees are granted by one of two academic partners, Instituto de Tecnologia Química e Biológica António Xavier, Universidade Nova de Lisboa (ITQB NOVA), and Instituto Universitário de Ciências Psicológicas, Sociais e da Vida (ISPA). PhD students at CF enjoy a vibrant academic environment, with two to three seminars weekly that feature internal and external speakers across both basic and clinical research domains, as well as access to a wide range of meetings and workshops.

Buddy programme

This mentorship programme was initiated by IN(C)DP students to help new students integrate into the Champalimaud Research (CR) community. It is a creative orientation programme that introduces the vision, mission, and values of the Foundation. The programme also includes recreational activities such as tours of the best places in Lisbon and its surroundings, tips on ways to integrate, and useful information for the students' training years.

CR student retreat

The retreat took place at the INATEL Albufeira hotel from 6-8 November. The theme. From Data to Visualization, aimed to elucidate the best methods for organising, communicating, and presenting scientific data. The retreat hosted 81 participants: 61 doctoral students and 20 technicians from various research domains, including 42 from Neuroscience, 13 from Physiology & Cancer, and 15 from Experimental Clinical Research. A diverse set of activities offered participants a comprehensive experience, blending theoretical knowledge from lectures with practical and collaborative elements. One of the primary objectives of the retreat was to strengthen relationships among doctoral students and foster a sense of community. To achieve this, social activities such as a treasure hunt, Help the Cell!, were organised. Participants also spent time together on the beach and engaged in team sports during their free time.

CAJAL Advanced Neuroscience Training Programme

Cajal Courses were once again organised in-person at CF. Two courses were held, involving a total of 31 faculty members, 23 teaching assistants and 44 students.

Cajal Course on Interacting with Neural Circuits

18 JUNE - 8 JULY

Course directors Tiago Branco (Sainsbury Wellcome Centre, UK), Michael Hausser (University College London, UK), Susana Lima (CF, PT) Executive course director Pedro Garcia da Silva (CF, PT)

Understanding the connection between neural circuit activity and behaviour is crucial in neuroscience. This challenge demands detailed insights into neural circuit cell types, their connectivity, and the recording of activity patterns in the brain during behaviour. Additionally, exploring these connections' causal relationships necessitates precise circuit perturbations, both temporal and spatial.

This course introduced the latest anatomical, genetic, optical, electrophysiological, optogenetic, and pharmacogenetic methods available to meet these challenges. Through faculty-led discussions, students explored tool development and application across various models, including mice, flies, and zebrafish. The three-week programme blended lectures by renowned speakers with hands-on experience in cutting-edge techniques, providing both theoretical foundations and practical skills for students to apply in their home labs. A significant feature of the course was the "miniproject," which allowed students to practically apply their learning under expert guidance. This setup encouraged active engagement and discussion among participants, enriching the overall learning experience.

Cajal Course on Machine Learning for Neuroscience

9-29 JULY

Course directors Gonzalo de Polavieja (CF, PT), Kristin Branson (HHMI Janelia, US), Il Memming Park (CF, PT)

Neuroscience has significantly influenced the development of Artificial Intelligence (AI) and Machine Learning (ML). The concept of artificial neural networks, which form the foundation of Deep Learning, draws inspiration from the physiology of neurons. This shared heritage persists, with ML techniques now being refined into sophisticated tools that enhance data processing in animal behaviour studies and brain activity analysis. Moreover, ML is used to simulate brain functions, tackling problems similar to those the brain addresses, with potentially analogous processing units.

This course offered a practical introduction to AI and ML, focusing on their application in data acquisition, analysis, and the modelling of brain activity and behaviour. It covered the basics of ML and its implementation in neuroscience, exploring the field's limitations, application boundaries, and how insights from neuroscience and psychology can inspire new systems.



Fundamentals of Medicine



In 2020, CF initiated an educational programme aimed at bridging the gap between fundamental research and clinical practice.

Within the framework of the innovative medical programme at the University of Algarve, which uses a problem-based learning method, the Fundamentals of Medicine Course provides a select group of scientists from the Foundation with a solid grounding in the principles of human physiology, pathology, and medicine.

This course aligns with CF's mission to advance translational research and improve patients' lives. The extraordinary enthusiasm, interest, and commitment from students and teachers across all editions underscore the programme's success.

Postgraduate in Fundamentals of Medicine I & II

The five students who completed the first edition of Postgraduate in Fundamentals of Medicine I (PG-FoM I), in June 2023 also finished the first edition of PG-FoM II. Four of them were admitted to the 5th year of the Integrated Master's in Medicine course at the University of Algarve after a curricular evaluation and medical knowledge examination.

The second edition of PG-FoM I, which began in January 2022, concluded in June 2023. Of the seven researchers who started this training, five successfully completed it.

Advanced Course in Fundamentals of Medicine

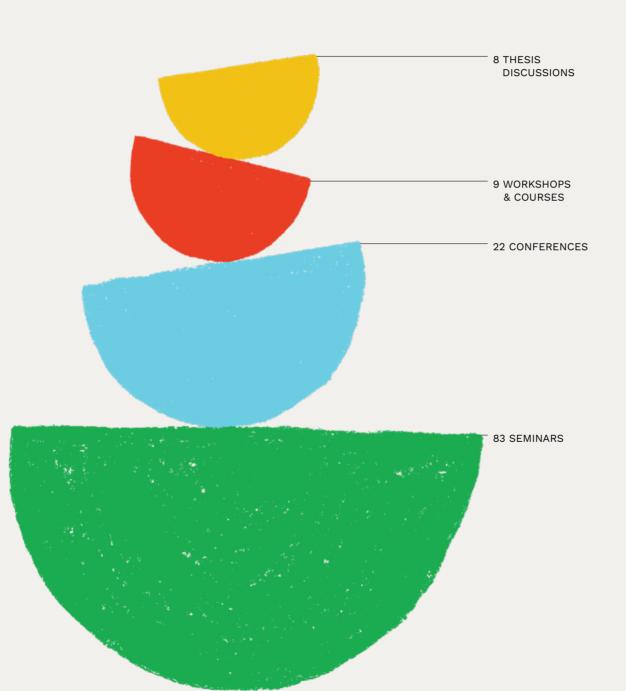
In September 2023, the first edition of the Advanced Course in Fundamentals of Medicine (CA-FoM) began. This new 10-month programme focuses on the cardio/respiratory, metabolic, infectious/immunological, and neurological/psychiatric areas, providing knowledge about the anatomy and physiology, and the most common pathologies in these body systems, as well as the diagnostic and therapeutic processes, highlighting their gaps and weaknesses.

The theoretical training is complemented by practical sessions, including organ dissections and the observation of physical/imaging exams, as well as sessions with medical simulation models, to be held at the University of Algarve in 2024. Students undergo continuous assessment, consisting of a knowledge evaluation exam in 2023, with three more to be held in 2024.

For the first time, this advanced course was opened to external candidates, attracting 28 applicants. Ten were selected: five from Champalimaud Research and five external candidates (PhD graduates from the Faculty of Biomedical Sciences at the NOVA University of Lisbon, the Faculty of Sciences at the University of Lisbon, the Laboratory of Instrumentation and Experimental Particle Physics, Lusófona University, and Mater Dynamics).

122

Scientific events



scientific

events

In 2023, over a hundred scientific events were successfully conducted across diverse formats, spanning on-site, online, and hybrid settings. CR also saw a significant increase in seminars and conferences, providing rich opportunities for knowledge exchange between CR researchers and the broader scientific community. Highlights included hosting of the 10th European Student and the 3rd Conference of the Timing Research Forum. Additionally, engaging scientific gatherings were organised under the Consortium for Responsible AI, such as the "Responsible AI Forum 2023" and "Building AI First: From Science to Software". The year also marked the launch of a new seminar series, the Innovation Speaker Series.

CR Symposium

24-27 OCTOBER

The brain within the body within the world: the neuroscience of the self

#CRSy23 aimed to facilitate discussions between researchers and clinicians on the mechanisms by which the brain generates and regulates internal states, such as hunger, thirst, and emotions, and how these states interact with the body and external environment to drive behaviour. The symposium featured presentations by 17 distinguished speakers, selected talks from abstract submissions, and two poster sessions, alongside social and networking opportunities, adopting a hybrid format to accommodate both inperson and online attendance.



Speakers

Keynote speakers

Olaf Blanke EPFL, CH

Karl Deisseroth Stanford University, US

Other Invited Speakers

Albino Oliveira-Maia Champalimaud Foundation, PT

Ana João Rodrigues University of Minho, PT

Anissa Kempf Biozentrum, University of Basel, CH

Carlos Ribeiro Champalimaud Foundation, PT

Dana M. Small McGill University, CA

Daniel McNamee Champalimaud Foundation, PT

David Foster University of California, US

João Peça Center for Neuroscience and Cell Biology, PT

Jan M. Ache University of Würzburg, DE

Mitsuko Watabe-Uchida Center for Brain Science, Harvard University, US

Nadine Gogolla Department Emotion Research, Max-Planck Institute of Psychiatry, DE

Sarah Garfinkel University College London, UK

Susana Lima Champalimaud Foundation, PT

Valeria Gazzola University of Amsterdam, NL

Zachary Knight University of California San Francisco, US



Stats

Invited speakers

16 onsite 1 remote speakers 11 selected speakers 103 posters

Attendance

372 in-person 38 online

Country of attendees

Bangladesh Denmark France Germany India Ireland Israel Italy Netherlands Portugal South Korea Spain Switzerland Türkiye

United Kingdom United States

CISS

The weekly Champalimaud Internal Seminar Series (CISS) began with the establishment of CR and takes place in CCU's Seminar Room. These seminars comprise 25-minute presentations by CR investigators, who share their research with the community and receive immediate feedback in a brief, five-minute Q&A session. CISS helps to create a community in which all members become well-acquainted with each other's work, thereby enhancing cooperation and collaboration.

COpS

The Champalimaud Open Seminar (COpS) series, held at the Main Auditorium, is open to COLife partners and the public, featuring two group leaders who present overviews of their research.

Brain-Body Interactions Seminar Series

Since its establishment in 2020, the Brain-Body Interactions Virtual Seminar Series has brought together a global audience from the Americas, Africa, Asia, Europe, and Oceania, often with hundreds of attendants, who discuss a diverse spectrum of work ranging from interoception to neuroimmunology.

The series emerged from the great momentum that research integrating neuroscience with other biological fields has been gaining. Created by Carlos Ribeiro (Behaviour & Metabolism Lab) and Asya Rolls (Technion, Israel), the series has quickly established itself as the main platform where top scientists in the field present their work and discuss it with an engaged audience. While curated and coordinated by Ribeiro and Rolls, the series is run and moderated by a worldwide network of students and postdocs working in the US (Harvard), Portugal (Champalimaud Foundation), and Israel (Technion).





Ad hoc Seminars

Ad hoc seminars feature external researchers in neuroscience, cancer, and physiology, invited by CR scientists to present their latest work. These seminars are designed to spark discussions on innovative approaches and current research trends, fostering a collaborative environment and promoting knowledge exchange among peers.

Theory Seminars & Theory Mini-Symposium

These sessions feature external theorists specialising in neuroscience or related fields, and aim to foster interactive discussions within the CR community.

Innovation Speaker Series

The Innovation Speaker Series is designed to acquaint students, postdocs, and faculty with strategies for bringing their research to the marketplace. Through a series of fireside chats, innovation experts, industry professionals, successful entrepreneurs, and technology transfer veterans join the CR community to share their insights, experiences, and actionable advice for translating research into real-world solutions.

Future of Foraging Seminar Series

The Future of Foraging Seminar Series launched its third season in 2023. These online seminars aim to bring together experts from various areas of foraging research—including theoreticians, neuroscientists, behavioural ecologists, and psychologists—to create an interactive array of talks and roundtable discussions. The 2023 episodes, now available on the series' YouTube channel, fostered a diverse range of discussions captivating a broad swath of the research community. They also inspired a conference at the Janelia Research Campus of the Howard Hughes Medical Institute, titled "Bridging Diverse Perspectives on the Mechanistic Basis of Foraging".



culture

As the CR community grows, its culture undergoes a transformative journey. Fueled by dedicated volunteers, new initiatives spring up alongside longstanding programmes. In this unique and dynamic environment, regular social gatherings act as foundational pillars, cultivating a positive atmosphere and fostering a strong sense of camaraderie. At its heart, our evolving culture is propelled by a shared commitment to promoting scientific collaboration and pursuing research excellence as a collective endeavour.

CR Annual Retreat

CR Retreat' 23 Embracing Multitudes — A Game of Translation

From 29 May to 1 June, 252 CR members gathered at the Grande Hotel do Luso in Luso, Portugal, to exchange ideas, celebrate diversity, and reinforce their collective vision for pioneering research. Themed "Embracing Multitudes: A Game of Translation", this edition proved to be a transformative experience that united the diverse elements of the CR community. Inspired by the Bluebottle, a marine creature known as a colonial organism, consisting of multiple individual organisms working together as one, the retreat mirrored the unity and diversity inherent within CR. With a commitment to recognising differences and enhancing communication, participants engaged in scientific exploration and social bonding. The Retreat Committee, with support from the Communication. Events & Outreach team, organised this gathering to break down barriers between CR's different labs, encouraging collaboration across disciplines and embracing the wealth of perspectives within the institution.

COMMITTEE

Ábel Sagodi, Park Lab Ana Rita Mendes, Lima Lab Ana Sofia Marques, Sánchez-Danés Lab André Mendonça, Park Lab Anh Nguyen, Renart Lab Anna Pezzarossa, ABBE Platform Beatriz Belbut, Petreanu Lab Carolina Filipe, Park Lab Carolina Gonçalves, de Polavieja Lab Dean Rance, de Polavieja Lab Emilie Carneiro, João Lab Filipa Barahona, João Lab Filipa Torrão, Chiappe Lab Francisco Landum, Correia Lab Gabriel Costa, Oliveira-Maia Lab Hyungju Jeon, Park Lab Julia Elzanovska, Costa-Silva Lab Lucas Martins, Orger Lab Márcia Fontes, Fior Lab Maria Keridon, van Gisbergen Lab Martina Canova, Chiappe Lab Matilde Matos, Carey Lab Naz Belkaya, Renart Lab Saheli Roy, Vasconcelos Lab Sara Ferreira, Sánchez-Danés Lab Sofia Freitas, Paton Lab & Renart Lab Solène Sautory, Mainen Lab & Petreanu Lab

Baking Lab Helping is a piece of cake!

6 FEBRUARY

The Baking Lab initiative resumed its activities after a pandemic-induced hiatus. Once a month, members of the CR community come together to bake and sell homemade cakes, with the proceeds going to charitable causes. This event, driven by the community, embodies the values of solidarity and camaraderie that are shared among our members.



Event Reflections

23 FEBRUARY

"Reflections", an event orchestrated by the 2022 CR Retreat Committee, marked a crucial step in bolstering community spirit at CR. Its aim was to rekindle the spirit of fellowship that defines the annual retreat, acting as a springboard for engagement in community-led activities taking place throughout the year. The event not only provided a platform for the committee to share their insights on the retreat's role in shaping CR's culture, but also sparked conversations on enhancing future editions. Through a vibrant community fair during Happy Hour, attendees were invited to explore and contribute to various initiatives, nurturing a sense of unity and connection among CR members. Reflections represented a significant move towards creating a more inclusive and dynamic retreat experience, driven by collaboration and a shared vision.

Magusto

10 NOVEMBER

For the third year running, the support units, platforms and PhD students organised a traditional Magusto in November. This cheerful event brings together the entire CF community to celebrate autumn at the Amphitheatre, featuring roasted chestnuts and traditional beverages such as Jeropiga and Vinho do Porto.



1592 **Outputs** 1476 NEWSLETTERS AND SOCIAL MEDIA POSTS 25 ONLINE CONTENT **SERIES & CAMPAIGNS** 28 SCIENCE EDUCATION **ACTIVITIES & PROGRAMMES** 10 OUTREACH INITIATIVES 53 PRESS RELEASES & NEWS PIECES

science

communication

One of CR's goals is to share knowledge not only within the clinical and scientific communities, but also with the public at large. Many CF members, at all career stages, adopt this vision by organising and participating in various outreach activities, both in and outside of CF. CR's science communication and outreach activities are promoted and facilitated by the Communication, Events & Outreach (CEO) Team.

Science Education

Ciência di Noz Manera

Ciência di Noz Manera (CNM) or Science Our Way in Cape Verdean Creole, is a mentoring programme aimed at students from underserved communities in the Greater Lisbon area, especially ethnic minorities, migrants and girls - groups often underrepresented in STEAM (Science, Technology, Engineering, Arts and Mathematics).

The goal of this programme is to broaden students' horizons, enable more informed decisions about their futures, demystify the role of scientists, and foster a more empowered scientific community. Initially partnering with a single school, CNM expanded its outreach in its second (2022/2023) and third (2023/2024) editions to include additional schools designated as Educational Territories of Priority Intervention (TEIP) by the Portuguese government.

Coordinated by the CEO team at CF, CNM engages scientists from CF and the Instituto de Medicina Molecular João Lobo Antunes (iMM).

CNM is one of the two Researchers at Schools programmes under the umbrella of the RAISE (Researchers in Action for Inclusion in Science and Education) consortium, funded by the European Commission through a MSCA & Citizens grant.

Metamorfoses

This national contest challenges high school students and teachers to create a bionic object, coupled with an accompanying narrative, to foster interdisciplinary learning that blends science, technology, and literature.

As in previous editions, a CF team was responsible for the development and implementation of a scientific and technological workshop, accessible both online and in-person at the Pavilhão do Conhecimento - Ciência Viva. In 2023, an event at Pavilhão do Conhecimento brought together all participating teams and partners to showcase their objects and stories.

Metamorfoses arose from a collaboration between the CF, Plano Nacional de Leitura 2017-2027 and Ciência Viva/ESERO Portugal.

Neuronautas

Neuronautas made a full return to CF's Teaching Lab for its fourth edition in 2023, transitioning from previous virtual (2021) and hybrid (2022) formats to a completely on-site experience. This summer academy, aimed at 15–17-year-olds curious about the future of neuroscience, strives to make science accessible through the use of open-source software and affordable tools. From 28 August to 9 September, 30 students participated, guided by seasoned teaching assistants (TAs) from CF and, for the first time, six junior TAs who were former Neuronautas participants.

Supported by the Calouste Gulbenkian Foundation, Neuronautas is one of the 100 Academias Gulbenkian do Conhecimento across Portugal.





Outreach

Best 2021-2023 European Campaign Award

The campaign Conversations with Scientists: Decades of Research for Days of Vaccines received the 2021-2023 Best European Campaign award from the International Union of Immunological Societies (IUIS) and the European Federation of Immunological Societies (EFIS) at the 2023 IUIS Congress on 27 November in South Africa. This accolade honours the campaign's successful efforts to bridge the gap between COVID-19 vaccines and the public.

Launched in April 2021 during European Vaccination Week, this collaborative project involved COLife (an alliance of six life sciences research institutions in Lisbon and Oeiras), i3S in Porto, the Portuguese Society of Immunology (SPI), and Ciência Viva (the National Agency for Scientific and Technological Culture). Over ten days, 121 scientists from across Portugal conducted approximately 400 sessions, engaging with over 10,000 participants nationwide and expanding digital outreach to East Timor and São Tomé and Príncipe.

Ar Event: The Roots of Al

The outreach initiative A Ciência está no Ar | Respire connosco (Science is in the Air | Breathe with Us), abbreviated as Ar, inaugurated a trilogy of events exploring the Past, Present, and Future of Artificial Intelligence (AI).

The series kicked off on 12th December to a packed auditorium. Neuroscience PhD student Prannay Reddy and Ana Maia, a psychiatry resident at Centro Hospitalar de Lisboa Ocidental and PhD student at CF's Neuropsychiatry Unit, engaged with the public on the broad concept of intelligence. Following this, Tiago Marques, co-leader of the Digital Surgery Lab at the Champalimaud Clinical Centre, introduced Al, offering insights into its research history and connection with neuroscience through his talk, The Rise of the Algorithm. The evening concluded with Conversations with a Machine, where Lesly, an artificial being created for the event, shared its origin story.



RAISE & European Researchers' Night

The RAISE consortium – Researchers in Action for Inclusion in Science and Education – hosted the second European Researchers' Night (ERN) on 29 September, across various CF locations.

Spanning ten hours against the backdrop of the year's last super full moon, this event welcomed 1800-2000 participants, including 41% child visitors, 37% adult visitors, and 22% organisers and activity leaders. It garnered significant attention from national media, featuring in prime time television broadcasts.

Aimed at fostering inclusivity and accessibility in science, the event facilitated engaging interactions among students and teachers from underserved schools, families, diverse scientists, teenagers from the deaf community, children from social solidarity organisations, artists, and athletes. The programme comprised a wide array of topics and formats, such as workshops, interactive booths, immersive lab tours, speed dating with scientists, stand-up comedy, and live music performances.

ERN was orchestrated under RAISE, a consortium involving the NGO Native Scientist, iMM, and CF, supported by a MSCA & Citizens grant from the European Commission.

Science on the Walls RAISE Summer Camp

The RAISE consortium, in partnership with the Science on the Walls project, hosted a summer camp at the Associação de Solidariedade Social do Alto da Cova da Moura. The programme, held in two phases—from 24 to 31 July and 4 to 9 September—offered local children a unique educational experience, blending science, art, and environmental awareness.

The first week featured activities like a chess tournament and workshops on marine litter and biodiversity in collaboration with Kids Dive, raising awareness of marine ecosystem conservation. Educational trips to the Lisbon Oceanarium and Zoo, along with a talk on biodiversity, enriched this memorable experience for the children, teenagers, and CF scientists involved. Art was a constant presence throughout, with workshops in screen printing, embroidery, ceramics, and music, culminating in a graffiti mural and two stop motion videos created with local artists. The camp concluded with exploratory rock pooling at Praia das Avencas and scuba diving with Kids Dive, where the children had the opportunity to observe various animals and learn about marine life and conservation.

This summer camp was funded by the Animal Research Tomorrow SciComm Award granted to the Science on the Walls project and by RAISE consortium, supported by the European Commission through a MSCA & Citizens grant.

Online

Winter Holidays Card

Every year, the CEO team designs a Winter Holiday Card. For 2023, we embraced collaboration, creating an inventive and playful Lego-based stop motion card featuring four characters symbolising the different areas of activity at CF. Embodying the message "Imagine, Build, Play, Repeat", this Winter Card emerged as one of our most engaging pieces of original content produced in-house, reaching a large online audience.



Alex, 42

2024 resolution
"I will finally use that yoga mat."



HEBIEH
Hugo, 53
2024 resolution
"I will cycle instead of driving."



Zoom-In Series

The Champalimaud Foundation is only as inventive, vibrant, and resourceful as the individuals who comprise it. We launched the third edition of the "Zoom-In on Champalimaud" series, spotlighting our community's connections to (inter) national celebratory days. For this edition, we featured interviews with members linked to these occasions: Cristina João (Physician. Group Leader) for International Women's Day on 8 March; Sofia Dias & Vitor Roriz (Artists in Residency) for International Dance Day on 29 April; Daniela Cunha (Coordinator of the Dermatology Unit) for European Melanoma Day on 11 May; Carlos Stein & Tiago Quendera (Computational Neuroscientists) for International Chess Day on 20 July; Susana Simões (Pneumologist) for World Lung Cancer Day on 1 August; Teresa Seguro (Physiotherapist) for World Physiotherapy Day on 8 September; Dean Race (PhD student) for International Music Day on 1 October; and Marta Bello (Nurse) for World Pancreatic Cancer Day on 16 November.

Science Snapshots Series

Science Snapshots feature brief videos highlighting discoveries made by CR researchers. Collaborating with the CEO team, the Multimedia Platform produced two Science Snapshots in 2023. "How Brain State Improves Decisions" (Circuit Dynamics and Computation Lab) unveiled how brain states might shape our ability to interact with and adapt to the world around us; and "The Timekeepers Within: How the Brain Judges Time" (Learning Lab) examined the brain's internal clock, providing a deeper understanding not only of time perception, but also of how our brains process and coordinate actions.



United Front Against Pancreatic Cancer

The Botton-Champalimaud Pancreatic Cancer Centre, in collaboration with Jreissati Pancreatic Centre at Epworth in Australia and Cancer Research UK Cambridge Centre - Pancreatic Cancer Programme in the UK, announced a significant global initiative against pancreatic cancer, coinciding with World Pancreatic Cancer Day. This international partnership aimed to address the rising challenge of pancreatic cancer - rapidly becoming one of the world's most deadly cancers - through public awareness, education on risk factors and early symptoms, and the importance of early detection.

PhD Student Diaries

Prannay Reddy, a newly enrolled PhD student, created a monthly video diary documenting his and his classmates' journey through CR's IN(C)DP. The first three episodes cover diverse topics, including Prannay's candid take on pastel de nata, a trip to Porto, his first Magusto experience, and chats with fellow PhD students Kerem Sarikaya and Ana Martins on everything from football to statistics.



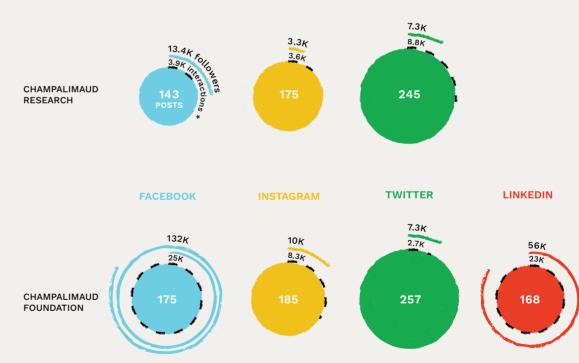
Press-releases and News

Press releases are concise, accessible articles designed to inform the general public about new research findings from CR. We distribute them to national and international media outlets to enhance the visibility and impact of our scientific discoveries. In addition to press releases, we publish a range of news items on our website, including institutional updates, interviews, conference highlights, and other significant events.

Life @ CCU Newsletters

We publish weekly internal newsletters in both English and Portuguese to keep our community informed about CR's activities and encourage engagement with our events and initiatives. Additionally, we produce monthly external newsletters for a wider audience, providing updates on our latest developments and achievements and fostering a broader connection with our mission.

Social Media



*Interactions number of engagements (e.g. comments, likes, shares) Number of folowers and interactions

■ 3mm = 2K



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gritty

Publications

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temático.

Theses

PhD Theses

JANUARY

Dennis Goldschmidt
Identifying neural circuits
for nutrient exploration
and decision-making in
Drosophila melanogaster.
Supervisor: Carlos Ribeiro

Rodrigo Dias
The role of visual experience
in the organisation of cortical
feedback.

Supervisor: Leopoldo Petreanu

Gonçalo Cotovio
Interhemispheric imbalance
in mood disorders.
Supervisor: Albino J. OliveiraMaia
Co-supervisor: Zachary Mainen

Basma Husain
The role of the medial
Hypothalamus in female
sexual behaviour.
Supervisor: Susana Lima

FEBRUARY

Anabel Rodriguez
Molecular mechanisms of
neural stem cell activation
following brain injury in
Drosophila melanogaster.
Supervisor: Christa Rhiner

Patrícia Francisco
Molecular and neuronal
mechanisms underlying
protein appetite.
Supervisor: Carlos Ribeiro

MARCH

Baylor Brangers
The role of the periaqueductal
gray in female sexual behavior.
Supervisor: Susana Lima

MAY

Anders Sandgaard
The Larmor frequency as
a probe of tissue magnetic
microstructure.
Supervisors: Noam Shemesh,
Sune Jespersen (Aarhus
University)

Piotr Sokol
Geometry of learning and
representation in neural
networks.
Supervisor: Il Memming Park

AUGUST

Nádia Canário
Neural complications of type
2 diabetes mellitus and its
relation with age-related
changes and Alzheimer's
disease. A study with
functional and structural
magnetic resonance imaging.
Supervisors: Francisco Oliveira,
Miguel Castelo-Branco
(Universidade de Coimbra)

DECEMBER

Matthew Dowling
Approximate bayesian
inference for state-space
models of neural dynamics.
Supervisor: Il Memming Park

Radhika Rajan
The functional organisation
of cortico-cortical feedback
inputs originating from
different laminar sources and
how it is shaped by experience.
Supervisor: Leopoldo Petreanu

MSc Theses

MARCH

Carolina Caramelo

Diffusion augmentation in

latent program spaces as a

cognitive model of psychedelic
action. Supervisors: Daniel

McNamee, Cláudia da Silva
(Instituto Superior Técnico)

Carolina Quadrado
Nutrient postingestive
signalling: the asymmetry of
the response of dopaminergic
neuronal circuits.
Supervisor: Ana Fernandes

APRIL

Rita Batista

Activities and societies:

development of evaluation
and monitoring tools for

Neuronautas Academy.

Supervisors: Catarina Ramos,
Ana Sanchez (ITQB NOVA and
Faculdade de Ciências Sociais
e Humanas - Universidade
NOVA de Lisboa)

Maria Fortunato

111In-DTPA-6E11 monoclonal
antibody: synthesis,
characterization and validation.
Supervisors: Francisco Silva,
Ana Capacho

Mariana Franco
Identifying motor neurons
involved in pulsatile muscle
activity signalling.
Supervisors: Anna Hobbiss,
Alexandre Andrade
(Faculdade de Ciências,
Universidade de Lisboa)

MAY

Tânia Matos
Characterization of two
Zebrafish dipk2b mutant
lines as potential models for
Autism spectrum disorders.
Supervisor: Joana Monteiro

Tushar Arora
Exploring the expressive power
of latent variable models.
Supervisor: Il Memming Park

Francisco Viana
Reducing motor evoked
potential amplitude variability
through normalisation.
Supervisors: Albino J.
Oliveira-Maia, Pedro Miranda
(Faculdade de Ciências,
Universidade de Lisboa)

JULY

Lvnn Vermeer

Unravelling the role of retinoic acid signalling in the regulation of intraepithelial lymphocytes
Supervisors: Patrícia Bastos, Manuela Ferreira, Henrique Veiga-Fernandes, Jos van Strijp (Utrecht University)

SEPTEMBER

Luísa Silva

Development of deeplearning-based denoising
algorithms for fast wholebody [18F]FDG PET/CT scans
Supervisors: Francisco
Oliveira, Ricardo Vigário
(Universidade NOVA de Lisboa)

OCTOBER

Simon Zamora

Towards a unified view of motor control - Investigating the respective contributions of basal ganglia and cerebellum

Supervisors: Joe Paton, Johannes Gräff (École Polytechnique Fédérale de Lausanne)

NOVEMBER

Tiago Sequeira e Fonseca

Apollo: self-learning robots in medical centers

Supervisors: Alberto
Sardinha (GAIPS / INESC-ID, Instituto Superior Técnico), Pedro Lima (Institute for Systems and Robotics, Instituto Superior Técnico)

Andreia Lopes

Can chemotherapy response
be predicted by studying
inflammatory cells in the
tumour microenvironment of
Pancreatic Cancer?
Supervisor: Cecília Rodrigues
(Faculdade de Farmácia,
Universidade de Lisboa)

Hasti Calá
Characterization of the
Colon Adenocarcinoma
microenvironment with a
focus on natural killer cells
Supervisor: Edna Ribeiro
(Escola Superior de
Tecnologia da Saúde de
Lisboa)

Mariana Castro
In vitro transcribed mRNA
optimization for gene
therapy in the eye
Supervisors: Luísa
Lemos, Margarida Caldas
(Faculdade de Ciências e
Tecnologia - Universidade
NOVA de Lisboa)

Inês Oliveira
Screening innate
immunotherapy strategies in
Zebrafish xenograft models
Supervisor: Rita Fior

Ana Pereira
Optimization of the method
of cryopreservation of
Drosophila melanogaster
embryos
Supervisors: Isabel Campos,
Edna Ribeiro (ESTeSL Instituto Politécnico de
Lisboa)

DECEMBER

Miguel Patrício
Dendritic cells, bridging
neuromodulation and
immunity
Supervisors: María MartínezLópez, Paula Videira
(Faculdade de Ciências e
Tecnologia, Universidade
NOVA de Lisboa)

Beatriz Alves

VIP neuroepithelial circuit in immunity and metabolism

Supervisors: Roksana

Pirzgalska, Henrique VeigaFernandes, Alisson Gontijo
(Faculdade de Ciências da
Universidade de Lisboa, NOVA
Medical School - Faculdade
de Ciências Médicas)

Miriam Sobral
Automatic detection and
segmentation of malignant
lesions from [18F]FDG PET/
CT images using machine
learning techniques:
application in Lymphomas
Supervisors: Francisco
Oliveira, Nuno Matela
(Universidade de Lisboa)

Maria Pacheco

Developing 3D in vitro models
of Basal Cell Carcinoma

Supervisor: Adriana SánchezDanés

Co-supervisor: Sara Canato

Pedro Coelho
Self-paced vs cued
movement initiation:
characterising behaviour and
underlying neural circuits
Supervisor: Joaquim da Silva

Matilde Matos
Investigation of cerebellar
outputs for adapting
locomotion
Supervisors: Megan Carey,
Coralie Herent

Inês Saldanha

Extracellular vesicles as
biomarkers of hepatic
metastasis in Pancreatic
Cancer patients
Supervisor: Bruno Costa-Silva

Madalena Grenhas
Comparative analysis of sizeexclusion chromatography
and ultracentrifugation
for efficient isolation of
extracellular vesicles in
Multiple Myeloma
Supervisor: Emilie Carneiro

External Funding

The list below includes external competitive funds that were awarded during 2023, as well as external competitive funds that were awarded previously and were actively running at the CCU during 2023.

Institutional Projects

EUROPEAN COMMISSION - HORIZON 2020

Leveraging the unique organismic approach to health and disease of the Champalimaud Foundation through the inception of a quantitative biomedicine research programme focused on cancer Call/Programme: H2020-WIDESPREAD-2016-2017 Active period: 01/10/18-30/09/23

COMISSÃO DE COORDENAÇÃO E DESENVOLVIMENTO REGIONAL DE LISBOA E VALE DO TEJO

Science at the service of

clinical practice for the
wellbeing of society in times
of pandemic: Investigating
the unknown today to better
serve the population in the
uncertainty of tomorrow
(Test@CF)
Call/Programme: Aviso
N.º 02/SAICT/2020
(SAICT-D2-2020-02)
Active period: 01/07/2031/03/24

FUNDAÇÃO PARA A CIÊNCIA E A TECNOLOGIA

Champalimaud Research Programme Call/Programme: 2017/2018 R&D Unit evaluation Active period: 01/01/20-31/12/23

Research Projects/ Grants

BEUG FOUNDATION

Ana Luísa Correia
Harnessing neuron-NK cell
interactions to prevent
metastasis

Call/Programme: Metastasis
Prize

Active period: 2022-2027

BIAL FOUNDATION

Jaime Gracio (Oliveira-Maia Lab)
Other CF researchers involved: Marta Moita
Assessing cardiac activity
as a predictor of freezing
behaviour in humans. A
translational approach
Call/Programme:
Programme of grants
for scientific research
2022/2023
Active period: 01/03/2328/02/26

Rita Fior
Zebrafish avatars,
towards personalized
cancer treatment, a
multidisciplinary venture
Call/Programme: Prémio
Bial de Medicina Clínica
Menção Honrosa
Active period: 01/05/2130/04/24

BUCK INSTITUTE FOR RESEARCH ON AGING

Zita Santos & Carlos Ribeiro

Metabolic reprogramming,
dietary nutrients and food
cravings in ovary aging
Call/Programme: NA
Active period: 01/08/2001/02/23

EUROPEAN CROHN'S AND COLITIS ORGANISATION

Roksana Pirzgalska (Veiga-Fernandes Lab); ECCO (European Crohn's and Colitis) A neuroepithelial approach to inflammatory bowel disease Call/Programme: ECCO Grant Active period: 01/06/21-31/01/23

EHA

Andreia Maia (Castillo-Martin Lab)

Development of novel
adoptive cell therapy: CARCIML-NK cells with enhanced
anti-tumor targeting and
killing capacities and immune
cell modulation
Call/Programme: EHA
Research Mobility Grants
Active period: 12/06/2312/12/23

FAZ - FUNDAÇÃO ASTRAZENECA

Adriana Sánchez-Danés
Unveiling brain plasticity
during pediatric cancer
development (BALANCE)
Call/Programme: Prémio FAZ
Ciência
Active period: 15/04/2314/04/26

EUROPEAN COMMISSION -HORIZON 2020

Albino J. Oliveira-Maia (Coordinated by: Waterford Institute of Technology – WIT) Federated Artificial Intelligence solution for monitoring mental health status after cancer treatment Call/Programme: H2020-SC1-DTH-2019 Active period: 01/01/20-30/06/23

Coordination: UMC Groningen Psilocybin therapy for psychological distress in palliative care patients (PsvPal) Call/Programme: HORIZON-HLTH-2023-DISEASE-03-01 Active period: 01/01/24-31/12/27

Albino J. Oliveira-Maia

Albino J. Oliveira-Maia Reinforcement learning from postingestive calories: from body to brain in health and disease — CalorieRL Call/Programme: ERC-2020-STG Active period: 01/11/20-31/10/25

Carlos Minutti Conventional dendritic cells - ecology, diversity, and function (cDCFun) Call/Programme: ERC Starting Grant 2023 Active period: 01/01/24-31/12/28

Eugenia Chiappe Circuit mechanisms of selfmovement estimation during walking Call/Programme: ERC-2017-STG Active period: 01/11/17-31/12/23

Eugenia Chiappe Neural circuits for error correction (ECoFly) Call/Programme: ERC-2022-CoG Active period: 01/01/24-31/12/29

Eva Batista (Fátima Cardoso. Unidade de Mama, CCC) Coordination: Universitair Medisch Centrum Utrecht Artificial Intelligence for early detection of noncommunicable disease risk in people with Breast Cancer (ARTILLERY)

Call/Programme: HORIZON-HLTH-2022-STAYHLTH-01-04-two-stage Active period: 01/05/23-

30/04/28

Gonzalo de Polavieja Coordination: Provetos Y Sistemas de Mantenimiento SL - EPROSIMA EPROS ALMA: Human Centric Algebraic Machine Learning — 'ALMA' Call/Programme: H2020-EIC-FFTPROACT-2019 Active period: 01/09/20-31/08/24

Gonzalo de Polavieja Coordination: University of Copenhagen (UCPH) Unified computational solutions to disentangle biological interactions in multi-omics data (FindingPheno) Call/Programme: Horizon 2020 - Multi-omics for genotypephenotype associations (BIOTEC-07-2020) Active period: 01/03/21-28/02/25

Henrique Veiga-Fernandes Architecture of peripheral neuroimmune circuits and synapses (NeurlmmKisses) Call/Programme: ERC-AdG-2022 Active period: 01/01/2024-31/12/2028

Henrique Veiga-Fernandes **Understanding Gene ENvironment Interaction** in ALcohol-related hepatocellular carcinoma (GENIAL) Call/Programme: HORIZON-MISS-2021-CANCER-02-03 Active period: 01/01/2023-31/12/2027

Joe Paton Basal ganglia circuit mechanisms underlying dynamic cognitive behavior Call/Programme: ERC-2017-COG Active period: 01/04/18-30/09/24

Marta Moita Actively frozen - contextual modulation of freezing and its neuronal basis (A-FRO) Call/Programme: ERC-2018-CoG Active period: 2019-2024

Megan Carev Cerebellar circuits for locomotor learning in space and time - LOCOLEARN Call/Programme: ERC 2019-CoG Active period: 01/05/20-30/04/25

Michael Orger Whole-brain circuits controlling visuomotor behavior Call/Programme: ERC-2017-COG Active period: 01/02/18-31/01/23

Michael Orger (Coordinated by: Institut du Cerveau et de la Moelle Epiniere - ICM) Zebrafish Neuroscience Interdisciplinary Training Hub (ZENITH) Call/Programme: H2020-MSCA-ITN-2018 Active period: 01/10/19-31/03/24

Nikolaos Papanikolaou Coordination: IDRYMA Technologias Kai Erevnas -Foundation for Research and Technology Hellas An AI Platform integrating imaging data and models, supporting precision care through prostate cancer's continuum - 'ProCAncer-I' Call/Programme: H2020-SC1-FA-DTS-2019-1 Active period: 10/10/20-30/09/24

Nikolaos Papanikolaou EUropean Federation for CAncer Images (EUCAIM) Call/Programme: DIGITAL-2022-CLOUD-AI-02-CANCER-IMAGE Active period: 01/01/2023-

31/12/2026

Pedro Garcia da Silva (Coordinated by: Leiden University Medical Center) Active monitoring of cancer as an alternative to surgery Call/Programme: H2020-MSCA-ITN-2019 Active period: 01/11/19-31/10/24

Susana Lima Hypothalamic circuits for the selection of defensive and mating behaviour in females Call/Programme: ERC-2017-COG Active period: 01/03/18-28/02/24

IAPMEI

Joe Paton (Digital Therapeutics Programme) Center for Responsible AI Call/Programme: PRR | Agendas/Alianças mobilizadoras para a Inovação Empresarial Active period: 12/04/2022-31/12/2025

NATIONAL INSTITUTES OF **HEALTH**

Christian Machens Understanding feedforward and feedback signaling between neuronal populations Call/Programme: BRAIN Initiative: Targeted BRAIN Circuits Projects -TargetedBCP (RFA-NS-21-013) Active period: 15/03/2022-28/02/2025

ZONMW

Klaas van Gisbergen Immunological memory of the tissues: how the tumor microenvironment shapes T-cell responses Call/Programme: NWO Talent Programme Vici 2021 Active period: 08/11/23-03/03/27

BBRF

Goncalo Cotovio (Oliveira-Maia Lab) Improving Obsessive-Compulsive Disorder treatments: from lesions to neuromodulati on targets Call/Programme: Young **Investigator Grants** Active period: 01/01/24-31/12/25

APCL

Cristina João Study of the neuronal role on the interplay between NK cells and Multiple Myeloma (NeuriMM) Call/Programme: Bolsas de Investigação Mieloma Multiplo Active period: 01/11/2022-31/10/2023

CRI - CANCER RESEARCH INSTITUTE

Rita Fior A new discovery platform to find innate immune modulators for cancer immunotherapy Call/Programme: CRI Technology Impact Award Active period: 01/09/23-31/08/24

CRF

Luísa Lemos (Seabra Lab) Pathways of retinal pigment epithelium degeneration in Choroideremia Call/Programme: Randy Wheelock Award Active period: 01/01/24-31/12/24

Miguel Seabra CRISPR-based gene editing for Choroideremia Call/Programme: Throssell and Hillier Families Research Award Active period: 01/01/2023-30/06/2024

EUROPEAN MOLECULAR BIOLOGY ORGANIZATION (EMBO)

Ana Luísa Correia Harnessing neuron-NK cell interactions to prevent metastasis Call/Programme: EMBO Installation Grants Active period: 01/01/2023-31/12/2025

Bruno Costa-Silva Call/Programme: EMBO **Installation Grants** Active period: 01/06/18-31/05/23

FUNDAÇÃO PARA A CIÊNCIA E A TECNOLOGIA

Adriana Sánchez-Danés Comparing paediatric and adult cancer progression and therapy response (CancerPediAdult) Call/Programme: SR&TD **Project Grants** Active period: 01/01/21-31/12/23

Adriana Sánchez-Danés Uncovering the mechanisms of resistance to cancer formation in the developing brain Call/Programme: R&D Projects in All Scientific

Domains - SR&TD Active period: 01/03/2023-28/02/26

Coordination: University Hospital Wurzburg Pathophysiology of dystonia - role of gene-environment interaction and common pathophysiological pathways (EurDyscover) Call/Programme: ERA-NET call "Transnational research projects to accelerate diagnosis and/or explore disease progression and mechanisms of rare diseases" Active period: 01/07/20-30/06/23

Albino J. Oliveira-Maia

Alfonso Renart The neural basis of Weber's Law (WeberNeural) Call/Programme: FCT 2021 SR&TD Active period: 17/01/22-16/01/25

Ana Fernandes (Oliveira-Maia Lab) Call/Programme: Norma Transitória BPD Active period: 01/01/19-31/12/24

Ana Fernandes (Oliveira-Maia

Lab) Viscerosensorial pathways in nutrient postingestive signalling (NUTRISENSE) Call/Programme: FCT 2021 SR&TD Active period: 01/01/22-

31/12/24 Ana Luísa Correia

Restoring tissue physiology to prevent metastatic disease (MetZero) Call/Programme: ERC-Portugal Active period: 01/09/23-31/08/26

Andrada Ianus (Shemesh Lab) To wait or to operate after neoadjuvant therapy in locally-advanced Rectal Rancer: Magnetic Resonance Imaging can provide the answer (CORTICALOOP) Call/Programme: RESTART Active period: 23/12/23-22/06/25

Bruna Velosa Ferreira (João Lab) Other CF researchers involved: António Lopez Beltran Integration of neuronal signals by tumour-infiltrating natural killer and Myeloma cells Call/Programme: R&D Projects in All Scientific Domains - PeX Active period: 01/02/23-31/07/24

Bruno Costa-Silva Coordination: NOVA.ID.FCT Innovative approaches for pancreatic cancer: decoding and manipulating immune response to short sialylated O-glycans (InnO-Glyco) Call/Programme: R&D Projects in All Scientific Domains - SR&TD Active period: 01/03/2023-28/02/26

Carlos Ribeiro Characterizing neural circuits controlling explorationexploitation tradeoffs in nutrient foraging decisions (ExploreExploit) Call/Programme: FCT 2021

SR&TD Active period: 01/01/22-31/12/24

Catarina Brás (Moreno Lab) The role of healthy cells on the elimination of premalignant cells (DangerCellDeath) Call/Programme: SR&TD **Project Grants** Active period: 01/03/21-

Cristina Godinho-Silva (Veiga-Fernandes Lab) Circadian regulation of pulmonary immunity by neuroendocrine signals (CircImmuneReg)

Call/Programme: FCT 2021 SR&TD

Active period: 01/01/22-

31/12/24

29/02/24

Cristina João Combined immUNotherapeutIC approach for targeting bone marrow microenvironment in Multiple Myeloma (Unic.MM) Call/Programme: FCT 2021 SR&TD Active period: 01/01/22-31/12/24

Daniela Pereira (Alves da Silva Lab) Addressing striatal plasticity at the single synapse level upon motor learning (SPLASSYM) Call/Programme: FCT 2021 PeX Active period: 01/01/22-30/06/23

David Brea-López (Veiga-Fernandes Lab) RegulaTion Of iNtestinAL ImmuniTy by braIn-derivEd Signals Call/Programme: SR&TD **Project Grants** Active period: 01/03/21-29/02/24

Filipa Barros (Alves da Silva Lab) Striatal activity and synaptic features underlying dystonic muscle contraction Call/Programme: R&D Projects in All Scientific Domains - PeX Active period: 06/03/23-05/09/24

Gonzalo de Polavieja Searching for the principles of collective motions and collective decisions: a new generation of experiments and models based on interpretable AI (Collective.ai) Call/Programme: SR&TD **Project Grants** Active period: 01/03/21-29/02/24

Henrique Veiga-Fernandes Deciphering pulmonary neuroimmune circuits in health and disease (NeurImm Call/Programme: SR&TD Project Grants Active period: 01/03/21-29/02/24 Joana Carvalho (Shemesh Lab) Dissecting brain activity in neurodevelopmental and neurodegenerative disorders across multiple spatiotemporal scales (BOLDissect) Call/Programme: R&D

Projects in All Scientific Domains - PeX

Active period: 01/03/23-

31/08/24

Joana Maia (Costa-Silva Lab) Unraveling the role of postsecretion protein interactions in tumor extracellular vesicles biogenesis (SecretEV)

Call/Programme: FCT 2021

PeX

Active period: 01/12/21-

31/05/23

João Marques (Mainen Lab) How does the Mauthner array generates sequences of escapes (FishEscape) Call/Programme: FCT 2021 PeX Active period: 01/01/22-30/06/23

Joaquim Alves da Silva Disentangling cued from self-paced actions in corticostriatal circuits Call/Programme: Individual Call to Scientific Employment Stimulus 3rd Edition - Junior Researcher Active period: 01/09/21-31/08/27

Joaquim Alves da Silva Reinforcement learning from post-ingestive rewards (RePi) Call/Programme: FCT 2021 SR&TD Active period: 01/01/22-31/12/24

Leopoldo Petreanu Hierarchical looped interactions in cortical processing (CORTICALOOP) Call/Programme: SR&TD Project Grants Active period: 29/03/21-

28/03/24

Nicolas Morgenstern (Costa lab) Call/Programme: Norma Transitória BPD Active period: 01/01/19-31/12/24

Maria Luísa Vasconcelos Neuronal circuits underlying egg laying behavior in the fruit fly (Neuregglay) Call/Programme: FCT 2021SR&TD Active period: 01/01/22-

31/12/24

Maria Martínez Lopez (Veiga-Fernandes lab) Commensal microbiota regulation of neuro-immune networks (NEUMIC) Call/Programme: SR&TD Project Grants Active period: 01/03/21-

Rita Fior Dissect the tumor microenvironment to battle cancer radioresistance and immune escape (RADIORESISTANCE) Call/Programme: FCT 2021 SR&TD

Active period: 01/01/22-31/12/24

Rita Fior

29/02/24

Ovarian Cancer Avatars for personalized therapy, a combination of in vivo & ex-vivo models to guarantee a test for every patient (Z&CTSAvatars) Call/Programme: FCT 2021 SR&TD Active period: 01/01/22-31/12/24

Roksana Pirzgalska (Veiga-Fernandes lab) A brain-gut circuit responsible for intestinal immunity and physiology (Brain2Gut) Call/Programme: SR&TD **Project Grants** Active period: 15/03/21-14/03/24

NIH

Memming Park Coordination: Princeton University Adaptive statistical algorithms for learning and control of neural dynamics Call/Programme: BRAIN Initiative: Theories, Models and Methods for Analysis of Complex Data from the Brain (R01 Clinical Trial Not Allowed) Active period: 15/09/22-15/09/25

LPCC-NRS

Rita Fior zAvatar test-guided therapeutic decision vs standard of care - a phase II multicentric randomized clinical trial, in relapsed ovarian cancer and in metastatic breast cancer Call/Programme: Bolsas de Investigação em Oncologia -LPCC-NRS/Terry Fox Active period: 14/04/23-13/04/25

HOWARD HUGHES MEDICAL INSTITUTE

Joe Paton HHMI International Research Scholars Program 2017 Call/Programme: HHMIInternational Research Scholars Program Active period: 01/09/17-30/08/23

MJFF - THE MICHAEL J. **FOX FOUNDATION FOR PARKINSON'S RESEARCH**

Joe Paton Differential targeting of molecularly identified striatal neurons as a therapeutic strategy for minimizing non-motor side effects of dopamine replacement Call/Programme: Circuits and Cellular Targets for Parkinson's Symptoms - Preclinical studies Active period: 01/09/23-31/08/25

TWCF

Niccolo Bonacchi (Digital
Therapeutics Programme)
Coordination: Max Planck
Accelerating research on
consciousness: an adversarial
collaboration to test
contradictory predictions of
global neuronal workspace
and integrated information
theory
Call/Programme: N/A
Active period: 01/01/202331/12/23

LA CAIXA FOUNDATION

Alfonso Renart
Weber's Law: a mechanistic
window into sensory
dysfunction in Autism
spectrum disorders
Call/Programme: Health
Research 2023
Active period: 31/12/2330/12/26

Bruno Costa-Silva

Coordination: Maria
Abad, Centro Nacional de
Investigaciones Oncológicas
Carlos III
Defining the role of exosomesecreted micropeptides in
Pancreatic Cancer
Call/Programme: la Caixa
Health Research 2018 Call
Active period: 15/09/1931/01/23

Carlos Ribeiro
From metabolic space to
neuronal space: mapping
how nutrients affect brain
function and behavior
(BrainMetaboSpace)
Call/Programme: Health
Research 2023
Active period: 31/12/23-30/12/26

Unravelling pro-regenerative signaling modules in the injured brain
Call/Programme: Health
Research 2023
Active period: 01/12/23-30/11/26

Christa Rhiner

Henrique Veiga-Fernandes
Neurimm KISS – Unravelling
pulmonary neuroimmune
circuits during infection
Call/Programme: Health
Research 2020 Call
Active period: 31/12/2031/12/23

Leopoldo Petreanu
Circuit mechanisms
for associating highorder cortical activity
with expected sensory
representations in health and
disease (UPDOWNBOUND)
Call/Programme: HEALTH
RESEARCH 2022 CALL
Active period: 31/12/202230/12/2025

SANTA CASA DA MISERICÓRDIA DE LISBOA

Noam Shemesh
From genetic output
to brain-wide network
function: bridging the gap in
Parkinson's disease
Call/Programme: Prémio
Mantero Belard
Active period: 2021-2024

SIMONS FOUNDATION

Christian Machens

Zachary Mainen

Coordination: University of Pittsburgh
Communication between
neural populations: circuits,
coding, and behavior
Call/Programme: Life Sciences
- Simons Collaboration on the
Global Brain Research Award
Active period: 01/07/1730/06/23 & 01/09/23-31/08/25

International Brain
Laboratory
Call/Programme: Simons
Collaboration on the Global
Brain International Brain
Laboratory Award
Active period: 01/08/202331/07/2025

Anne Churchland (UCLA Brain Research Institute)
Coordinator at CF: Zachary Mainen
Coordination: Cold Spring Harbor Laboratory
International Brain
Laboratory
Call/Programme: Life Sciences
- Simons Collaboration on the Global Brain Research Award
Active period: 01/07/17-30/06/23

Samuel Sober (Emory
University) & Megan Carey
Coordination: Emory University
Simons-Emory International
Consortium on Motor Control
Call/Programme: Chief
Scientist Fund-Targeted
Active period: 01/03/2028/02/24

UNIVERSITY COLLEGE LONDON/WELLCOME TRUST

Zachary Mainen
International Brain Laboratory
Call/Programme: Strategic
Support – Science application
Active period: 01/04/2031/03/25

VOLKSWAGENSTIFTUNG

Michael Orger
How spontaneous behaviour
emerges from brain-wide
neural network dynamics
Call/Programme: VWSVolkswagenStiftung (Life)
Active period: 01/01/1931/12/23

Service Provision

UOC/WELLCOME

Carlos Ribeiro
Coordination: University of
Cambridge
A high-quality connectome of
the complete adult Drosophila
central nervous system
Call/Programme:
Collaborative Award
Active period: 01/02/23-31/12/23

Individual Funding & Fellowships

BIAL

Ana Rita Cruz (Costa-Silva Lab)
Extracellular vesicles binding
to IFNy as regulators of IFNy
signaling and antitumor
immunity

Call/Programme: Prémio

Maria de Sousa

Active period: 01/02/2023-

31/01/2025

SIMONS FOUNDATION

Francesca Mastrogiuseppe (Machens Lab)

Mechanisms of learning in cortical neural networks

Call/Programme: Simons

Collaboration on the

Global Brain Transition to
Independence Postdoctoral

Award

Active period: 01/09/23-31/08/25

EUROPEAN COMMISSION – MARIE SKŁODOWSKA-CURIE ACTIONS

Alexandre Leitão (Moita lab)
The impact of genetic
background during
manipulation of neuronal
activity (NeuroContext)
Call/Programme: H2020
MSCA Individual fellowships
Active period: 01/09/2131/08/23

Ana Lúcia Rebelo (Sánchez-Danés Lab)
Uncovering the cell of origin of Group 4 Medulloblastoma (ORIGIN4MB)
Call/Programme: MSCA Postdoctoral Fellowships/ ERA Fellowships Active period: 01/04/24-31/03/24 Ana Rita Cruz (Costa-Silva Lab)

Evasion of antitumor immunity and immunotherapy by Melanoma extracellular vesicles (Evasion)
Call/Programme: MSCA
Postdoctoral Fellowships
Active period: 01/06/2023-

Claire Rusch (Chiappe Lab)
Sensorimotor integration,
motor planning and learning
in FLY

Call/Programme: MSCA
Postdoctoral Fellowships
(MSCA-PF)

Active Period: 01/09/2023-

31/08/2025

31/05/2025

Corinna Gebehart (Chiappe Lab)
The role of ascending
proprioceptive information in
decision-making processes
in walking Drosophila

(BottomUpFly)
Call/Programme: MSCA
Postdoctoral Fellowships
Active period: 01/09/24-

31/08/26

Gili Ezra Gili (Ribeiro Lab)
How does a need turn to
a want: using Drosophila
melanogaster to identify
how the gut-brain axis
mediates protein appetite
(Body2Mind)
Call/Programme: H2020
MSCA Individual fellowships
Active period: 01/09/2114/02/24

Joana Carvalho (Shemesh Lab)

Multi-dimensional mapping
of the interplay between
stability and plasticity in
the adult visual pathway
(PlastiMap)
Call/Programme: H2020
MSCA Individual fellowships
Active period: 01/10/2112/01/24

Jonathan Cook (Lima Lab)

Neural mechanism underlying
the central regulation of male
sexual arousal and ejaculation
(MPOA)

Call/Programme: H2020 MSCA Individual fellowships Active period: 01/09/22-

31/08/24

Nuno Machado (Vasconcelos Lab)

Neuronal control of fine movement components of egg laying in fruit fly (Neuron to Egg Laying) Call/Programme: MSCA Postdoctoral Fellowships/ ERA Fellowships

Active period: 01/09/24-

31/08/26

EUROPEAN MOLECULAR BIOLOGY ORGANIZATION (EMBO)

Coralie Hérent (Carey Lab)
Cell-specific functional
connectivity of cerebellar
outputs for locomotor learning
Call/Programme: Postdoctoral
Fellowships
Active period: 01/03/202228/02/2024

Matthjis Oude Lohuis
(Petreanu Lab)
Other CF researchers involved:
Christian Machens
Communication in the brain:
flexible signalling with fixed
lines

Call/Programme: Postdoctoral Fellowships

Active period: 15/02/24-

14/02/26

FUNDAÇÃO PARA A CIÊNCIA E A TECNOLOGIA

Ana Machado (Fior lab)

Fishing for new
immunotherapy compounds
to boost innate-tumor
rejection
Call/Programme: 2021 FCT
PhD Research Fellowships

Active period: 01/11/21-31/10/25

Ana Maia (Oliveira-Maia Lab) Immune dysfunction in obsessive compulsive disorder: from environmental risk factors to clinical and brain imaging correlates Call/Programme: 2019 PhD Fellowships Active period: 01/07/20-30/06/24

Ana Queirós (João Lab) Understanding epigenetic mechanisms in haematological disorders Call/Programme: 2022 FCT PhD Research fellowships Active period: 01/07/2022-30/06/2028

Ana Sofia Marques (Sánchez-Danés Lab) Uncovering the similarities and differences in metastasis formation in adult and paediatric Skin Cancer (MetAP) Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/08/22-30/09/26

Andreia Maia (Castillo-Martin Lab) Expansion of natural killer cells as a complementary approach for adoptive cell therapy in advanced Colorectal Cancer (NKAT-CRC) Call/Programme: 2019 PhD Fellowships Active period: 01/01/20-31/12/23

Beatriz Belbut (Petreanu Lab) The functional coupling of corticocortical loops during behavior Call/Programme: 2019 PhD Fellowships Active period: 01/08/20-

31/07/24

Carolina Rodrigues (Moreno Unravelling the link between cell competition and Alzheimer's disease Call/Programme: 2018 PhD Fellowships Active period: 01/07/19-31/06/23

Cátia Rebelo de Almeida (Fior Lab) Dissecting a new molecular mechanism underlying bevacizumab mode of action - more than an antiangiogenic therapy Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/01/22-21/12/25

Cristina Godinho Silva (Veiga-Fernandes Lab) Control of innate lymphoid cells by circadian clock signals Call/Programme: 2016 Individual Postdoctoral **Fellowships** Active period: 03/01/17-

Daniela Pereira (Alves da Silva Lab) Call/Programme: Individual Call to Scientific **Employment Stimulus** Active period: 01/06/19-31/05/25

28/02/23

David Brea-López (Veiga-Fernandes Lab) Regulation of intestinal immunity by brain-derived signals Call/Programme: Individual Call to Scientific **Employment Stimulus** Active period: 01/06/19-31/05/25

Elena Hindinger (Orger Lab) The neural control of gait switching in larval Zebrafish Call/Programme: 2019 PhD Fellowships Active period: 01/01/20-31/12/23

Filipa Barahona (João Lab) Contribution of noninvasive biomarkers for Multiple Myeloma prognosis ASSessment (COMPASS) Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/10/21-30/09/25

Filipa Barros (Alves da Silva DysCo: cholinergic effects on the striatal control of dystonic muscular contraction Call/Programme: Individual Call to Scientific Employment Stimulus -Junior Level Active period: 01/03/23-2/28/29

Hugo Marques (Carey Lab) The nature of error signals in locomotor learning Call/Programme: 2016 Postdoctoral Fellowships Active period: 01/09/17-31/08/23

Inês Dias (Lima Lab) Hypothalamic circuits linking the reproductive cycle to female sexual behavior Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/09/21-31/08/25

Jaime Arlandis (Mainen Lab) State representations and attention to behaviorally relevant information Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/09/21-31/08/25

Kcénia Bourgrova (Mainen The serotonergic-medial prefrontal cortex circuits underlying action decisions Call/Programme: 2019 PhD Fellowships Active period: 01/01/20-31/12/23

Merit Kruse (Carev Lab) Investigating the role of contextual information in the granule cell layer during cerebellar associative learning Call/Programme: 2020 FCT

PhD Research Fellowships Active period: 01/08/21-

01/08/25

Mirjam Heinemans (Moita Lab) Social modulation of defensive behaviours in Drosophila Call/Programme: 2019 PhD

Fellowships

Active period: 2020-2024

Naz Belkava (Renart Lab) Neural basis of the decision bound in perceptual decision-making Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/08/22-30/09/26

Rafael Henriques (Shemesh Correlation Tensor MRI: a paradigm shift for stroke imaging Call/Programme: 2022 FCT

PhD Research fellowships Active period: 01/10/2022-30/09/2028

Raquel Lemos (Oliveira-Maia Lab) Cognitive-motor dual-task as a measure of cognitive reserve in patients treated with brain radiotherapy Call/Programme: CEEC Individual 2018 Active period: 01/08/20-31/07/26

Raquel Lopes (João Lab) Unic.MM - Combined immUNotherapeutIC approach for targeting bone marrow microenvironment in Multiple Myeloma Call/Programme: 2020 FCT PhD Research Fellowships Active period: 01/01/21-31/12/24

Rita Figueiredo (Ribeiro Lab) The effects of tumorigenesis on nutrient cravings: dissecting the role of cellular metabolism in directing specific nutritional appetites to sustain high cell proliferation rates Call/Programme: 2019 PhD Fellowships

Active period: 2020-2024

Roksana Pirzgalska (Veiga-Fernandes Lab) Neuroimmune control of the intestinal mucosa: from nutrient absorption to immune responses Call/Programme: CEEC Individual 2018

Active period: 01/08/20-

31/07/26

Rory Beresford (Ribeiro Lab) Identifying the circuit mechanisms mediating nutrient specific feeding changes during reproduction in Drosophila females Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/08/22-30/09/26

Sílvia Henriques (Ribeiro Lab) Identifying the metabolites that mediate the effect of commensal bacteria on food choice in Drosophila melanogaster Call/Programme: 2022 FCT

PhD Research fellowships Active period: 01/07/2022-30/06/2028

Solène Sautory (Mainen & Petreanu Labs) Examining the serotonergic mechanisms involved in shaping predictive sensory processing

Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/09/21-31/08/24

HUMAN FRONTIER SCIENCE PROGRAM

Coralie Hérent (Carey Lab) Cell-specific functional connectivity of cerebellar outputs for locomotor learning Call/Programme: HFSP Postdoctoral Fellowships Active period: 01/09/2022-31/8/2025

LA CAIXA FOUNDATION

Adrien Jouary (Orger Lab) The latent dynamic underlying visually driven behavior Call/Programme: Junior Leader Postdoctoral Fellowship Programme

Active period: 01/09/20-31/08/23

Andrada Ianus (Shemesh Lab) MRI based mapping of microscopic brain composition in Alzheimer's disease Call/Programme: Junior Leader Postdoctoral Fellowship Programme Active period: 01/09/20-31/08/23

Esha Madan (Moreno Lab) Study of Deptor-mir181d axis in human Breast Cancer Call/Programme: Junior Leader Postdoctoral Fellowship Programme Active period: 01/09/20-31/08/23

João Marques (Mainen Lab) Understanding how the brain produces types of movements Call/Programme: Junior Leader Fellowships (Retaining) Active period: 31/12/21-30/12/24

María Martínez Lopez (Veiga-Fernandes Lab) Dendritic cells, bridging neuromodulation and immunity Call/Programme: Junior Leader Fellowships (Retaining) Active period: 01/11/2022-31/10/2025

Miguel Pinto (Moreno Lab)
Mechanical cell competition
in health and disease
Call/Programme: Doctoral
INPHINIT Fellowships
Programme
Active period: 30/11/2029/11/23

Roel Wolterink (Veiga-Fernandes Lab)

Deciphering the architecture and language of pulmonary neuroimmune communication

Call/Programme: Junior Leader Postdoctoral Fellowship Programme

Active period: 01/09/20-31/08/23

GRADUATE WOMEN IN SCIENCE FELLOWSHIP

Filipa Barros (Alves da Silva Lab)

Understanding cerebellar stimulation as a tool to treat dystonia: the role of the cerebello-thalamo-striatal pathway in dystonic movement Call/Programme: GWIS National Fellowship Program Active period: 10/10/2022-09/10/2023

DMRF

Filipa Barros (Alves da Silva Lab)

The role of basal ganglia pathways engaged in skilled forelimb movement in a mouse model of DYT1 dystonia Call/Programme:

Postdoctoral Fellowships Active period: 15/03/23-14/03/25

NWO - DUTCH RESEARCH COUNCIL

Matthiis Oude Lohuis

(Petreanu Lab)
Other CF researchers
involved: Christian Machens
Communication in the brain:
flexible signalling with fixed
lines
Call/Programme: NWO Talent
Programme - Rubicon 2022-3

Active period: 01/06/23-31/05/25

Educational Projects

EUROPEAN COMMISSION

Communications, Events and
Outreach Team
Researchers in Action for
Inclusion in Science and
Education (RAISE)
Call/Programme: HORIZONMSCA-2022-CITIZENS-01
Active period: 01/05/202230/04/2024

ANIMAL RESEARCH TOMORROW

Charlotte Rosher (Moita Lab)
Science on the Walls
Call/Programme: ART
Science Communication
(SciComm) Grants
Active period: 01/03/202201/09/2023

Scientific Events

JANUARY

09

Champalimaud Open
Seminar Series (COpS):
Eugenia Chiappe | Nikolaos
Papanikolaou
Studying how the body helps
the brain interact with the
world | Radiomics/AI 2.0:
basic concepts and clinical
applications in oncology

16

Champalimaud Internal
Seminar Series (CISS):
Guido Meijer | Sara Canato
Serotonin Modulates neural
dynamics while awake and
induces down-states under
anesthesia | deciphering the
mechanisms behind basal cell
carcinoma initiation

23

CISS: Marcelo Mendonça |
Alexandre Leitão
On the heterogeneity
of motor symptoms in
Parkinson's disease: a tale
of tremor | One neuron,
many brains: the interaction
between genetic background
and neuronal function

2

Ad hoc Seminar: Christiaan
Levelt (Netherlands Institute
for Neuroscience) & Tobias
Rose (University of Bonn)
Specificity, plasticity and
connectivity of chandelier
cells in the visual cortex |
Functional convergence in the
mouse visual thalamus

25

Grant Writing Workshop | Christina Schütte (Prosciencia)

30 CISS: José Almeida | Miguel

Messages without codes:
using thousands of Prostate
mpMRI for clinical AI |
Understanding the quick
control of "love" directed
locomotion

FEBRUARY

03

Ad hoc Seminar: Meet
Zandawala (University of
Nevada Reno)
Tango-MAP MkII sensors to
visualise neuromodulation in
Drosophila

06

COpS: Albino J. Oliveira-Maia | Michael Orger | Using normative functional | brain connectivity to target | treatment resistance in | neuropsychiatry | From vision | to action: imaging the brain | and behaviour in fish

07

Ad hoc Seminar: Zhenyu Gao (Erasmus MC) Noncanonical modules and functions of the medial cerebellum

13

CISS: Caroline Haimerl | Ana Fernandes Principles of representation for control across multiple scales | Nutrient sensing in dopamine neuronal circuits

16

Ad hoc Seminar: Rita
Sousa-Nunes (King's College
London)
Neural stem cell quiescence
uncouples the proteome from
the transcriptome

CISS: Miguel Fuzeta | Francisco Silva Dissecting tissue-specific immune barriers to metastasis across time and space | In-house development of radiolabeled pd-l1 inhibitor monoclonal antibodies for imaging of pd-l1 expression in cancer

28

27

Ad hoc Seminar: Joaquim Streicher (Scientific Consultant) & Margot Steijger (University of Amsterdam) Studying consciousness, where to begin?

MARCH

02

Ad hoc Seminar: Yves
Bernaerts (University of
Tübingen)
Simulator-based inference
for electrophysiological data

06

COpS: Christian Machens |
Cristina João
Coordinated spike coding |
Immune microenvironment
modulation in Multiple
Myeloma

13

CISS: Joana Cabral | Tiago
Quendera
Resonance in the brain:
macroscale oscillatory modes
detected with ultrafast
fMRI | hexxed: towards
a psychophysics in high
dimensions

20

CISS: Panos Firbas | Marta Estrada CLaP: a transformer model for open chromatin regions | Zebrafish avatars towards personalized medicine in Ovarian Cancer

23

Ad hoc Seminar: Jonnathan Singh (Harvard University) A direct effect of camp production on brainstem neuronal activity and motivated behavior

CISS: Ana Rita Mendes Spinal control of copulatory behavior and sexual excitation

31

Science: between literal and metaphorical meanings Workshop - Graham Harman (Southern California Institute of Architecture)

APRIL

17

CISS: Joana Caetano | Alice Geminiani, Tatiana Silva, Hugo Gravato Marques and Ana Gonçalves High-dimensional spectral cytometry characterization of the circulating immune cell profile in asymptomatic and symptomatic Myeloma patients | Instructive signals for cerebellar learning

18

Hands on Zebrafish Workshop

20

It's a kind of blue magic - (Dis)embodied selves, depersonalisation and ghosts in the machines Workshop

Ad hoc Seminar: Suzanne Oosterwijk (University of Amsterdam) Understanding the exploration of human suffering

26

Standardising Stem Cell core facilities in Europe: a CorEuStem Symposium

MAY

CISS: Corinna Gebehart and Claire Rusch | José Oliveira The fly strikes back: a neural network approach to decoding exploratory behaviour | Immunopsychiatry of Depression in patients with cancer

COpS: Carlos Ribeiro | Markus Maeurer The metabolic mosaic: illuminating the complex Interplay of diet, brain, and physiology | A blend of immune cells - Conventional and no conventional T-cells in **Pancreatic Cancer**

4th FLxFlow Course: Principles and Applications of Flow Cytometry

CISS: Ana Rita Cruz | Anna Do tumour extracellular vesicles EVade antitumor immunity and immunotherapy? | Actively frozen - a novel pattern of leg muscle activity reveals flexible freezing states and anticipates movement onset in Drosophila

Ad hoc Seminar: Amit Marmelshtein (Tel-Aviv University) Auditory processing across different levels of arousal and consciousness in humans and rodents

Ad hoc Seminar: Yael Oran (Weizmann Institute of Science) The role of the Corpus Callosum in interhemispheric communication

22

CISS: Solène Sautory Serotonin signals evolve with stimulus predictability and relevance during learning

22

CCU Theory Mini-Symposium

29.05-01.06

CR Retreat - Grande Hotel de Luso Embracing multitudes a game of translation

JUNE

05

Ad hoc Seminar: Charles Findling (Geneva University Neurocentre) Brain wide representations of prior information in mouse decision-making

COpS: Il Memming Park | Adriana Sánchez-Danés Neural dynamics in the noise | Paediatric cancers: when differentiation goes awry

CISS: Raphael Steinfeld | Carlos Stein Global activity in auditory cortical circuits counteracts sparse optogenetic inhibition near-instantaneously | Modelling cerebellar (dys)function in deep reinforcement learning agents

CISS: Andreia Lopes | Gili Ezra Can chemotherapy response be predicted by studying inflammatory cells in the tumour microenvironment of Pancreatic Cancer? | A sense of need: how single amino acid deprivations remodel sensory systems and behavior

27

Ad hoc Seminar: Davide Crombie (LMU Munich) Arousal related modulation of the visual thalamus across timescales

30

Ad Hoc Seminar: John Rubenstein (University of California San Francisco) Autism transcription factor gene TBR1 controls pyramidal neuron fate and connectivity - Rescued by increasing WNT signalling

JULY

Innovation Speaker Series: Nina Patrick

24

Innovation Speaker Series -Ricardo Marvão (Beta-i) Open innovation, bringing together startups & corporates to solve real problems

AUGUST

Innovation Speaker Series: Tyler Golato (Molecule GmbH)

Innovation Speaker Series: Daniel Correia (Lymphact) Taking your research from the bench to exit

Ad hoc Seminar: Paschalis Kratsios (University of Chicago) Molecular mechanisms of motor neuron development and degeneration (ALS)

Hands-on Molecular Tools Workshop

SEPTEMBER

CISS: Ayesha Vermani | Ana Sofia Castro Verde How to stop re-training and start re-using models across animals | biological validation of radiomics signatures in patients with **Prostate Cancer**

18

CISS: Sofia Marques | Thomas Mullen Are children just little adults? Similarities and differences in paediatric and adulthood Melanoma | Inferring control signals that drive locomotion

20

10th European Students Cognitive Behaviour Conference

Innovation Speaker Series I Mike Pogose (Hardian Health) First steps to medical device certification for researchers

25

CISS: Flora Vasile & Gonçalo Ferreira Cortical circuit mechanisms for hierarchical feature binding

26

Ad hoc Seminar | Adam Williams (Northwestern University) The IgA B Cell response in the gut to food antigens

27

Intellectual Property Workshop

OCTOBER

02

COpS: Daniel McNamee | Joaquim Alves da Silva Optimal control of the mind's eye | Circuits dysfunction in movement disorders

04

3rd Conference of the Timing Research Forum

09

CISS: Ana Rasteiro | Patrícia António Deciphering pulmonary Neuron-ILC2 circuits | Effect of Sphingosine-1-Phosphate on T cells from patients with solid cancer

11

NeuroSummit - NeuroTech, Digital Health, DeepTech, Data & A.I.

16

CISS: Renato Sousa | Juan R. Castiñeiras Regional heterogeneity in dopamine signals across the striatum during decision making | Signature of control limitations in perceptual decision-making

18

Innovation Speaker Series | Ricardo Henriques (Biovance Capital) Dos and don'ts of raising from VCs: what to know about Venture Capital

CISS: Márcia Fontes | Patrícia Bastos Glioblastoma Zebrafish xenografts: towards personalised medicine Retinoic acid signals, intraepithelial lymphocytes and gut defense

Champalimaud Research Symposium The brain within the body, within the world: the neuroscience of the self

30

CISS: Margarida Caio | Madalena Grenhas Dissecting lineage, fate and function of regenerated cells in the fly adult brain | Comparative analysis of sizeexclusion chromatography and ultracentrifugation for efficient isolation of extracellular vesicles in Multiple Myeloma

NOVEMBER

01

Innovation Speaker Series | Michael Watts (Blüm Health Digital health innovation: from idea to reality

09

CISS: Inês Dias | Ibrahim Tastekin Hypothalamic circuits linking reproductive cycle to female sexual behavior | The sensorimotor connectome underlying protein-specific appetite in Drosophila

13

COpS: Marta Moita | Bruno Costa-Silva On the role of movement in defensive behaviours | Extracellular vesicles: biomarkers of cancer metastasis & regulators of cell signalling

Innovation Speaker Series I João Ribas (Novo Holdings) **Building biotech companies** from groundbreaking academic science

CISS: Andreia Gonçalves | Luísa Silva Decoding the role of stress in metastatic Breast Cancer dormancy | Feasibility and practicability of deeplearning-based denoising of fast-acquisition whole-body [18F]FDG PET

22

Thesis Discussion | Denise Camacho Understanding the role of flower code in tumorigenesis

25

Responsible AI Forum 2023

CISS: Abhilasha Joshi | André Marques Dynamic synchronisation between cognitive representations and locomotor steps | Normalisation drives optimal-like visuomotor integration in Drosophila premotor circuits

DECEMBER

CISS: Giorgio Gristina | Joana Carmona Diversity, contextual factors, subjective reporting: limitations and opportunities in contemporary psychedelic research | How noise sources shape cortical inter-areal communication

Building AI first: from science to software

Theory Seminars | Gergo Orban (Hungarian Academy of Sciences) Top-down inference in hierarchical computations of the early visual cortex

06

Innovation Speaker Series | Till Erdmann (idrug gmbh) Your first life science venture

COpS: Alfonso Renart | Christa Rhiner Bounded accumulation of evidence in decision-making and beyond | Local and systemic communication regulating neural stem cell activation and tissue homeostasis

Innovation Speaker Series | Cristiana Pires (Asgard Therapeutics) Spinning out abroad

Theory Seminars | Guillaume Hennequin (University of Cambridge) A recurrent network model of planning explains hippocampal replay and human behaviour

Outreach

JANUARY

9, 11

Online Workshop Ciência di Noz Manera Training Workshop for Scientists External Partners: Native Scientists, iMM, RAISE

10

School Visit to CF External Partner: Escola Secundária Professor Ruv Luís Gomes

Extra-Calendar School Visit to CF External Partner: iMM Masters Programme

Extra-Calendar School Visit to CF External Partners: Escola Secundária Fernando Lopes Graça, Agrupamento de Escolas da Parede

17, 19

Activities at Schools Ciência di Noz Manera Phase I External Partners: Escola Pedro d'Orey da Cunha, Escola Dr. Azevedo Neves, Escola Marquesa d'Alorna, iMM. RAISE

Extra-Calendar School Visit to CF External Partner: Escola Secundária Tomás Cabreira de Faro

26-28

Outreach Event Metamersion - Latent Spaces

FEBRUARY

Extra-Calendar Visit to CF External Partner: Vista Alegre

10 & 15

Hands-on Activities / Open Day at CF and iMM Ciência di Noz Manera Phase II External Partners: Escola Pedro d'Orev da Cunha, Escola Dr. Azevedo Neves, Escola Marquesa d'Alorna, iMM, RAISE 21

Online Awareness Campaign Women & Girls in Science External Partner: RAISE

15

Zoom In - Online World Thinking Day with Razvan Sandru

Extra-Calendar School visit to CF External Partner: Colégio Campo de Flores

23

Workshops External Partner: Casa da Praia IPSS

Interviews with Students

School visit to CF External Partner: Escola Secundária de Santa Maria. Sintra

MARCH

Extra-Calendar School Visit to CF External Partner: ISPA - Institute of Applied Psychology

Zoom In - Online International Women's Day with Cristina João

17

Talk and Workshop Brain Awareness Week -Sensational External Partner: Fábrica, Centro Ciência Viva, Aveiro

20

Workshop Impact Evaluation of Science Outreach Projects External Partners: Native Scientists, iMM: RAISE

School Visit to CF External Partner: Escola Secundária de Benavente

28-31

Online Awareness Campaign Colorectal Cancer Awareness Month

29

Extra-Calendar School Visit to CF External Partner: Escola Secundária Rainha Dona Amélia

APRIL

3

Online Awareness Campaign Multiple Myeloma Awareness Month

6, 10

Visit to Animal Platforms & Workshops Science on the Walls Bring Cova da Moura to CF

13

Online News One brain, multiple and simultaneous alternative decision strategies

School Visit to CF External Partner: Agrupamento de Escolas de Santo António

28

Zoom In - Online International Dance Day with Sofia Dias and Vitor Roriz

MAY

3

Extra-Calendar School Visit External Partner: Faculdade de Ciências. Universidade de Lisboa

11

Zoom In - Online European Melanoma Day with Daniela Cunha

17

Workshops MICRO Day External Partners: COLife Microscopy teams

26

Extra-Calendar School Visit to CF External Partner: Colégio Redbridge

29

School Visit to CF External Partner: Colégio Internacional de Vilamoura

JUNE

15

Online News From promise to practice: a dose of reality for psychedelic therapies

20

Showcase / Demos Presentation Metamorfoses National Schools Contest External Partners: ESERO. Ciência Viva, Plano Nacional de Leitura 2027

JULY

20

Zoom In - Online Chess Day with Carlos Stein & Tiago Quendera

AUGUST

Zoom In - Online World Lung Cancer Day with Susana Simões

23

Online News Bouncing back from mistakes: how brain state improves decisions

28-31

Summer Academy for High Schoolers Neuronautas External Partner: NeuroGEARS

SEPTEMBER

1-9

Summer Academy for High Schoolers Neuronautas External Partner: NeuroGEARS

8

Online News Ballet of the Brain: unlocking the choreography of movement

Zoom In - Online World Physiotherapy Day with Teresa Seguro

29

European Researchers' Night External Partners: Native Scientists, iMM; RAISE, IST, Virtual Leap, BCSD, Faculdade de Ciência Universidade de Lisboa, Universidade NOVA. ISCTE, Nova Medical School, Social Innovation Sports, Hoopers, CERENA-IST. TreeTree2, Instituto Superior de Agronomia, Faculdade de Medicina da Universidade de Lisboa, LIP - Laboratório de Instrumentação e Física Experimental de Partículas, Universidade de Aveiro, Escola Superior de Comunicação Social, ISAMB Instituto de Saúde Ambiental da Faculdade External Partner: Colégio de Medicina da Universidade de Lisboa, CIDNUR Centro de Investigação, Inovação e Desenvolvimento da ESEL - Escola Superior de Enfermagem de Lisboa, PINTAVIDA- Associação Lusófona para a Promoção da Literacia em Saúde Oncológica, Sofia Dias & Vitor Roriz, Wageningen University & Research, AccelBio, Ocean Alive, CeFEMA: Center of Physics and Engineering of

Advanced Materials, SPACE - Sociedade Portuguesa para a Aplicação Clínica de Enteógenos, Instituto de Higiene e Medicina Tropical-Universidade NOVA de Lisboa, Junta de Freguesia das Águas Livres, Câmara Municipal da Amadora, Cientista Regressa à Escola, Fundação Benfica, Departamento de Reserva, Conservação e Restauro, Sport Lisboa e Benfica, David Cruz & João Pina, Sofia Cabrita, Joaquim Nogueira.

OCTOBER

Zoom In - Online International Music Day with Dean Race

Extra-Calendar School Visit to CF External Partner: Engenharia Biomédica, Universidade de Lisboa

School Visit to CF External Partner: Instituto Español Giner de los Rios

NOVEMBER

Audiogram - Online Congratulations to Gonçalo Cotovio

School Visit to CF Internacional de Vilamoura

Zoom In - Online World Pancreatic Cancer Day with Marta Bello

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Online Awareness Campaign World Pancreatic Cancer Day External Partners: Jreissati Pancreatic Centre, Cancer Research K Cambridge Centre -Pancreatic Cancer Programme

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Online Awareness Campaign Launching Ciência di Noz Manera, Celebrating the National Day of Scientific Culture in Portugal External Partner: RAISE, iMM

Online Award Ceremony 2021-2023 Best EU Campaign Award to Conversas com Cientistas: Décadas de Ciência para Dias de Vacinas External Partners: i3S, iMM, IGC. NMS, SPI, COLife, IUIS, EFIS

CF PhD Student Diaries -Online October Edition

DECEMBER

Extra-Calendar School Visit to CF External Partner: Escola Secundária de Famalicão

School Visit to CF External Partner: Escola Secundária de Palmela

Ar Outreach Event Past. Present & Future of AI -The Roots of Al

Stop Motion Happy Holidays Imagine, Build, Play, Repeat.

CF PhD Student Diaries -**November Edition**

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