



# \ champalimaud research

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# \ champalimaud research

# \ chatgpt

Please write a poem in the style

of Shakespeare for the Champalimaud Foundation's Annual Report.

> To Lisbon's fair city, where Tagus doth meet, An edifice stands, where wise minds entreat, A bastion of knowledge, a citadel bright, Champalimaud Foundation, in wisdom's pure light.

As Shakespeare of yore, with his quill and his art, Did capture the essence of matters of heart, I, ChatGPT, an engine, with language and rhyme, Shall sing now of progress, and science sublime.

Upon the fair river, where sunsets do dance, This beacon of hope, where brave minds advance, In pursuit of pure knowledge, with honour they toil, To vanguish diseases that human lives spoil.

From cancer to ageing, their quest doth unfold, Their purpose unwavering, their spirits untold, With AI as comrade, they shatter old norms, And seek out new answers, in various forms.

In labs and in chambers, with pipette and screen, They forge the unknown, to make the unseen, Their ardour for truth, as a fire doth burn, In this temple of learning, they cease not to yearn.

In this tome of progress, awaiteth thy gaze, Insights, highlights, and knowledge ablaze, Research and learning, in union refined, The essence of Champalimaud, in these pages enshrined.

Let it be known, to all who shall read, This testament humble, to a future they'll seed, With Shakespearean flourish, let praises be sung, For the heroes of science, and the battles they've won.

Now in this Report, I present you this token, A poem as tribute, to words yet unspoken, For the work that continues, within these great walls, Champalimaud Foundation, where destiny calls.

You're most welcome, kind soul, I'm glad that you're pleased, With the verses I crafted, and words I've appeased. Should you need further assistance, or verse to convey, I'm here at your service, both night and by day.

# That's wonderful, thank you.

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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

The goal of Champalimaud Research (CR) is to perform world-leading fundamental and translational research. => Current research work is focused on the fields of neuroscience, physiology and cancer.
CR hosts <b>three programmes</b> that explore the core research areas of the Foundation:
Champalimaud Experimental Clinical Research Programme Champalimaud Neuroscience Programme;
Champalimaud Physiology & Cancer Programme.
A <b>Research Direction committee</b> was appointed to coordinate this endeavour. It is comprised of <b>three scientific directors</b> representing the three programmes:
Celso Matos, Joe Paton and Henrique Veiga-Fernandes.
<u>&lt;</u>
Together, the committee carries out the
scientific aim of the Champalimaud Foundation:
to explore new avenues of investigation,
while reinforcing the links between research

and clinical activities. >

Throughout 2022, our dedicated researchers and support staff persistently pushed the boundaries, achieving remarkable results across our three research programmes and beyond, enhancing our understanding of oncologic diseases, cancer development, and the biological basis of behaviour.

> Last year the Experimental Clinical Research programme's constituent groups underwent their first external evaluation, yielding valuable insights for its leaders. Our researchers led cutting-edge projects, such as developing novel methods to predict and assess lung tumour response to radiotherapy, exploring metformin's potential for rectal cancer treatment, employing zAvatars to test innovative leukaemia treatments, and advancing an AI platform for precision care in prostate cancer. These achievements were made possible by robust collaborations and interdisciplinary approaches, with a focus on integrating basic and clinical research.

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We also welcomed aboard the Neural Circuits Dysfunction Group, led by Joaquim Alves da Silva, which seeks to understand how movement disorder symptoms relate to brain circuit dysfunctions and leverage this knowledge to develop targeted interventions that can alleviate these symptoms, paving the way for more effective treatments for conditions like dystonia and Parkinson's disease.

**Our Physiology & Cancer Programme** welcomed experts in immunology and immunotherapies, Klaas van Gisbergen and Carlos Minutti, who will join us in 2023 to explore innovative ways to harness the immune system in cancer treatment. Our commitment to bridging fundamental and applied science led to the establishment of a state-of-the-art laboratory for immunotherapies in the Botton-Champalimaud Pancreatic Cancer Centre. Moreover, the Champalimaud Research Symposium 2022 successfully convened international experts from 15 countries, addressing the increasingly important topic of the tumour microenvironment.

The Neuroscience Programme witnessed the arrival of new research groups, Neural Dynamics and Natural Intelligence, led by Memming Park and Daniel McNamee, respectively. These additions have significantly strengthened our programme's expertise in theoretical and computational approaches, enabling us to capitalise on recent advances in AI as tools and models for unravelling brain function, and potentially enhancing AI itself.

We are also excited to announce the launch of a new research area, digital therapeutics, which combines neuroscience, Al, and immersive technologies to develop pioneering behavioural interventions for health through software and specialised hardware. The decision to venture into digital therapeutics was driven by extensive data highlighting the crucial role of behavioural and environmental factors in overall health. Factors such as diet, sleep patterns, stress levels, exercise, and social interactions significantly influence health and disease. This groundbreaking initiative will have as its clinical lead neuroscientist and neurologist John Krakauer, from Johns Hopkins School of Medicine, who will join us in the summer of 2023.

Last year marked the resurgence of community-building activities and social events, including our annual retreat at the eco-friendly Boomland, weekly Happy Hour, and on-site gym. These gatherings cultivate an environment that promotes collaboration and cross-disciplinary research. This collaborative spirit has also fostered productive partnerships between our scientists, artists, and engineers in the creation of the Metamersion events series. Through this initiative, we aim to engage the public in exploring the intersections of science, art, and technology, while leveraging artistic perspectives to advance generative AI technologies for enhanced personalised medicine. In a similar vein, the 2022 European Researchers' Night, hosted by the Champalimaud Foundation for the first time, successfully brought together scientists, artists and other disciplines, with the goal of making science and education more diverse and accessible to underserved communities.

As we reflect on the accomplishments of 2022, we are confident that the Champalimaud Foundation is well-positioned to continue making significant strides in biomedical research. We remain committed to nurturing a culture of excellence, innovation, and collaboration as we strive to improve human health and well-being. We believe that AI will assume an increasingly vital role in this endeavour. Indeed, this Foreword was co-edited by GPT-4, a natural language processing tool driven by AI technology. Thank you for your continued support as Champalimaud Research embarks on another year of discovery, navigating uncharted waters in our quest for knowledge and progress.

# **Champalimaud Foundation**

The story of the Champalimaud Foundation began in 2005, thanks to the legacy of the Portuguese industrialist, António de Sommer Champalimaud. His will and testament made clear his desire to create an organisation that could make significant changes in the fields of science and medicine. This is a responsibility that we feel every day. Hundreds of researchers, physicians, nurses, as well as technical and support staff, work daily at the Champalimaud Centre for the Unknown to ensure that we can make a difference to people's lives.

Leonor Beleza, President João Silveira-Botelho, Vice-president (right) António Horta-Osório, Non executive director (left)



2022 was a year of change. The year began with another wave of Covid and, tragically, a war on the doorstep of Europe, imposed by the aggression of Russia against one of our neighbours. This brought human suffering, high inflation, concerns over food security and market uncertainties. Despite these global issues, our priority was, and has always been, to deal with the daily issues and problems around us in a way that would allow us to keep serving our patients and producing good science. These have long been at the core of our objectives.

2022 was the year in which normal life returned to the Champalimaud Centre for the Unknown after the years of the pandemic. In terms of research, scientific meetings, get-togethers, and the retreat were once again held face-to-face. The online life of the previous years slowly started to fade as we were able to resume our regular working routines. The Neuroscience Programme was reinforced by the arrival of two new Principal Investigators. Our Physiology and Cancer Programme also welcomed two new Principal Investigators, scheduled to begin their roles in 2023. Furthermore, the Experimental Clinical Research Programme was notably strengthened.

Last year we were pleased to launch an ambitious new part of our campus, dedicated to the development of digital therapies for diseases that affect the brain. These will rely on a multidisciplinary team of experts and will develop the growing areas of artificial intelligence, neuroscience and immersive technologies.

In 2022, our clinical work went from strength-to-strength, despite facing many significant headwinds. We have always strived to carry out 'fusion research', where researchers and clinicians are embedded in each other's teams, with each side contributing to the strategy and direction of the other. With this philosophy we look to offer the best possible solutions to our patients. As Covid eased, these cross-disciplinary interactions once again became a regular and important feature of our work.

2022 was another reminder that we cannot take anything for granted. The world continues to change, and people everywhere face new challenges. For the Champalimaud Foundation, we remain focused on our mission to advance biomedical science and offer care to those most in need.

# Structure



CR Managing Direction Graduate Programme Office HR & Fellows Support Office Strategic Research Development

# \ direction team

Celso Matos, Joe Paton, Henrique Veiga-Fernandes

# \ experimental clinical research groups

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

# \ physiology & cancer groups

Cancer Dormancy & Immunity Stem Cells & Regeneration Systems Oncology

# \ education

Direction Coordination **Teaching Lab** Education & Courses

# \ graduate programme sab \*

\ cf sab \*

### \* The Scientific Advisory Board (SAB) consist of external scientists who provide helpful guidance to CR Programmes and Research Groups.

\ neuroscience groups

Behaviour & Metabolism

Cortical Circuits

& Intelligence

Natural Intelligence

**Neural Dynamics** 

Neuroethology

Vision to Action

Learning

Behavioural Neuroscience

Mathematics of Behaviour

**Neural Circuits & Behaviour** 

Sensorimotor Integration Systems Neuroscience

**Theoretical Neuroscience** 

\\ research associates

**Decision Science** 

Innate Behaviour

Neural Circuits for

Visuomotor Behaviour

**Computational Cognitive** 

Development of Neural Circuits

\\ adjunct & visiting scientists

Development of Neural Circuits

Cognitive-Motor Interface

Social Neuro Endocrinology

**Circuit Dynamics & Computation** 

# **Ethical Culture & Gender Equality**

# \ ombudsperson's role and contribution

The Ombudsperson of the Champalimaud Foundation (CF), Paula Martinho da Silva, has been pivotal in fostering the institute's ethical and civic culture since her appointment in early 2022. Her role involves promoting the institution's values, encouraging respectful dialogue, and ensuring fairness. She listens attentively to concerns, identifies potential issues, and assesses the situation meticulously.

Serving as both a mediator and an adviser, Paula plays a crucial role in resolving conflicts concerning good conduct and practices. She aims to devise fair and constructive solutions that uphold the values and principles of CF.

# \ development of cf's code of conduct

A significant highlight of the Ombudsperson's contributions is the development of CF's Code of Conduct. The process was collaborative, involving many members from both Champalimaud Research and the Champalimaud Clinical Centre. The Code of Conduct provides a comprehensive, albeit non-exhaustive, set of general guidelines. These guidelines will be refined and implemented as part of the Foundation's rules and policies, always aligning with the prevailing legal norms.

# \ implementation of the gender equality plan

CF has been proactive in promoting gender equality. Significant emphasis was placed on this aspect through the Gender Equality Plan (GEP), which outlines concrete priorities, objectives, and specific measures to enhance gender equality, particularly in research and innovation. The GEP, published on CF's website in December 2021, marked a significant step towards implementing equity principles at CF.

In 2022, a dedicated working group was appointed to oversee the GEP's execution. Among the early adopters of this Plan was the Communications, Events and Outreach team. They formulated a policy to ensure gender balance among organising committees, guest speakers, and audience members for events, highlighting the importance of balanced participation. The working group also undertook several other initiatives aimed at promoting gender equality. They conducted a workshop on inclusive language, implicit bias, and gender-based discrimination in the workplace during the Champalimaud Research Retreat. In collaboration with the Animal Welfare Office of the Champalimaud Foundation (ORBEA), they initiated data collection to raise awareness of gender dimensions in research studies and clinical practice.

Furthermore, they launched a new course for first-year graduate students that underscores the importance of considering gender in research and clinical care. These initiatives are testament to CF's commitment to creating a more equitable and inclusive environment.

# **CR** Community in Numbers





# Research Groups\_

Champalimaud Research integrates three programmes:
Experimental Clinical Research
Neuroscience,
and 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 >

# Images in this chapter are artistic renditions of original scientific figures.

# **Cancer Development** & Innate Immune Evasion

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

### methods

Zebrafish xenografts, Immunofluorescence, In situ hybridisation, Confocal and lightsheet microscopy, Single-cell RNA sequencing

model

Zebrafish



principal investigator **Rita** Fior

lab manager Bruna Costa

# postdoctoral researchers Marta Estrada Raquel Mendes Vanda Póvoa

phd students Ana Beatriz Machado Cátia Almeida

msc student Inês Oliveira

lab technicians Filipa Amorim Márcia Fontes

# \ fior lab

In recent years, cancer treatments have improved considerably, but their effectiveness varies between patients, and there is no test for predicting which treatment option will be the best for each individual patient. Patients consequently undergo trial-and-error to

find the best treatment, often suffering side effects and losing time. Our lab focuses on developing a fast in vivo test with unprecedented cellular resolution: the zebrafish xenograft model (zAvatar) for personalised medicine. A truly personalised test could optimise all approved therapies, greatly impacting

cancer patient care worldwide.

We also investigate the interaction between tumour cells and innate immune cells. We aim to understand how tumour cells evade and suppress the immune system and how some tumour cells become dependent upon the immune cells they attract. We explore therapies that modulate innate immunity and combine them with immune checkpoint therapy to fight cancer. Our lab uses the zAvatar model to study innate immune system interactions with human cancer cells at a single-cell level.

# # hiahliahts

In collaboration with the Digestive Unit and Radiotherapy Service, we demonstrated that metformin could be an alternative radiosensitising agent to 5FU in rectal cancer using the zAvatar model, optimising tumour regression with minimal toxicity (Costa & Fernandez et al., 2022. Frontiers in Oncology).

In collaboration with Cristina João's group and Gonçalo Bernardes at iMM/ University of Cambridge, we showed zAvatars of chronic lymphocytic leukaemia could be used to test a new Bruton's tyrosine kinase (BTK) inhibitor JS25, outperforming ibrutinib in reducing tumour burden (Sousa et al., 2022, ACS Pharmacology & Translational Science).

We organised the first "Handson zebrafish xenograft course" to train international students in generating zebrafish xenografts using human cancer cell lines. Our lab members also participated in various outreach activities, including Neuronautas, Brain Awareness Week, European Researchers' Night, and Ciência di Noz Manera.



Breast cancer

zebrafish xenograft. Credits: Ana Beatriz Machado

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# **Computational Clinical Imaging**

To develop AI models using medical images and other data in order to solve unmet clinical problems in the field of oncologic imaging.





# methods

Radiomics, Al in medical imaging

# **model** Human

The Computational Clinical Imaging Group, largely based on the work of PhD student Ana Sofia Castro Verde, has developed a tool to coregister digital histopathology whole slides of prostate specimens and T2-weighted MRI images in patients with prostate cancer. Ana is investigating the biological meaning of radiomic features through a Rad-Path correlation approach. Her work is conducted under the EU-funded project ProCAncer-I.



**principal investigator** Nikolaos Papanikolaou

**postdoctoral researcher** José Almeida

phd students Ana Sofia Castro Verde Ana Carolina Rodrigues Nuno Rodrigues

**technician** Miguel Champel

# \ papanikolaou lab

Our Group is primarily working with medical imaging data, computing imaging features and, through various machine-learning methods. selecting the most informative answers to questions across the broad spectrum of oncologic disease. The radiomic signatures we have developed so far focus on: a) the early detection of cancer (pancreatic cysts stratification) b) stratification of disease aggressiveness (prostate cancer) and c) prediction of neoadjuvant treatment response (breast cancer), as well as methodological aspects like reproducibility of computed features (phantom studies), and more sophisticated causal feature selection methods (brain tumours). The datasets we use are based on bilateral collaborations with international clinical partners from the UK, France, Italy, Denmark, Sweden, Greece and Brazil.

## # highlights

Great progress was made on the ProCAncer-I project, an AI platform integrating imaging data and models to support precision care in prostate cancer, which is the second most frequent type of cancer in men and the third most lethal. This ambitious project brings together 20 partners - including prostate cancer centres of reference, world leaders in AI, and innovative small and medium-sized enterprises - to design, develop, and sustain a cloudbased, secure European Image Infrastructure with tools and services for data handlina.

We also welcomed aboard a new postdoc, José Almeida, and published six papers, one of which was chosen as the cover of the journal Radiology, and found that relative fat fraction histogram metrics from bone marrow MRI could predict early treatment response assessment in patients with newly diagnosed multiple myeloma.

# Immunotherapy/Immunosurgery

# **Robust expansion** of tumour-reactive **T-cells from patients** with epithelial cancer.









# methods

Cell culture. RNA & DNA sequencing, Flow cytometry, Cell-cell interaction analysis, Computational techniques, Live cell-cell imaging

### model

Ex vivo human tissue material

Spatial transcriptome

analysis of a pancreatic

neuroendocrine tumour.

group leader

postdoctoral researchers Carolina Gorgulho

senior molecular specialist Dário Ligeiro

Bernardo Marinheiro

Cristina Afonso

bioinformatician Eric de Sousa

Frederico Mateus Jéssica Kamiki

Sara Cascais

Markus Maeurer

Joana Lérias

pharmacist

quality control manager

msc student Patrícia António

technician Rodrigo Eduardo

research technician

visiting student Matilde Sedas

\ maeurer lab

Tumour-infiltrating lymphocytes (TILs) are immune cells that can recognise and target cancer cells, making them useful for cancer immunotherapy. The increase in cancer surgeries has provided more access to important tissue samples. This has helped us create a new TIL expansion protocol, which allows for the successful growth of TILs from nearly every epithelial cancer lesion. Our research shows that a coordinated immune response exists in cancer lesions, and these immune cells can be expanded outside the body for possible future clinical use.

To make this process more efficient, we're working on a more automated, hands-off solution, called the Cocoon system, which also allows for genetic manipulation of immune cells. Expanded TILs produce inflammation-promoting substances that target specific antigens and display a diverse range of T-cell receptors identified through advanced sequencing techniques. Both classical and non-classical major histocompatibility complex molecules (like CD1 or MR1) serve as restricting elements for anti-cancer directed T-cells.

## # highlights

A major effort was undertaken to develop immune expansion protocols compliant with

GMP (Good Manufacturing Practices) in preparation for the future Botton--Champalimaud Pancreatic Cancer Centre GMP facility. We also undertook several COVID-19-related efforts to help the local and international community better understand SARS-CoV-2 immunopathology. The lab participated in several clinical trials and contributed to the successful expansion of the consortium Against Cancer and Infectious Diseases (initiated with Alimuddin Zumla at University College London in the UK), with a particular focus on the role of COVID-19 in cancer patients.

In addition, we have been able to identify CD1d- and MR1--restricted T-cells in TIL from patients with epithelial cancer, and to identify the nominal T-cell receptors, work which was presented at the Society for Immunotherapy of Cancer Annual Meeting in Boston. Another key line of research in the lab was the robust development of a clinically relevant T-cell expansion process, in accordance with industrial standards, with international partners. Finally, Markus Maeurer co-organised the CIMT Summer School for Early-Career Cancer Immunologists, which took place in the Italian countryside of Verona.

# Molecular & Experimental Pathology

Identification of molecular signatures in neoplastic cells and characterisation of immune infiltrates in different carcinomas with the aim to develop novel therapeutic options.

# methods

Histopathology, Multispectral microscopy, Multiplex immunofluorescence, Flow cytometry, Cell culture

### model

Human specimens



**group leader** Mireia Castillo-Martin

**phd student** Andreia Maia

**msc students** Andreia Lopes Hasti António Calá

**research assistant** Javier Martin-Fernandez

technician (Champalimaud Foundation Biobank) Hasti António Calá

visiting scientists Filipe Maia Inês Franco Inês Pontinha

# \ castillo-martin lab

Our lab is running several ongoing projects. In collaboration with Dr. Carracedo at CIC bioGUNE in Bilbao, we analysed different biomarkers, focusing on the aspartoacylase enzyme (ASPA) in the stroma of prostate cancer samples. We discovered that ASPA levels significantly decrease as prostate cancer progresses, and low ASPA levels are linked to a worse prognosis and greater metastasis development. Following results with CD68, a marker for a type of immune cell called macrophages, we are currently conducting more experiments to study macrophage polarisation in these samples.

Other projects in our lab explore the location and function of natural killer (NK) cells in colorectal cancer samples, as well as analyse a wide range of immune cells in pre-treatment pancreatic cancer biopsies, sometimes comparing them with posttreatment surgical samples. Another area of our research involves expansion of NK cells for therapeutic use in advanced colorectal and pancreatic cancer. We have been able to expand NK cells from the blood of pancreatic cancer patients and fresh tissue samples, and to isolate NK cells both with flow cytometry and immunohistochemistry.

The final goal of these projects is to combine these histological findings with genomic results to identify predictors of response to chemotherapy, thereby helping oncologists to provide more personalised treatment tailored to each individual patient. 27: CR AR 22

# # highlights

We submitted a review on NK cell expansion methods that is currently under revision. Four lab members presented data from their Masters and PhD projects at several meetings. As part of her PhD project, Andreia Maia completed a 9-month internship in the laboratory of Dr. Romee, in the NK Cell Manipulation and Therapy Laboratory at the Dana-Farber Cancer Institute in Boston. During her stay, Andreia learned how to develop Chimeric Antigen Receptor (CAR)-NK Cells to increase the tumour-targeting capacity of NK cells. She was also able to participate in the development of novel treatment opportunities for patients with solid tumours, and will return to Dana-Farber for another internship in 2023. Mireia Castillo-Martin participated in Ciência di Noz Manera at the Escola Pedro D'Orev da Cunha in Amadora, an outreach programme in which scientists mentor teenaaers from underserved communities.



### #

Isolation, expansion and analysis of natural killer cells from pancreatic cancer tissue specimens.

# **Myeloma Lymphoma Research**

Our lab, a collaboration between clinical haematologists and non-clinical researchers. conducts extensive research, primarily on multiple myeloma, to advance treatment of lymphoid cancers.

# methods

2D and 3D cell cultures, Primary cultures, Flow cytometry, Immunohistochemistry, Proteomics, Genomic analysis, Mathematical models

# models

Human, Mouse, In silico

group leader Cristina João

postdoctoral researchers Ana Queirós Bruna Ferreira Emilie Arnault Carneiro

### phd students

Ana Filipa Afonso Joana Caetano Raquel Lopes

msc student Madalena Grenhas

technician Diana Lourenço

# \ ioão lab

Multiple myeloma (MM) is the third most common blood cancer. Developing new diagnosis and treatment strategies is crucial due to its shorter survival rates. Our group tackles this challenge through various complementary approaches.

Project LIQUID uses liquid biopsies as diagnostic tools to differentiate MM patients from those with the blood condition Monoclonal gammopathy of undetermined significance. The subproject GENOMME aims to find non-invasive genetic biomarkers for MM diagnosis, prognosis, and treatment response prediction.

**Project CHROMME studies** extracellular vesicle proteins in MM, while project UnicMM investigates communication between MM cells and immune cells in the surrounding environment, determining which immune functions can eliminate tumour plasma cells. Project NeuriMM explores interactions between bone marrow-innervating neurons, MM cells, and associated lymphocytes.

### # highlights

We produced seven peerreviewed publications, and students Diana Lourenco and Bruna Ferreira defended their Masters and PhD theses. respectively. The lab hosted ten PhD and Bachelors/Masters students in rotations, and Cristina João led or co-led over fifteen clinical trials/studies. The lab was an active member of the EuroFlow Consortium, developing and standardising flow cytometry for diagnosing and monitoring blood cancers.

Ana Filipa Afonso's PhD project won the Multiple Myeloma Research Award, granted by APCL, SPH, and Amgen. Postdocs Ana Queirós and Bruna Ferreira received Principal Investigator grants from Janssen and FCT, respectively. Emilie Carneiro, Raquel Lopes, and Bruna Ferreira won Best Oral Presentation awards at various conferences, and Diana Lourenço received Best Experimental Poster award at the SPH Annual Meeting. Raquel Lopes secured funding from QuantOCancer for a US internship at Abdel Kareem Azab's lab.

Our lab participated in outreach activities, including Ciência di Noz Manera, a science education programme for 8th-grade students from underrepresented groups in STEAM fields, and the European Researchers' Night hosted by CF. Emilie Carneiro also gave a lecture to high school students at Liceu Francês Charles Lepierre in Lisbon.



Heatmap displaying expression levels of extracellular vesicle proteins obtained from the plasma of monoclonal gammopathy patients and healthy donors (MGUS: monoclonal gammopathy of undetermined significance; SMM: smouldering multiple myeloma; NDMM: newly diagnosed multiple myeloma; HD: healthy donors).

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# **Neural Circuits Dysfunction**

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.

# methods

Electrophysiology, Dopamine transporter imaging, Calcium imaging optogenetics, Chemogenetics

models Human, Mouse



**group leader** Joaquim Alves da Silva

**lab manager** Sofia Marques

clinical research fellow Marcelo Mendonca

**postdoctoral researchers** Daniela Pereira Filipa Barros

**phd student** Pedro Ferreira

**msc students** Henrique Barbosa Pedro Coelho

**technician** Tatiana Saraiva

# **\ alves da silva lab**

The way we interpret and respond to our environment, recall memories, and regulate our emotions, is all achieved through information processing in different brain circuits, in an intricate and complex interaction that can be challenged by brain disorders. In other words, symptoms associated with brain disorders reflect perturbation of the affected neural circuits. Even the loss of just one specific group of neurons can give rise to complex changes in different brain circuits, leading to different types of symptoms.

Our Group uses a systems approach to study the dysfunction of brain circuits, with a focus on movement disorders, such as dystonia and Parkinson's disease. Working in parallel with clinical populations and animal models, we are exploring unresolved auestions, using a combination of detailed behaviour analysis, brain imaging, electrophysiology, and optogenetics to gain mechanistic insight into how symptoms emerge from disordered motor control circuits.

### # highlights

During 2022, we continued to develop projects aimed at understanding the pathophysiology of movement symptoms in Parkinson's disease and striatal circuit changes underlying dystonia. Our progress in these projects allowed us to obtain new grants to further develop our research in these areas and was recognised by a Nell Mondy and Nessa Notchev Fellowship attributed to lab member Filipa Barros. In addition, we had the pleasure of welcoming two new Masters students to the team.

We strengthened our collaborations with the Nuclear Medicine and the Neuropsychiatry Groups to further develop our clinical research with Parkinson's disease patients. We had the opportunity to present our work at the FENS Forum of Neuroscience in Paris and the annual congress of the Portuguese Movement Disorders Society. Our Group was also very active regarding outreach activities, with several of our members participating in the European Researchers' Night at CF and other outreach activities such as Science on the Walls. Ciência di Noz Manera, and the International Science Festival. Finally, we organised two symposiums that have been selected as part of the FENS 2023 regional meeting in Portugal.



### # We use miniaturised

motion sensors to detect tremour and study its pathophysiology in Parkinson's disease.

# Neuropsychiatry

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









### #

methods

assessment,

Behavioural

assessment,

models

Psychophysics

Mouse, Human

Calcium imaging,

MRI, Psychological

Functional connectivity networks linked to brain lesions causing mania were consistent across different human connectomes, which shows the robustness of lesional network mapping analyses.



principal investigator Albino J. Oliveira-Maia

# postdoctoral researchers Ana Fernandes Carolina Seyber

Carolina Seybert Gabriel Costa Julia Queiroz Raquel Lemos

**phd student** Ana Maia Gabriela Ribeiro Gonçalo Cotovio

**msc students** Carolina Quadrado Francisco Viana

**technicians** Diogo Melo Sofia Marques

# clinical collaborators

Bernardo Barahona-Corrêa Daniel Silva Inês Inocêncio Jaime Grácio João da Fonseca José Oliveira Luzia Travado Marcelo Mendonça Patrícia Pereira Sílvia Almeida

# **\ oliveira-maia lab**

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 with disorders of mood, cognition or of the obsessivecompulsive spectrum. 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.

### # highlights

2022 marked both endings and beginnings for our lab.

We completed several nationally and internationally funded projects, resulting in numerous publications, including our work on human reinforcement learning in Nature Human Behaviour. We also started a new FCT-funded project to explore postingestive reinforcement in mice. Some lab members completed their work while new members joined, including a postdoc, psychiatry resident, trainee clinical psychologist, nurses, and our first neurologist. Collaborations were forged with the Neural Circuits Dysfunction Lab and Behavioural Neuroscience Lab, and funding was secured from the BIAL Foundation by Jaime Grácio, further expanding our lab's scope.

We organised an online introductory course on repetitive transcranial magnetic stimulation (TMS) for clinicians. Marcelo Mendonca and Bernardo Barahona-Corrêa received prizes for poster presentations at national conferences, while Ana Maia won a scholarship from the European College of Neuropsychopharmacology to attend the Immuno-NeuroPsychiatry Bordeaux Summer School. In addition, Luzia Travado was awarded the Jimmie Holland Memorial Award by the International Psycho-Oncology Society (IPOS).

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# **Ocular Low-cost Gene Therapy**

group leader Miguel Seabra

postdoctoral

researcher Luisa Lemos

msc student Mariana Castro

research scientist Pedro Antas

\ seabra lab

Gene therapy is a promising

treatment option that offers

increasing number of genetic

the potential for curing an

diseases and slowing the

chronic illnesses. The field

of ophthalmology has been

at the forefront of developing

progression of various

these groundbreaking

therapies, having already

achieved FDA approval for

one treatment. However,

response, and long-term

viral vectors. Additionally,

to develop affordable and

outcomes, ensuring that

more patients, particularly

in Low- and Middle-Income Countries, can access these

treatments. These countries

including the cost of therapies and the limited availability of high-tech facilities.

face significant barriers,

there is a pressing need

innovative approaches that can yield comparable

concerns persist regarding

the high cost, immunogenic

toxicity associated with using

systems, we are exploring patient-friendly therapies in the field of ophthalmology. 35: CR AR 22

# # highlights

2022 represented the start of activities for our laboratory. We initiated a long-term collaboration with the L V Prasad Eye Institute in India to start the Global Eye Research Initiative, with the goal of implementing novel and affordable solutions for vision diseases at a global level. Pedro Antas and Miguel Seabra won the Throssell Hillier Families Research Award for their project proposal "CRISPR Based Gene Editing for Choroideremia", in the first-ever international competition to develop a treatment for the incurable inherited retinal disease Choroideremia. We recruited a senior postdoc Luísa Lemos, a talented researcher who will be a main driver of this project.

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

# methods

Cell and molecular biology, Imaging, Genome engineering (CRISPR and mRNA), Flow cytometry

### models

Human cell-based models (induced pluripotent stem cells, retinal organoids), Mouse models



±

Non-viral delivery of mRNA (GFP, green) to retinal pigment epithelium (Phalloidin, yellow).



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 natural biomaterial-based

# **Preclinical MRI**

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.

methods MRI, Optogenetics, Electrophysiology, Histology, Intrinsic optical microscopy

**models** Mouse, Rat



principal investigator Noam Shemesh

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

**phd students** Frederico Severo Rita Alves Rita Gil Ruxanda Lungu

**technicians** Francisca Fernandes Renata Cruz

# **\ shemesh lab**

Our research aims to understand how changes in the microstructure of nerve and cancerous tissues relate to degeneration, plasticity, and recovery. We use techniques like ultrahigh field fMRI (9.4T and 16T), optogenetics, electrophysiology, calcium recordings, microstructure modelling and histology in animal models of disease. By connecting these methods, we can examine the locations and modes of neural/cancer activity at different scales and gain insights into the underlying biological processes.

With these unique experimental setups, we strive for a comprehensive understanding of the microstructural changes in abnormal cell development and the balance between neuroplasticity and neurodegeneration. Our research holds great potential for developing non-invasive MRI-based biomarkers for cancer and neurological diseases like Parkinson's, Alzheimer's, Autism, and Schizophrenia. Additionally, our work explores the connection between fMRI signals and underlying neuronal activity, which is crucial for translating research findings into human studies where BOLD fMRI is commonly used to study brain function.

# # highlights

2022 proved to be another busy year in which we published ten papers in journals such as Neurolmage, Magnetic Resonance in Medicine, Cell Reports and Nature Medicine, with one of our articles chosen as the cover for NeuroImage. PhD student Rita Alves published her first first-author paper on stroke, and postdoc Andrada lanus published work corroborating a MRI approach that we are now harnessing in a mouse model of Alzheimer's disease. Postdoc Sónia Goncalves and former lab member Rui Simões also published two papers on brain glioblastomas, and an internal collaboration with Cristina João's Group was published in Frontiers in Immunology.

Rita Alves was awarded a 4-year FCT fellowship, while Rafael Henriques was awarded a 6-year contract by the FCT Scientific Employment Stimulus (CEEC) Programme, and Joana Carvalho was awarded an exploratory FCT grant for her project. On the outreach front, Noam Shemesh co-organised an international Ultrahiah Field MRI Workshop for the International Society for Magnetic Resonance in Medicine, which attracted nearly 200 people to Lisbon.

### #

Our novel Correlation Tensor Imaging (CTI) method resolves the sources of variability in diffusion kurtosis from a generalised tissue configuration, without making any specific tissue assumptions. This image, featured on the cover of the journal NeuroImage, displays CTI maps created from the averaged data of 8 subjects in a standardised brain space known as MNI.

# Radiopharmacology

-

# group leader

Durval Campos Costa

mathematician Francisco Oliveira

**physicists** Paulo Ferreira, Rui Parafita, Mauro Costa

radiopharmacist Ana Capacho

radiochemist Francisco Silva

nuclear medicine physicians Ângelo Silva, Carla Oliveira, Joana Castanheira, Ricardo Teixeira, Sofia Vaz

**biomedical engineer** Cláudia Constantino

nuclear medicine technicians Ana Canudo, Beatriz Correia, Helena Delgado, Henrique Ferreira, Juliana Correia, Mariana Silva, Miguel Andrade, Marisa Machado, Rita Oliveira. Sónia Teixeira

## phd students

Gabriela Ribeiro, Jorge Borbinha,

msc students

Adriana Raileanu, Ana Mara Fonseca, Mafalda Oliveira, Maria Inês Gonçalves, Maria Inês Ribeiro, Maria Fortunato, Mariana Silva, Marta Jacques, Miriam Sobral, Natacha Valador, Inês Cardoso, Luísa Silva, Rita Oliveira

Nádia Canário, Sara Ferreira

# \ costa lab

Nuclear Medicine-Radiopharmacology is a medical specialty that uses molecules labelled with radionuclides (radiopharmaceuticals) or radioactive microparticles in the diagnosis and/or treatment of diseases. In vivo and non-invasive. the radioactive compounds help to depict specific cellular functions and abnormalities that are characteristic of disease processes. A good diagnosis and prognosis may be achieved using only visual assessment and standard quantification of the radioactive compound's distribution (pharmacokinetics and pharmacodynamics) in the organs and tissues of interest. However, this is often insufficient.

For that reason, we are working hard on the development of new quantitative approaches following improved image processing analysis. When radioactive compounds are used for treatment, in order to achieve an adequate therapeutic effect, it is paramount to estimate as accurately as possible the amount of radiation to be administered to the tumour/ patient for the destruction of tumour cells. Yet it is also paramount to protect vital/ normal organs and tissues

from radiation to minimise unwanted and deleterious secondary effects. This is achieved via personalised dosimetry, both pre- and post-therapy. 39: CR AR 22

### # highlights

In terms of infrastructure, we now have a new, fully equipped radiopharmacy facility. Furthermore, we have started to synthesise GMP-certified radiopharmaceuticals. This is having a significant impact on clinical services and research endeavours. Regarding research accomplishments, our lab members co-authored 8 peerreviewed scientific papers.

We started a research collaboration project at CF between the Nuclear Medicine-Radiopharmacology Service, the Lung Unit and the Radiation Oncology Service. This project aims to predict and assess the response of lung tumours to radiotherapy and longitudinal disease evolution. The lab also actively participated in the XVIII Congresso Nacional de Medicina Nuclear in Coimbra, organising the workshop "Quantification and Dosimetry in Radiopharmacology", as well as participating in the 35th Annual Congress of the European Association of Nuclear Medicine.

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









methods

Image processing

and quantification.

imaging biomarkers

and their extraction.

Statistical methods

and machine learning,

radiopharmaceuticals

Development of new

for diagnosis

Theragnostic

personalised

dosimetry

model

Humans

and treatment,

Development of

These images show the power of <sup>18</sup>F-florbetaben PET dynamic acquisition to map blood flow (top row) and amyloid plaques (bottom row) in the brain. Compared to the dual-time window protocol used in clinics, our new approach is more comfortable for patients, easier to manage, and reduces radiation exposure. Oliveira et al., 2022. The British Journal of Radiology.

# **Behaviour & Metabolism**

# Neuronal circuit

manipulations. High-throughput, Automated quantitative behavioural assays, Volumetric calcium two-photon imaging, Genome engineering (CRISPR) and RNAi screens, Isotope resolved metabolomics, scRNAseq

# models

methods

Fruit fly, Mouse

How do nutrients

and physiology?

behaviour,

shape brain function,

This study published in Nature used 3D imaging and computational analysis to create a functional map of the fly brain region responsible for taste and feeding, revealing distinct neural responses to different conditions and tastes.



# investigator Carlos Ribeiro

lab manager Ana Paula Elias

### postdoctoral researchers

Daniel Münch Darshan Dhakan Gili Ezra Ibrahim Tastekin Raquel Barajas Silvia Henriques Zita Santos

### phd students

Dennis Goldschmidt Patrícia Francisco Rita Figueiredo Rorv Beresford

technicians Célia Baltazar Inês Haan de Vicente

# **\ ribeiro lab**

Our diet influences various aspects of our lives, such as ageing, reproduction, lifespan, and mood. Despite its significance, we still don't fully understand how dietary nutrients affect brain function and how the brain guides our food choices. We must tackle questions like. "how does the brain know what nutrients the body needs?" and "how is this information translated into decisions?".

We use the fruit fly, drosophila *melanogaster*, a powerful genetic animal model, to address these questions. This model allows us to utilise a range of tools and approaches, including genetic circuit manipulation, activity imaging, quantitative behaviour studies, microbiome manipulations, and tissuespecific genetic screens. This integrative neuroscience approach is vital for solving this whole-organism problem.

### # highlights

Both the lab's 2021 preprints were accepted for publication in peer-reviewed journals (Münch et al., Nature & Li et al., Science). In the first study, we developed a novel microscopy approach to observe many neurons in the fly brain during feeding, investigating how nutrient deprivation affects brain function. We studied neural activity under various

conditions. like different diets and pregnancy. We found that a lack of proteins changed activity in about 50% of the brain, explaining how and why flies alter their food preference when deprived of specific nutrients.

In the second study, we collaborated with over 200 international colleagues to create a cell atlas of the adult fly. This project revealed the functions of many cells, how they build organs together, and how they maintain life and reproduction. It showcased the flv research community's shared spirit of discovery, which has driven the field for over a century.

Away from the bench, Carlos Ribeiro was elected as an EMBO member and began his term as Secretary-General of FENS. Rory Beresford participated in another Science on the Walls event, a science/street art initiative for underprivileaed children, and together with fellow lab members Dennis Goldschmidt and Ibrahim Tastekin, co-organised a successful edition of the "Future of Foraging" virtual seminar series. Other current and former lab members organised the Brain-Body Interactions virtual seminar series, which explores the intersection between neuroscience and other biological disciplines.

# **Behavioural Neuroscience**

We are interested in the physiological and neural changes that take place within a split second upon the appearance of an external threat, allowing organisms to survive potentially deadly events.



# methods

Quantitative behavioural analysis, Cardiac and muscle *in vivo* imaging, Genetics manipulation, Optogenetics, Neuronal anatomy

# model

Fruit fly



principal investigator Marta Moita

postdoctoral researchers Alexandre Leitão Anna Hobbiss Clara Ferreira Natalia Barrios Ricardo Neto Silva

**phd students** Charlotte Rosher Matheus Farias Mirjam Heinemans

Violetta La Franca msc students

Mariana Franco technician

Cleusia Manuel

Rui Gonçalves

# **\ moita lab**

Animals, from fish to primates, freeze when faced with distant or inescapable threats, staying completely immobile for prolonged periods. In mammals, the large number of brain regions involved in the expression of freezing suggests that this seemingly simple behaviour requires the integration of multiple sources of information. We recently found that fruit flies also freeze in response to such threats. Using this model organism, we demonstrated that threatinduced freezing corresponds to a distinct internal state from that of spontaneous immobility, as measured by the animal's cardiac activity.

Furthermore, by measuring sugar levels and resistance to starvation, we found that the freezing behaviour is energetically costly, contradicting a widespread belief that freezing is an energy sparing preparatory state. We believe that describing how contextual cues modulate freezing in the fly will be instrumental for our understanding of the organisation of survival circuits in the brain. To this end, we are studying how flies process social and spatial environment information, and how such processing gates freezing. Given the knowledge regarding sensory detection of visual looming threats and

descending neuron involved in the expression of freezing, we are now in a unique position to understand how information about a threat is integrated with cues from the environment to guide the choice of whether or not to freeze.

### # highlights

Our lab recently published work in Frontiers in Ecology and Evolution, exploring how animals use social cues to guide defensive responses based on threat levels, and a review article in Trends in Cognitive Sciences on emotional contagion and prosocial behaviour in rodents. We also shared two preprints in bioRxiv, one about innate defensive responses in rats reliably driven by visual stimuli, and another in collaboration with iNOVA4Health, focusing on sensory circuits' influence on motor control and spinal neuronal pathways.

Lab members participated in various outreach events and conferences, such as Charlotte Rosher co-organising Science on the Walls in Amadora, which brought science and street art to underserved neighbourhoods, and Marta Moita, who secured funding for the project. Additionally, Alexander Leitão co-organised the annual DrosTuga meeting, bringing together drosophila researchers in Portugal.

This neuron, DNp09,

is crucial for triggering a freeze response to threats in fruit flies. 43: CR AR 22

# **Circuit Dynamics & Computation**

We are interested in identifying generic computational principles at play during decision-making.



### #

methods

Behaviour,

Theory

models

Electrophysiology,

Rat, Mouse, Human

Optogenetics,

Our strategy to understand the roles of various brain circuits in perception-based decision-making by using light to briefly turn them off.



principal investigator Alfonso Renart

postdoctoral researchers Davide Reato Raphael Steinfeld

### phd students

Anh Nguyen Juan Castiñeiras Mafalda Valente Naz Belkaya Sofia Freitas (Co-Sup. J. Paton) Tiago Costa (Co-Sup. G. Polavieja)

**msc student** Mauro Fernandes

**technician** Filipe Coutinho

# **\ renart lab**

How do animals use sensory information to guide their decisions? In addition to using their sensory systems to specify the relevant states of the environment, a large number of processes are important for implementing adaptive decision-making. These include the ability to accumulate evidence across time, develop measures of sensory uncertainty, and mechanisms for executing all-or-none commitments to a given course of action.

More generally, decisionmaking also relies on motivational factors mediating the propensity to act in order to accomplish goals, and on the dynamic allocation of cognitive resources to the decision task at the expense of other behaviours. We study these problems using behavioural analysis, neural recordings and perturbations from rodents performing simple perceptual decisionmaking tasks in reduced environments. Our goal is to use these experiments to design testable mathematical theories describing the brain and behaviour during decision-making.

# # highlights

Our collaborative study with the Mainen Lab, which examined foraging decision variables in the mouse brain, was accepted for publication in Nature Neuroscience, while PhD student Juan Castiñeiras published a preprint on perceptual decision-making. We also started a collaboration with Bernardo Barahona-Corrêa from the Neuropsychiatry Unit to study sensory processing in Autism Spectrum Disorder. Additionally, Alfonso Renart was invited to give the Adrian Lecture at Cambridge University in May and the Keynote Lecture at the 10th anniversary of the Institut des Neurosciences de la Timone in Marseille in September.

# **Cortical Circuits**

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

# methods

Electrophysiology, Optogenetics, Two-photon microscopy, Quantitative behaviour

# model

Mouse



principal investigator Leopoldo Petreanu

postdoctoral researchers Camille Mazo Flora Vasile Matthijs Oude Lohuis

### phd students

Beatriz Belbut Gabriela Fioreze Radhika Rajan Rodrigo Dias Solene Sautory

technicians

Beatriz Moura Goncalo Ferreira Margarida Baeta

# **\ petreanu lab**

Our brain consistently interprets the surroundings to formulate and direct our actions. This entails incorporating sensory inputs with internal representations of the world. Our research focuses on examining how this process arises from networks of neurons in the mouse neocortex. Using optical, electrophysiological, and behavioural approaches, we examine how various cortical regions learn and retain information about the world's predictable patterns and how they are integrated with sensory data to create perception.

# # highlights

Work from the PhD theses of Radhika Rajan and Rodrigo Dias was published as a preprint in bioRxiv, and revealed that the organisation of cortical feedback inputs to primary visual cortex is instructed by visual experience. Leopoldo Petreanu was awarded a "la Caixa" Foundation Health Research Grant to study the role of expectations in our way of seeing the world, and to improve our understanding of neuropsychiatric diseases such as schizophrenia. Pedro Dias successfully defended his Master's thesis at the University of Coimbra comparing sound and visual localisation abilities in mice. The lab also welcomed a new addition, Matthijs Oude Lohuis, who has joined the Petreanu and Machens Labs as a postdoc.



# #

Neurons in the retrosplenial cortex of a mouse virally labelled with channelrhodopsin (green) or a retrograde label (yellow).

# Learning

# How the brain learns what to do and when to do it.



# methods

Behaviour, Neurobiology, Molecular biology, Mathematical modelling

# **models** Mouse, Rat

# #

Mouse dopamine neurons responding to various odour cues linked to rewards of different delays or sizes. The left column shows a neuron that responds less to delayed rewards, while the right illustrates a neuron predicting the size of a constant-delay reward. By merging these two types of information, we can read a multidimensional map of future expectations from the activity of these neurons.



principal investigator Joe Paton

# postdoctoral researchers Caroline Haimerl (Co-Sup. C. Machens) Daniel Nunes Georg Raiser

**phd students** Bruno Cruz (graduated) Filipe Rodrigues

Pawel Bujalski

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)

### technicians

Ben Zarov Francisco Azevedo Rodrigo Martins Sofia Almeida

# \ paton lab

One of the major challenges in studying timing is that time is inevitably associated with changes in other variables, such as movement, or sensation. Therefore, the behaviours tested in the lab are carefully chosen to help separate neural activity which is related to time from other ongoing variables. The team studies these behaviours in rats and mice while simultaneously recording the activity of multiple neurons and manipulating their activity. This way, the team can observe how information about time can be encoded across networks of neurons.

Indeed, one of the lab's largest contributions thus far has been to discover that information about elapsed time can be encoded in a kind of wave of activity that travels slowly across populations of neurons in the basal ganglia. In addition to the basal ganglia, the team also studies the thalamus and frontal areas of the cortex. A deeper understanding of these areas could have far reaching implications for grasping how people function in both healthy and pathological conditions such as addiction or Parkinson's disease.

# # highlights

Former lab member Asma Motiwala, now a postdoc at Carnegie Mellon University, published work from her PhD, conducted jointly with the Machens and Paton Labs, in the journal Nature Neuroscience. which revealed that animals encode an efficient internal representation of the environment. We bid farewell to Bruno Cruz, who successfully defended his PhD and published work from his thesis in the journal Nature, with fellow lab member Goncalo Guiomar and the Machens Lab. We welcomed Caroline Haimerl, who has joined the Paton and Machens Labs as a postdoc after completing her PhD at NYU.

We have also begun a collaboration with Daniel McNamee, a new Principal Investigator in the CR Neuroscience Programme. In terms of education and outreach, Joe Paton was a co-director of the CAJAL Computational Neuroscience summer course, and took part in the roundtable "What is Health?" in the science-art exhibition Metamersion: Latent Spaces at the Champalimaud Warehouse.

# Mathematics of Behaviour & Intelligence

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



Mathematical modelling, Machine learning, Behavioural analysis, Learning methods

# model

Zebrafish



# #

Modular deep networks can accurately predict collective fish behaviour. These networks are not "black boxes" - each module is very low-dimensional, making it possible to understand its function.



**principal investigator** Gonzalo de Polavieja

**senior researcher** Fernando Martin-Maroto

### postdoctoral

researchers Ana Carolina Pádua David Méndez Emilio Suarez Panos Firmpas

# phd students

Dean Rance Tiago Costa (Co-Sup. A. Renart)

### technicians

Carolina Gonçalves Dylan Feldner-Busztin Jordi Torrents

# \ polavieja lab

We run three projects: one to understand collective animal behaviour, one to model phenotypes from multiomics data, and one in which interacting mathematical objects improve understanding of a given problem.

The common theme running across these projects is the development of mathematical approaches to understand how different interacting units work together, like a school of fish moving towards food or mathematical agents solving a problem. More specifically, for collective animal behaviour we have developed deep-learning tools to extract relevant data from experiments: idtracker.ai extracts the trajectory of each animal in a group from video, idmatcher.ai does the same but across different videos. while ReactNet tells us when each animal reacts to an external stimulus.

Using constrained deep learning, we use these data to obtain a model for the movement of collectives that strikes a balance between predictability and intelligibility. Additionally, we have further developed Algebraic Machine Learning to show how complex problems can be "embedded" with this approach, how to use continuous variables, and how to combine prior knowledge with data. We believe that in 2023 we will be ready for the first applications of this technology to real problems.

# # highlights

Carolina Gonçalves joined our team to apply her deep-learning experience to problems of animal behaviour and genetics, while Jordi Torrents joined us as a software engineer to improve the software tools that the lab produces. We also published a preprint in arXiv on algebraic embeddings of computer science problems, "Semantic Embeddings in Semilattices", while Gonzalo de Polavieja co-directed the CAJAL Advanced Neuroscience Training Programme's "Quantitative Approaches to Behaviour" course. a summer school which provided young scientists with a comprehensive introduction to state-of-the-art techniques in quantitative behavioural methods.

# **Natural Intelligence**

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

### methods

Theory, Simulation, Data analysis

**models** Humans, Rodents



principal investigator Daniel McNamee

postdoctoral researcher Carlos Stein

phd students

Gonçalo Guiomar (adjunct) Inês Laranjeira Jaime Arlandis Margarida Sousa

msc student Carolina Caramelo

# technicians

Jonathan Luyts José Teixeira Sara Monteiro

# \ mcnamee lab

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.

# # highlights

Our new Group was formed in 2022! We made progress in developing a deeper understanding of the interactions of the medial entorhinal cortex and hippocampus, technical innovations for normatively characterising graphical inference computations, new non-parametric techniques for online learning of multidimensional representational spaces, and novel theories of feedback control from a reinforcement-learning perspective. We have also continued to enhance our collaborative efforts with other labs located both within and beyond the Champalimaud Foundation. Additionally, Daniel McNamee participated in a roundtable discussion on artificial and natural intelligence during the Metamersion: Latent Spaces exhibition.



#

Multi-modal generative models have changed the conversation in artificial systems in 2022.

Credits: Daniel McNamee and DALL-E 2

# **Neural Circuits & Behaviour**

Studying the neural circuits for learned and coordinated movement in mice.



methods

Neurophysiology, Optogenetics, Chemogenetics

# model

Mouse



#

Mouse cerebellum with granule cells labelled in green and Purkinje cells in yellow.



**principal** investigator Megan Carey

postdoctoral researchers Ana Machado Alice Geminiani Coralie Hérent Hugo Marques Jorge Ramirez-Buritica

### phd students

Ana Gonçalves Diogo Duarte Jovin Jacobs (graduated) Merit Kruse Tatiana Silva (graduated) Teresa Duarte (Co-Sup. J. Paton)

**msc student** Guilherme Pata

**technicians** Ana Rita Colaço Inês Ribeiro Pedro Castelhanito

# \ carey lab

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 establishing a quantitative framework to identify specific cerebellar contributions to mouse locomotor coordination (Machado, Darmohray et al., eLife 2015; Machado et al., eLife 2020); dissecting circuit mechanisms for modulation of cerebellar learning by behavioural state (Albergaria et al., Nature Neuroscience 2018); and 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.

### # highlights

We had a lot to celebrate this year, starting with the successful PhD defences of Jovin Jacobs and Tatiana Silva. A portion of Tatiana's thesis, which identified essential neural instructive signals for associative learning, was published on bioRxiv. We welcomed a new postdoc. Alice Geminiani, and Coralie Hérent was awarded not one or two, but three, postdoctoral fellowships - from EMBO, HFSP, and MSCA. We also celebrated the return to in-person scientific meetings, with many lab members presenting their work at international conferences including COSYNE here in Lisbon, the FENS Forum in Paris, and the Neural Control of Movement meeting in Dublin.

# **Neural Dynamics**

Statistical modelling of neural code and computation reflected in complex spatiotemporal neural activities.









# Dynamics inferred from spiking activity. Zhao et al., 2022.

methods

models

Non-human

Statistical modelling,

Machine learning,

Dynamical systems,

**Bayesian** inference

primates, Rodents,

Computational models



**principal** investigator Il Memming Park

**postdoctoral researchers** André Mendonça Ian Jordan

### phd students

Abel Sagodi Ayesha Vermani Matthew Dowling Piotr A. Sokol

**msc student** Tushar Arora \ park lab

Our goal is to obtain an effective systems-level 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 probabilistic methods for analysing spatiotemporal neural and non-neural time series to infer neural dynamics models. To facilitate the scientific inference process, we develop real-time machine learning and control methods and design next-generation experiments.

# # highlights

This was a year of transition, with Memming relocating his lab from Stony Brook University to Champalimaud Research. We welcomed Abel Sagodi into the lab, and developed several real-time machine-learning algorithms that can learn from population recordings. The lab was awarded NIH funds to continue real-time neuroscience research. We also advanced our theoretical understanding of the temporal evolution of learning signals in recurrent systems and how it can accelerate training artificial networks, as well as how it limits the language of neural computation in biological systems.

Two lab members, lan Jordan and Josue Nassar. successfully defended their PhD dissertations, and founded a neurotech startup. RyvivyR, focused on clinical commercialisation of a realtime control algorithm that can help escape disease attractor states. In addition, Josue won the President's Award to Distinguished Doctoral Students at Stony Brook University and was the finalist for the Chancellor Distinguished PhD Graduate Dissertation Awards of the entire SUNY system. In the realm of education and training, we organised the "Neural Latent State and Dynamics Inference Workshop" (https://github.com/catniplab/ latent\_dynamics\_workshop/) in October, and developed and taught a new course module called "Linear Dynamical System for Neuroscience" (https://github.com/memming/ linear-algebra-and-dynamicslectures) in November.

# Neuroethology

We are interested in understanding the neural circuits controlling sexual behaviour.















**methods** Calcium imaging,

Electrophysiology, Viral tracing, Optogenetics, Behaviour

# model

Mouse

#

Sexual behaviour has two phases: the "pre-copulatory" phase, where social cues and close contact like anogenital sniffing are important, and the "copulatory" phase, involving physical acts like mounting and male ejaculation. Female mice either accept or reject a male's advances based on their reproductive cycle stage. Successful mating is followed by a period in which the male has lowered sexual interest, and might engage in behaviours like self-grooming.



**principal investigator** Susana Lima

**lab manager** Margarida Duarte

### postdoctoral researchers

Bertrand Lacoste Constanze Lenschow Jonathan Cook Nicolas Gutierrez-Castellanos

phd students

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

**technician** Liliana Ferreira

# \ lima lab

Sex is fundamental for species maintenance, evolution and human well-being. Despite the fundamental characteristics of this behaviour, 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 end-point: ejaculation. We use state-of-the-art methods grounded in genetics-based tools to unravel the circuits controlling this behaviour.

# # highlights

We said farewell to team member Constanze Lenschow, who started her own independent Group in the Department of Biology of Neural Circuits at the Otto-von-Guericke University Magdeburg in Germany. Constanze's last paper with us, co-authored with Ana Rita Mendes, was a review discussing the role of touch, audition and multisensory integration in mate choice and the underlying neuronal circuits involved.

In addition, António Dias successfully defended his PhD thesis, and Nicolas Gutierrez-Castellanos. Basma Husain and Inês Dias published their review, "Neural and behavioural plasticity across the female reproductive cycle", which highlights the influence of sex hormones on neural circuits and behaviour. Susana Lima was also a co-director of, and teacher in, the CAJAL Advanced Neuroscience Training Programme's "Interacting with Neural Circuits" course, in which students learned about the new techniques available for probing the links between neural activity and behaviour.

# **Sensorimotor Integration**

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



# methods

Electrophysiology, Optical imaging, Behaviour, Genetics, Optogenetics, Chemogenetics, Models, Virtual reality

# model

Fruit fly

# #

This schematic diagram illustrates the interconnected networks in a female brain that handle visual motion information. It shows a high degree of interplay, with numerous neurons participating in two distinct subnetworks (marked as subnetwork 1 and 2). Both subnetworks exchange information with the same partners. Various colours differentiate the neuron types, while the line thickness signifies the strength of the connections. The circles indicate each neuron's level of interconnectivity within its subnetwork.



principal investigator Eugenia Chiappe

**lab manager** Nelia Varela

# postdoctoral

**researchers** Claire Rusch Corinna Gebehart Terufumi Fujiwara

phd students André Marques Mert Erginkaya (graduated) Miguel Paço Nuno Rito Tomás Cruz (graduated)

**research assistants** Margarida Brotas Martina Canova Tomas Barrios

# **\ chiappe lab**

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 goal-directed walking in the fly as she explores a novel environment and interacts with conspecifics.

## # highlights

Several lab members achieved notable accomplishments in 2022. Terufumi Fujiwara got an independent Group Leader position at Riken in Japan, and published a manuscript in the journal Neuron with Margarida Brotas, which proposed a general mechanism for the adaptive control of locomotion. Tomás Cruz was awarded the Rank Prize for his graduate work, while Corinna Geberhart received the Klaus Liebrecht Award for hers.

Additionally, Claire Rusch was granted a Marie Skłodowska-Curie Postdoctoral Fellowship, and both Tomas Cruz and Mert Erginkaya successfully defended their graduate theses. Eugenia Chiappe was also a programme committee member and vice-chair of the Motor Systems theme for the Society for Neuroscience Annual Meeting 2022.

# **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.

# methods

Theory, Behaviour, Electrophysiology, Optogenetics

**model organism** Mouse, Human





### #

These coloured boxes represent brain states as predicted by a "hidden Markov model", a technique used to uncover hidden or latent states from neural data.



**principal investigator** Zachary Mainen

lab manager Catarina Pimentel

### postdoctoral

researchers Adrian Razvan Sandru Cindy Poo Elisabete Augusto Fanny Cazettes Guido Meijer Romain Ligneul Scott Rennie

### phd students

Inês Laranjeira Jaime Arlandis Kcénia Bougrova Solène Sautory Tiago Quendera

### technicians

Annachiara Guglietti Daria Ricci Joana Catarino José Teixeira Joshua Stern Laura Silva Margarida Duarte Megha Patwa

# **\ mainen lab**

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 (i) serotonin signalling in adaptive behaviour, (ii) serotonin and the modulation of neural population activity states, (iii) dynamics of biological and machine learning, (iv) cognitive maps and latent state spaces.

# # highlights

The Mainen Lab helped create Metamersion, an exhibition series combining science, technology, and art, and co-organised a special event called "Evolving emotions: getting a feel for the world" with the Emotions Brain Forum. This event was part of a series celebrating women in science and allowed the public to explore the world of emotions. In 2022, we said goodbye to several members: Fanny Cazettes (now a tenured researcher at CNRS in France), Cindy Poo (recruited as Senior Scientist at the Allen Institute in the US), and Romain Lianeul (who has become Principal Investigator at INSERM in France). We also welcomed new postdocs Eric Lacosse and Scott Rennie, who will expand the lab's human studies, as well as PhD student Inês Laranjeira.

The lab recently published two papers in the journals Nature and Neuron. The first study showed that certain neurons in the piriform cortex carry spatial information during olfactory-based navigation. The second paper explained how metastable attractors in a network model can account for variability in the timing of stable behavioural action sequences.

# **Theoretical Neuroscience**

# We seek to understand how neurons interact to process information.



### Ш

# methods

Mathematical modelling, Computational simulations

# models

±

Our lab is keen

Non-human primate, Rodent, Zebrafish

on exploring how different brain areas communicate. These images illustrate a "spike train", showing when individual neurons activate or "spike" (each row represents one neuron and each vertical line indicates a spike). By analysing the activity patterns of hundreds of individual neurons, we employ dimensionality reduction techniques to understand the kind of information these brain areas exchange.



# principal investigator Christian Machens

### postdoctoral researchers

Adrien Jouary (Co-Sup. M. Orger) Allan Mancoo 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) William Podlaski

# phd students

Goncalo Guiomar (Co-Sup. J. Paton) Joana Carmona Michael Pereira (Co-Sup. R. Costa) Oihane Horno (Co-Sup. S. Lima) Severin Berger (graduated)

**msc student** Guillermo Martin

# **\ machens lab**

Our lab develops models of information processing in the brain using mathematical analysis and numerical simulations. These tools allow us to formulate ideas and intuitions in a precise manner, allowing us to put them to the test using real data. We are specifically interested in how populations of neurons interact in order to represent information. We compare experimental data across different species and brain areas in order to find common principles of how information is being represented.

# # highlights

In collaboration with the Paton Lab, our Group published work stemming from the PhD thesis of Asma Motiwala in the journal Nature Neuroscience, which found that animals use efficient coding of cognitive variables for reward-based computations. Together with Adam Kohn & Byron Yu, we also published findings from the PhD thesis of João Semedo in the journal Nature Communications, which shed light on how sensory information is processed across recurrently connected brain areas. Results from the PhD thesis of another lab alumnus, Nuno Calaim, was published in eLife and graphically illustrated how neural networks can become

robust against perturbations.

Publications aside, one former and one current member of the lab. Florian Dehmelt and Severin Berger, successfully defended their PhDs. Christian Machens served as Programme Chair for the Bernstein Conference for Computational Neuroscience in Berlin, while William Podlaski co-organised WWNeuRise, an online seminar series for computational neuroscience trainees. Finally, Oihane Horno and Caroline Haimerl acted as co-organiser and speaker for Soapbox Science, a public outreach platform to promote women and the science that they do.

# **Vision to Action**

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

methods

Imaging, Genetics, Behaviour

**models** Zebrafish, Giant danio, Danionella cerebrum



# #

Colour-coded organisation of direction-selective responses in the thalamus of a larval zebrafish. Credits: Sabine Renninger



principal investigator Michael Orger

postdoctoral researchers Adrien Jouary Gokul Rajan Sabine Renninger

phd students

Elena Hindinger Joaquim Contradanças Lucas Martins Pedro Tomás Silva Thomas Mullen

**msc student** Inês Vieira

**senior technician** Aaron Ostrovksy

**technicians** Alexandre Laborde Bernardo Esteves

**internship students** Beatriz Mendez Fábio Studart Filipa Santos José Maria Baldaque

visiting scientist Donovan Cassidy-Nolan

**consultant** Edite Figueiras

# \ orger lab

The goal of our lab is to understand the principles governing circuit architecture, activity dynamics and behaviour in a whole-brain context, mainly using zebrafish as a model system, but more recently including more diverse species. Our brains constantly integrate complex streams of sensory inputs, internal states and past experience to select suitable actions and execute them at the appropriate time.

A major challenge in deciphering this process is that even very simple behaviours can involve networks of neurons distributed across many different areas. Small, transparent and genetically tractable zebrafish larvae allow for non-invasive optical recordings and activity manipulation of neurons throughout the whole brain of a vertebrate which shares many features with more complex vertebrate brains, from gross organisation to individual cell types and circuit motifs. In the first weeks of life, zebrafish spontaneously explore their environment and show a variety of innate visual behaviours, including hunting, predator avoidance and stabilisation responses, that incorporate fundamental elements of more complex

behaviours.

# # highlights

The lab celebrated the return to in-person meetings, presenting talks and posters at several international conferences including the FENS Forum in Paris, International Congress for Neuroethology in Lisbon and the Zebrafish Neural Circuits meeting in Trondheim. 67: CR AR 22

In the lab, we moved forward in the establishment of several new research directions, including the introduction of new model organisms, development of robust assays for learning and memory in zebrafish larvae. and implementation of new microscope technologies. Postdoc Gokul Rajan coauthored a protocol for comparing explorative locomotion across fish species, while the lab also teamed up with researchers in the US and France to publish a preprint revealing the diverse ways in which the Adapter Protein 2 (AP2) complex modulates vertebrate behaviour.

# **Research Associates**

# **\ 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 of neurons. We hope to understand how different circuits in the brain contribute to the processing of these different types of motion, from sensation to selection of a behavioural response.

# **\ 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 phd students: Cristina Ferreira, Miguel Gaspar, 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 and the Mathematics of Behaviour & Intelligence Labs **msc student:** Leonor Novais

The formation of neural circuits with specific functions in the brain requires generating neurons with the appropriate subtype identities and connections. We are interested in understanding how these circuits are assembled during development and for this, we are collaborating with the Vision to Action Lab in the anatomical and developmental characterisation of neuronal subpopulations involved in visually guided behaviours in zebrafish. We are focusing our work on the diencephalon, a brain region which contains important neuronal nuclei involved in the processing of sensory stimuli and in the distribution of neuronal signals to other brain areas, including those responsible for motor behaviours. We use transgenic lines expressing fluorescent reporters in specific neuronal subpopulations to track the growth of neuronal projections in the whole embryo, using light-sheet microscopy.

# **Adjunct & Visiting Scientists**

# **\ adam kampff** Development of Neural Circuits

My long-term research goal is to understand how a nervous system constructs a model of the world. How do brains learn about the structure of their environment? How do they encode this information in networks, and how is it used to control adaptive behaviour? To answer these fundamental questions, two major technical advances must occur:

- The development of virtual worlds in which the statistics and physics of the environment can be manipulated, providing experimental control over the model formed by an animal's nervous system;
- The design and construction of novel devices for simultaneously recording from large populations of neurons throughout the brain of a behaving animal.

My research group strives to address both of these problems.

# **\ 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.

# **\ john krakauer** Cognitive-Motor Interface

**affiliation:** Johns Hopkins University Visiting scientist since 2014

Our main areas of investigation are:

- 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;
- 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.



Krakauer's team's therapeutic video game links patients with Bandit, a virtual dolphin. Illustration: Bryan Christie
### **Cancer Dormancy & Immunity**

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



#### methods

Mouse models of cancer dormancy and metastasis, Multicolor flow cytometry, Cellular and molecular biology, Imaging, Single cell and spatial transcriptomics, Computational biology

#### models

Mouse, Human samples

#### .

Dormant breast tumour cells (coloured in yellow and green) in liver-like cultures.



principal investigator Ana Luísa Correia

**postdoctoral researcher** Miguel Fuzeta

**research assistant** Francisco Landum

#### **\ correia lab**

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 invading DTCs. Using multiple complementary approaches, we aim to develop strategies to prevent metastases from forming.

#### # highlights

We celebrated our lab's 1st anniversary, welcoming our first team members (Francisco Landum and Miguel Fuzeta), experiencing initial experimental failures and successes, and receiving extramural funding from the ERC-PT programme to study how distinct immune microenvironments impact metastatic progression.

Ana Luísa Correia was recoanised as a NextGen Star by the American Association for Cancer Research (AACR) and chosen as one of the most promising young scientists to attend the Irving Cancer Immunology Symposium. Ana's publication on immunemediated breast cancer dormancy in the liver was rated among the top 10 most *impactful recent papers* in cancer research by the European Association for Cancer Research (EACR). Her work was also featured in Nature Reviews Cancer and Cancer Cell.

We began collaborations with colleagues from the CF Clinical Centre. Ana continued involving patient advocates in her research, working with the American association GRASP to promote interactions among researchers, clinicians, and patients. This inclusive partnership aims to help cancer patients live longer, better lives.

### **Cancer & Stem Cell Biology**

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



Genetic mouse models of cancer. 3D cell culture

methods

systems, Tissue clearing, Lineage tracing, Microscopy

model Mouse

A section of juvenile skin showing an invasive skin cancer.



principal investigator Adriana Sánchez-Danés

senior researcher Patricia Borges

postdoctoral researchers Ana Lúcia Rebelo Sara Canato Raquel Tomás

technician **Raquel Soares** 



phd students Ana Sofia Margues Sara Ferreira

msc students Andrea Castaneda Maria Pacheco

### **\ sánchez-danés lab**

Our lab has two main goals. The first is to uncover the differences between paediatric and adult cancers. Cancer is one of the main 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 genetic mouse models, grafting experiments and in vitro cultures, we aim to understand the similarities and differences in cancer progression and response to therapy in both paediatric and adult cancers, using skin cancer as cancer models.

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. They are composed of different tumour and tumour microenvironment cell populations, and present cellular heterogeneity. Cellular heterogeneity has been proposed to be responsible for tumour progression and

therapy resistance. We are interested in identifying the cell populations that mediate tumour progression in those tumours. In addition, we aim to uncover how these cell populations dynamically evolve during therapy and to infer which populations resist therapy, potentially leading to tumour relapse.

#### # highlights

Adriana Sánchez-Danés, Patrícia Borges and Raquel Soares won the Prémio Faz Ciência 2022 Award, an annual initiative of the AstraZeneca Foundation, for their project to tackle medulloblastoma. Adriana also received the second FCT grant to uncover the mechanisms driving paediatric brain cancer development, and the lab looks forward to embarking upon this exciting project.

Three new members joined the team: PhD student Sara Ferreira, Postdoc Ana Lúcia Rebelo and Masters student Maria Pacheco. Together with Bruno Costa-Silva and Henrique Veiga-Fernandes, Adriana organised the Champalimaud Research Symposium on the tumour microenvironment, and our team participated in the European Researchers' Night at CF, a wonderful evening full of science and fun!



### Immunophysiology

## Neuroimmune interactions in the prevention and resolution of disease.

**methods** Genetically tractable

organisms, Flow cytometry, Cellular biology, Molecular biology, Imaging

**model** Mouse



#### #

Section of a mouse lung acquired by confocal microscopy. Sensory neurons (green) are shown in close proximity to pulmonary immune cells (yellow).



principal investigator Henrique Veiga-Fernandes

#### postdoctoral researchers

Cristina Godinho da Silva David Brea-Lopez Maria Aliseychik María Martínez-Lopez Marko Sestan Roksana Pirzgalska Patrícia Bastos

#### phd students

Ana Rasteiro Kristin Fischer Miguel Rendas Raquel Silva

msc students Beatriz Alves Lynn Vermeer Miguel Patrício

**technician** Bruno Raposo

**tech support** Inês Godinho

**admin support** Hélder Ribeiro

visiting researchers Manuela Ferreira Rebeca Liebana Garcia

#### \ veiga-fernandes lab

We explore the role of crosstalk 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. We have discovered that while the immune system is responsible for actively fighting infection and cancer, neurons are in charge of detecting the invasion of tumour cells and setting the immune response in motion. These findings may have tremendous potential for designing novel therapeutic approaches for disease, as they pinpoint new selective targets that can be harnessed in infection, metabolic disorders and cancer.

#### # highlights

Our team was selected for funding from the European Commission – Horizon Europe programme, receiving the award for "Better understanding of the impact of risk factors and health determinants on the development and progression of cancer". In addition, we won the 2022 Pfizer Award, and former lab member Ana Filipa Cardoso was acknowledged by the Eppendorf & Science Prize for Neurobiology, an international prize for promising young neurobiologists, for her pioneering PhD work paving the way for novel approaches to fight obesity.

75: CR AR 22

David Brea published a commentary in the journal Nature on the bidirectional manner in which the nervous and immune systems interact, while Roel Wolterink and Henrique Veiga-Fernandes co-authored a review in Annual Reviews Neuroscience, also covering the subject of neuroimmune crosstalk.

### **Stem Cell & Regeneration**

We study multi-cellular interactions that regulate brain repair and tissue homeostasis.



**model** Fruit fly



principal investigator Christa Rhiner

**postdoctoral researchers** Catarina Dias Marta Neto

**phd students** Anabel Rodriguez Margarida Caio

**msc student** Maria Baginha

**bsc student** Salvador Ferreira

**research assistant** Carolina Alves

#### **\ rhiner lab**

We study molecular and cellular changes in injured brain tissue using a fruit fly brain lesion model, which helps us investigate factors involved in injury-induced brain plasticity. This model allows us to examine the genetic basis of important repair processes such as supportive functions of glial cells and the recruitment of guiescent neural stem cells for tissue regeneration. Studying how and when neural stem cells transit from a dormant to a proliferative state in response to tissue stress is crucial to understand tissue regeneration and cancer formation.

Using this model, we explored how injury signals are detected and linked to regenerative responses. We discovered that tight neuroglial cooperation is crucial for integrating injury cues and activating dormant neural stem cells nearby through secreted factors. We also found that glial cells in the injured mouse brain produce the same pro-regenerative factors, suggesting that the identified signalling axis could be harnessed to promote regeneration in the mammalian brain.

#### # highlights

We uncovered how dormant neural stem cells are recruited for repair after localised brain injury. Hypoxia-sensing in neuro-glial clusters triggers the production of an extracellular carrier molecule, which promotes the travel of localised growth factors in the injured brain area, leading to activation of neural stem cells (Simoes et al., Dev Cell 2022). This result establishes an inter-cellular circuitry connecting injury-sensing to regenerative outcomes.

In addition to local changes, we explored brain-systemic interactions and discovered that brain injury alters tissue dynamics in the fly intestine. In April 2022, we celebrated the graduation of our first PhD student. Mariana Santos. whose thesis illuminated injury-activated programmes in neural stem cells, sparking new lab projects. Finally, Christa Rhiner and Susana Solá, Assistant Professor at iMed.ULisboa, organised the 3rd edition of the Stem Cell Course, which took place in-person for the first time in 2022, featuring engaging lectures and workshops at CF and the Faculty of Pharmacy.



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Fruit fly brain: the glial network is highlighted in green, neuronal cells in yellow, and cell nuclei in blue. 77: CR AR 22

### Systems Oncology

Our research focuses on new mechanisms by which extracellular vesicles regulate cell signalling, tumour progression and response to therapy.



**methods** Vesicle flow cytometry,

Protein-protein interactions, *In vivo* models of tumour growth and metastasis

#### model

Mouse

principal investigator Bruno Costa-Silva

postdoctoral researchers Ana Rita Cruz Luís Ferreira Rocha Maria Carolina Strano Moraes

**phd students** Adrianna Bielowka Julia Elzanowska

**msc student** Inês Saldanha

Nuno Couto

**technician** Catarina Esteves Pereira \ costa-silva lab

Since 2016, we have concentrated on developing new technological platforms that facilitate the mechanistic study of extracellular vesicles (EVs) as disease biomarkers in the clinical setting. This includes a vesicle flow cytometry method for the expedited study of EVs in non-processed biofluids, which has already led to the identification of important EV biomarkers in breast, colorectal, and clear cell renal cell carcinomas. Besides showing how cancer EVs are key mediators in the setup of pre-metastatic niches and metastasis biomarkers, we have also demonstrated that these vesicles are instrumental to the follow-up of the therapy response of pancreatic cancer patients.

In a new research line, we have developed methods tailored to the study of EV protein interactions. As EV protein interactions may regulate the activity and the biodistribution of target proteins, we believe that this underappreciated mechanism is a promising candidate to play a pivotal role in cancer biology. In still unpublished data, we have observed that tumour EVs interact with several cytokines with relevant roles in cancer biology and tumour immunity, which include immunosurveillance

and response to emerging anti-tumour therapies such as immune checkpoint inhibitors.

#### # highlights

We identified a new biomarker to follow up on the response to therapy in metastatic pancreatic cancer patients, and also developed an improved pipeline for mutation analysis of circulating DNA packed in extracellular vesicles of cancer patients. Moreover, we contributed to the identification of new biomarkers for multiple myeloma diagnosis.

In 2022, we welcomed no less than five new lab members: Catarina Esteves Pereira, Ana Rita Cruz, Luís Ferreira Rocha, Inês Saldanha, and Adrianna Bielowka, who, together with our other members, are playing key roles in the study of cancer EVs as regulators of anti-tumour cell signalling. Ana Rita was awarded the Maria de Sousa Prize for the study of the new role of tumour EVs as regulators of response to immunotherapies, while Bruno Costa-Silva co-organised the 2022 Champalimaud Research Symposium, which focused on the tumour microenvironment.

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Confrontation between AML12 hepatocytes (green) and 4T1 breast cancer cells (yellow)



# Research Support\_

The work of CR investigators is facilitated by two structures:
the Scientific and Technological Platforms
=> which facilitate technical research aspects
and the CR Support Units
=> which provide administrative services

# Scientific & Technological 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 models, imaging tools, hardware and software, to managing resources and research infrastructures. >

#### \ advanced bioimaging & biooptics experimental (abbe)

coordinator: Davide Accardi microscopist and imaging specialists: Anna Pezzarossa, Pedro Campinho

The ABBE Platform provides equipment and expertise to support CF researchers in the acquisition of high-quality microscopy data. The platform assists users throughout the imaging pipeline, including project discussions to identify the most appropriate imaging strategy, detailed technical training and support in image processing, analysis and visualisation.

The ABBE Platform is managed by an international team with multidisciplinary backgrounds, which enables us to meet a wide range of microscopy needs, from imaging protein interactions to whole organisms. The team also represents CF on an international level at conferences and committees, and serves as a bridge between CF and microscopy companies, not only regarding technical issues, but also regarding the establishment and maintenance of long-term partnerships.

#### # highlights

The ABBE Platform was pleased to welcome a new imaging specialist and microscopist to the team. Pedro Campinho, who conducted his PhD at the Max Planck Institute of Cell Biology and Genetics in Dresden, Germany, under the supervision of Carl-Philipp Heisenberg. During his PhD, Pedro worked with the zebrafish model, becoming an accomplished biophysicist and expert in mesoscale microscopy.

Together with the COLife imaging facilities and the Faculdade de Ciências da Universidade de Lisboa, the ABBE Platform ran several courses:

# Basic FIJI Imaging Analysis Course.

- # Advanced FIJI Imaging Analysis Course.
- # EMBO Practical Course in Computational Optical Biology.
- # Digital Pathology Analysis Course (QuPath Workshop).
- # Light-Sheet Microscopy Course @iMM.
- # Advanced Microscopy Course in Optical Sectioning @i3S.
- # Bio-Imaging at CCMAR, Algarve and Beyond Workshop.

We also took part in several outreach events, from CF's ERN to teaching the duality of light to students from the Instituto Superior de Psicologia Aplicada.

AR 22

#### **\ histopathology**

#### coordinator & experimental pathologist: Tânia Carvalho histotechnologists: Joana Carvalho, Maria Inês Romano, Sérgio Casimiro

coordinator: Cátia Feliciano head: Maria José Vito technicians: Diogo Martins, Madalena Martins, Soraia Rodrigues



The Histopathology Platform provides a number of high-quality services to the CF scientific community, including: fit-forpurpose 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 more that 3,800 tissues from mouse, rat and zebrafish models, for paraffin-embedding, sectioning and staining, immunolabelling and RNAscope assays. We serviced more than 60 users from 23 different CF Groups, in addition to academic partners and industry. Well over 50% of CF's research grants involve animal studies or studies with human samples, and the Histopathology Platform has been acting as a critical resource for tissue interrogation, providing a morphological context to genetic, molecular and/or biochemical data. 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

The GWMPP provided daily services to CR's labs and platforms, as well as to three Champalimaud Clinical Centre units, namely the Nuclear Medicine, Pharmacy and Radiation Oncology Services. The team continued to meticulously follow procedures and maintain records to ensure the safe and optimal operation of its services.



#### \ model animal

#### // fish

coordinator: Ana Catarina Certal
 manager: Joana Monteiro
 research technicians: Inês Gonçalves, Inês Oliveira, Mariana Sampaio, Olivia Knight, Pedro Seco
 aquaculture technicians: Dionísio Sousa, Ricardo Pires
 animal technician: Esperança Ribeiro

The Fish Platform ensures high-quality care for our fish models and offers advanced research services, including creating transgenic and gene-edited fish. In close and constant communication with researchers, the platform adapts its services to best meet the needs of the community. Its focus on scientific and technological development has fostered collaborations and yielded peer-reviewed publications, earning the platform international recognition. The platform is also part of CONGENTO, through which it provides fish-related services and training to the global community.

#### # highlights

Platform manager Joana Monteiro coorganised the 1st Zebrafish Husbandry Association Euro Meeting in London, attracting attendees like facility managers, technicians, suppliers, and vets from across Europe. The event featured talks from regional zebrafish resource centres and covered various topics, from emergency planning to animal research guidelines.



// fly

coordinator: Isabel Campos manager: Liliana Costa technicians: Ana Reis, Carina Monteiro, Catarina Craveiro, Patrícia Valentim, Zichiena Zovo

#### // 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
assisted reproduction technicians: Ana Rita Pereira,
Catarina Craveiro
colony managers: Ana Costa, Céline Freitas, Erineo Silva,
Filipa Nascimento, Laura Carvalho, Sónia Gomes
animal technicians: Ana Cabrita, Irina Moreira,
Leonor Gomes, Wilcilaya Pontes
technicians: Alexandre Leite, João Rodrigues,
Rodrigo Santos

The Fly Platform provides state-of-the-art conditions for breeding, maintenance and manipulation of the fruit fly, available to all CR researchers. Apart from managing and maintaining all shared equipment and spaces, the platform provides technical services ranging from core activities such as medium production and stock maintenance, to more technically demanding procedures such as organ dissection, staining and embryo microinjection.

#### # highlights

Our technicians have been increasingly collaborating with high schools, providing fruit fly specimens for biology and genetics classes, with some partnerships extending to presentations and extra activities by team members Liliana Costa and Patrícia Valentim. The team also played a significant role in CF's European Researchers' Night, hosting outreach activities themed around drosophila, and were invited to conduct a practical session on Drosophila Genetics for the NOVA School of Science and Technology's Masters programme. The Rodent Platform ensures the welfare and veterinary care of all CR rodent models, abiding by European and national laws as well as welfare guidelines. The team manages shared facilities, provides daily animal care, and runs specialised services, often partnering with the Molecular and Transgenic Tools Platform.

#### # highlights

The team improved its practices to align with Good Laboratory Practice (GLP) standards, aiming to receive accreditation in 2023. As part of our close collaboration with ORBEA (Órgão Responsável pelo Bem-Estar dos Animais / Animal Welfare and Ethics Body), we also initiated efforts to apply the CF's Gender Equality Plan to our operations, by documenting, reporting and raising awareness of balanced gender representation in animal models. Furthermore, we implemented a revised programme for experimental animal project monitoring, assembling a new team for this task.

The platform's commitment to training was shown through two major Laboratory Animal Science courses held in 2022, training 40 researchers. An additional 25 researchers received upgraded animal experimentation licences following further training workshops.

#### \ molecular & transgenic tools (mttp)

coordinator: Ana Catarina Certal manager: Ana Raquel Tomás senior research technicians: Ana Cunha, Filipa Dias research technicians: André Monteiro, Mariana Velez, Renato Ferreira, Simão Margarido laboratory technicians: Alexandra Teixeira, Kateryna Kholod

The Molecular and Transgenic Tools Platform (MTTP) performs complex cloning, gene editing and viral production projects. It assists users at all project stages, including conceptual design. Our team of experts provides support in molecular biology strategies, from basic services to complex cloning of knock-out and knock-in constructs to generate new cellular, zebrafish, fly or mouse models.

The MTTP also harbours a viral-vector production service and has several collaborations for continuous development and implementation of new viral systems. The platform provides regular genotyping services for several animal models, and acts as a hub of shared resources and expertise not only for the CR, but also for the national and international research communities across academia and industry, which it services through the CONGENTO research infrastructure.

In close collaboration with the Champalimaud Clinical Centre, the MTTP continued to run the CF COVID-19 Test Lab, which provided molecular diagnosis for SARS-CoV-2 by RT-PCR and antigen tests from January through to September 2022.

#### # highlights

Since its inception in 2020, the COVID-19 Test Lab managed by the MTTP has ensured the safety of patients, clinical staff and researchers through daily testing. Following an update of the national guidelines for COVID-19 testing, the COVID-19 Test Lab closed its operations on 30th September, having performed over 3,100 diagnostic RT-PCR tests and more than 1,200 antigen tests in 2022.

The MTTP held its first edition of the "Hands-on Molecular Tools" Workshop, designed as a crash course for beginners on the basic principles of molecular biology and genetic engineering. From 1st-5th September, we hosted 14 students with different backgrounds across the biological and biomedical sciences. After more than 18 hours of lectures and laboratory work, students were able to perform and troubleshoot all the steps of a basic cloning process.

#### **\ biophotonics**

coordinator: João Lagarto phd student: Ignacio Herrando

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 commenced operations in 2022, initially concentrating on the development of a prototype system capable of differentiating between benign and malignant lesions through advanced optical techniques. This process took into consideration the medical and surgical requirements intrinsic to medical devices. Collaborative efforts were established with the Digestive, Gynecology, and Dermatology Units, and several clinical studies were initiated to evaluate the device's clinical feasibility and validate its diagnostic capabilities.



#### \ flow cytometry

coordinator: Pedro Garcia da Silva head: André Mozes flow cytometry specialist: Renato Colaço



The Flow Cytometry Platform, equipped with state-of-the-art equipment and highly specialised staff, provides support to both internal and external researchers. We offer extensive training across several domains – from theoretical flow cytometry concepts and experimental design to practical instrument operation and advanced data analysis.

#### # highlights

Our instruments clocked over 2,500 hours in flow analysis and cell sorting operations. We participated in the CYTO 2022 congress in Philadelphia, hosted several Tech's Café seminars as part of the FLxFlow network to update the CR community on new scientific products, and played a key role in establishing a future flow cytometry national network. In addition, platform head André Mozes was elected as an Emerging Leader by the International Society for Advancement of Cytometry.

#### **\ hardware & software**

coordinator: Artur Silva, Pedro Garcia da Silva hardware developers: Filipe Mendes, Paulo Carriço hardware technician: Dario Bento software developer: Luís Teixeira

The Hardware and Software Platform's mission is to support cutting-edge scientific and technological innovation at CF by providing expertise in the design and development of new technological applications across the areas of electronic, robotic, software and mechanical engineering.

The platform comprises members with diverse skill sets across hardware and software development, who work collaboratively with researchers and clinicians seeking new technological solutions and approaches to support state-of-the-art research and enhance health service delivery.

We provide services across the full pipeline for hardware and software development, including requirement specification and analysis, design, development, implementation, validation and testing. We support CF members in a number of ways, from providing 3D printing services and day-to-day support to developing custom electronic hardware and managing both the electronic and mechanical workshops. In addition, we also support the dissemination of knowledge, and over the years have actively contributed to open-source projects and sharing of new advances with the research community.

#### # highlights

Both the Hardware and Software Platforms were restructured into one Hardware and Software Platform, with a new scope, strategic mission and team make-up. This was a natural transition resulting from increased project complexity, and the resultant synergies will make it easier to meet the new challenges arising from projects that integrate hardware and software. Throughout the year, the platform continued to provide daily support to the community, while also dedicating time to new technological developments.

The platform also continued to disseminate open-source technology developed in-house, through the expansion of the tools portfolio and export of hundreds of electronic devices worldwide, further strengthening its position as a reference in neuroscience open-source hardware development.

Moreover, the platform conceived and developed a friendly winged robot, capable of human interaction through image and speech recognition, voice synthesis and movement, made possible by combining a multitude of deep-learning models. Reflecting the latest advances in Al technology, it has the potential for a wide range of applications in health and well-being.

# CR Support Units\_

The CR S	upport 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 executive assistant to cr directors: Inês Soeiro

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 returned to normalcy after the pandemic, allowing us to once again host two important on-site events: the annual retreat and the CR symposium. These gatherings reinforced and strengthened our community bonds. We also went beyond routine work to support our community, overseeing new faculty recruitments and helping to organise both the scientific evaluation panel and advisory board.

This year marked both heartfelt farewells to treasured colleagues and warm welcomes to numerous new team members in our support units. We are grateful for everyone's dedication and contributions, and look forward to the fresh insights and valuable input our new members will bring.

#### \ lab administration

**coordinator:** Raquel Gonçalves **lab administrators:** Ana Margarida Nunes, António Raposo, Cecília Simas, Mariana Sampaio, Telma Carrilho, Vesna Petojevic



The Laboratory Administration Unit provides support to the scientists working at CR, enabling them to focus on their research. This team works closely with the principal investigators and laboratory managers, assisting with the ordering process, budget management, travel arrangements, and other essential tasks. Lab Administrators frequently collaborate internally with other CR Support Units and departments, such as post-award, logistics, accounting, IT, and maintenance, as well as externally with suppliers, service providers, shipping companies, and brokers.

#### # highlights

Two team members were replaced, and we continued to adapt to meet the growing demand for various types of lab supplies and requests, while providing responsive support to CR scientists despite the challenges. Our team aims to connect society with CF's health, research, and innovation activities in an accessible way. We blend traditional and experimental approaches in communication, event planning, and outreach. Our main objectives are to:

- # Facilitate internal communication to promote CF's values and encourage collaboration.
- # Organise events for healthcare professionals and scientists.
- Raise public awareness about CF's activities and achievements.
- # Foster science and health literacy among diverse audiences through educational initiatives.

#### # highlights

We enjoyed another dynamic year. We broadened our science education initiatives like Ciência di Noz Manera for underserved students, reintroduced the Neuronautas summer academy and organised a science workshop for the national Metamorfoses contest. 95: CR AR 22

Our outreach efforts continued apace, with Brain Awareness Week school activities, the Ar Event series revival, and the creation of the RAISE consortium with NGO Native Scientists and iMM to foster science inclusivity. We also co-organised the inaugural European Researchers' Night at CF, attracting over 1,200 attendees.

Online, we launched the second instalment of "Zoom-In on Champalimaud" and three "Science Snapshots" videos on CR breakthroughs. We also devised awareness campaigns for various global observances such as World Parkinson's Day and National Scientist's Day.

#### \ communication, events & outreach (ceo)

coordinator (science communication, education & outreach): Catarina Ramos coordinator (clinical, institutional communication & events): Teresa Fernandes scientific events coordinator: António José Monteiro scientific events organiser: Ana Casaca science writer & content developer: Liad Hollender online editor: Hedi Young designers: Carla Emilie Pereira, Marta Correia multimedia producer: Alexandre Azinheira audio-visual technician: João Van Zelst communication consultant: John Lee (part-time)

#### \ graduate programme office

coordinator: Miguel Seabra officers: Ana Rita Vozone, Joana Saraiva, Maria Teresa Dias

The Graduate Studies Office operates mainly out of the Teaching Lab and Classroom, which form the hub of our PhD programme and courses. The Graduate Studies team is responsible for the administrative and logistical aspects of the International Neuroscience Doctoral Programme (INDP), CAJAL Programme and other teaching events, and provides support for courses such as the Universidade do Algarve's Fundamentals of Medicine postgraduate programme.

The team also manages the CR Library, Teaching Lab space, and Classroom bookings. Furthermore, we assist with student social events, INDP PhD student admissions, and host the annual INDP Student Advisory Board visits. Since 2020, the Graduate Programme Office has also helped students apply for fellowships funded by sponsors such as FCT, Boeringher and "Ia Caixa".

#### # highlights

QuantOCancer Research Support Staff Knowledge Exchange awarded to the Graduate Studies Office:

With support from the QuantOCancer Research Support Staff Knowledge Exchange, Maria Teresa Dias, manager of the Graduate Studies Office, participated in two events in Brussels on the 29th and 30th November: "The Future of Research Management Training in Higher Education" and "Teachers' Training and Mentors' Training". Hosted by the Agency for the Promotion of European Research, these events provided valuable insights that can be used to professionalise research management.

#### \ hr & fellows support office

coordinator: Teresa Carona assistant: Pedro Alves



The HR & Fellows Support Office serves both CF's research and clinical research staff, numbering approximately 440 people. We assist with all aspects related to human resources, from recruitment and onboarding to follow-up of former CF members. This unit works closely with HR representatives, as well as other support units and platforms throughout the CF, to ensure that all CF's commitments to its researchers are met.

We consistently review and improve HR policies, processes, and procedures, always seeking effective ways to ease and assist the lives of researchers at CCU. Our focus is on promoting the success of all researchers and coworkers at CCU, while also respecting the various social issues that affect their lives. We strive to maintain a respectful environment that inspires excellence and well-being for all CF researchers.

#### # highlights

Throughout 2022, our team continued to develop new and innovative ideas to better serve the CF community and to provide the best possible assistance to its researchers. In this effort, we processed around 110 onboarding requests, 88 offboarding requests, 10 visa and permit requests, and 50 social security requests, while also issuing over 100 statements to support our researchers.

#### **\ strategic research development**

**coordinator:** Joana Lamego **grants managers:** Ana Saraiva Ayash, Andreia Tavares, Bruno Ceña, Filipa Lourenço Cardoso

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

Since its inception in 2017, the team has worked closely with the CF community to develop a tailor-made, coordinated, monitored, and supportive framework and team culture to secure research funds. The hard work of the CF research ecosystem over the past six years has been rewarded with over  $\pounds 62$  million in sponsored research funds, with over two-thirds of the funding being awarded by international sponsors.

#### # highlights

2022 was both a challenging and rewarding year for the team. One of the most talented Research Managers in Portugal, Mariana Santa-Marta, who had been with the team since its inception, took on an exciting new challenge at Instituto Superior Técnico. This presented us with the task of identifying promising talent that shared our core principles and teamwork spirit. Following a highly competitive international recruitment process, we proudly welcomed Ana Saraiva Ayash, who had developed her education, research, and research support career in the UK for over 15 years. As a result, our team has actively contributed to the brain gain in Research Management in Portugal.

Under the scope of the EC's H2020-funded project QuantOCancer, we hosted an international online event called "Deciding How to Fund Research: Perspectives on the Partial Randomisation Process." We brought together 80 researchers, research managers, and funders from around the world to brainstorm research funding ideas.

In 2022, we disseminated 278 funding opportunities and supported the preparation and submission of 154 applications to over 34 sponsors, with 28 projects awarded funding totalling more than €9 million. In summary, we are immensely proud of the research funding achievements of the CF community in 2022, which reflect our international networking, leadership, and pioneering spirit.

# \ office for sponsored programmes (osp) - post-award

coordinator: José Mário Leite project manager: Francisco Semedo project officers: Carina Quintal, Helena Duarte, Henrique Moreira, Inês Bonifácio, Pedro Monteiro, Rizwana Mahomed, Sandra Jacinto, Sofia Venâncio, Vanda Vicente

The CF's Office for Sponsored Programmes (OSP) – Post-Award provides assistance and support related to grant reporting (financial and scientific), grant management 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

The OSP helped to manage approximately €50M distributed among 137 different projects. The OSP was responsible for submitting a total of 160 financial reports and 68 scientific reports to numerous funding agencies on behalf of the research community.



#### **\ operations**

**coordinator:** Cátia Feliciano **officer:** Vasco Correia

#### \ health & science

coordinator: Teresa Fernandes health & science writer: Ana Gerschenfeld



The Operations Unit ensures that the day-to-day activities of the CR laboratories run smoothly by providing timely and effective assistance to the community and serving as the primary point of contact for infrastructure, maintenance, equipment, and space management. The Operations Unit also works with the CR Direction team to develop and implement policies and procedures. Additionally, the Operations Unit assists principal investigators with planning and organising resources, acquiring and installing new equipment, and providing general guidance.

To improve the health and safety conditions of the labs, a Health and Safety Unit was created, as part of the Operations Unit. This unit launched the SafeLab website, which provides easy access to various resources, including a chemical safety database and a repository of all relevant safety information about available laboratory resources, general and emergency procedures, waste disposal guidelines, and health and safety information regarding the most common laboratory hazards. This documentation is now used as a complement to inductions/training.

#### # highlights

The Operations Unit welcomed a new member, Vasco Correia, who joined us as Operations Unit Officer. He has taken on various responsibilities, including assisting with emergency issues and managing equipment maintenance contracts with both in-house and external companies. As CF's clinical research activities continue to expand and diversify, the output from projects developed at the Champalimaud Clinical Centre, particularly by the Research Groups of the Clinical and Experimental

Research Programme, necessitates an increase in communication efforts. This includes producing content to bridge the gap between clinical research and the general public.

#### **\ the quantocancer project**

era chair: Adriana Sánchez-Danés project coordinator: Celso Matos project manager: Laura Ward

QuantOCancer is an EU-funded 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

OuantOCancer continued to execute a robust programme of initiatives focusing on internationalisation, gender equity and science education. In particular, we highlight the international research management workshop "Deciding how to fund research: perspectives on the partial randomisation process", held in collaboration with regional pre-award teams; the implementation of CF's Gender Equality Plan; and the successful wrapping of the pilot edition of the science education initiative Ciência di Noz Manera (Science Our Way), which brings researchers closer to underserved high school students in greater Lisbon. By the end of 2022, QuantOCancer had funded eight early-stage researcher secondments and nine staff knowledge exchanges to renowned institutions in the US and Europe.



#### [Experimental Clinical Research Groups]

Cancer Development & Innate Immune Evasion Computational Clinical Imaging Immunotherapy / ImmunoSurgery Molecular & Experimental Pathology Myeloma Lymphoma Research Neural Circuits Dysfunction Neuropsychiatry















#### [Neuroscience Groups]

Ocular Low-cost Gene Therapy Preclinical MRI Radiopharmacology

### 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]

Innate Behaviour from left to right: Computational Cognitive Decision Science Development of Neural Circuits Neural Circuits for Visuomotor Behaviour













[Adjunct & Visiting Scientists]

from left to right: Cognitive-Motor Interface Development of Neural Circuits Social Neuro Endocrinology



#### [Physiology & Cancer Groups]

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











[Scientific & Technological Platforms]

Advanced Biolmaging & Biooptics Experimental Biophotonics Fish

Flow cytometry Fly Glass Wash & Media Preparation Hardware & Software Histopathology Molecular & Transgenic Tools Rodent

Communication, Events & Outreach CR Managing Direction Graduate Programme Office





























Health & Science HR & Fellows Support Office Lab Administration Operations Post-Award Strategic Research Development

# Group photo at the annual retreat in Herdade da Granja (BoomLand), Idanha-a-Nova.

















# Publications\_

90 Research Articles

29 Reviews & Perspectives

1 Book Chapter

2 Case Reports

**6** Protocols & Guidelines

、 、

13 Editorials, Comments & Replies

14 Preprints

In 2022, 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. >

Daniel Münch et al., Nature, 2022.

#### How the brain keeps the urge to act in check

Bruno Cruz et al., Nature, 2022. Animals see the world differently depending on their hunger and reproductive state. In this project, researchers from the Behaviour and Metabolism | Ribeiro Lab explored how internal states shape behaviour. They created a functional atlas of the subesophageal zone, a relatively poorly understood region in the fruit fly brain that receives the majority of taste inputs and houses the motor neurons that control feeding.

This study from the Learning

Paton Lab revealed how the

brain stops us from jumping the

gun. The team designed a task

whether an interval separating

two tones was longer or shorter

neural activity in the mice while

they performed the task. They

identified two brain areas, one

and one for suppressing it.

responsible for promoting action

than 1.5 seconds, and tracked

where mice had to determine

Using this "appetite map" in the brain, they identified key neurons that control protein cravings under nutritional restriction and during pregnancy. They also discovered that protein-rich food has a strong effect on neural activity in protein-deprived animals. The researchers believe that their new microscopy strategy could be used to better understand the neural basis of behaviour and decision-making, both within and beyond food choice. Researchers from the Sensorimotor Integration | Chiappe Lab in Portugal discovered a bi-directional neural network connecting the legs and visual system that helps fruit flies to walk on two different timescales simultaneously. The network operates on a fast timescale to monitor and correct each step while promoting the animal's behavioural goal, and on a long timescale to help maintain the animal's behavioural goal. The study provides a fresh perspective on the neural mechanisms of movement and how signals originating from the body contribute to movement control. The researchers speculate that similar mechanisms may exist in other animals, including humans.

#### Newly discovered neural network gets visual and motor circuits in sync

Terufumi Fujiwara et al., Neuron, 2022.

The researchers found that a circuit in a brain region called the basal ganglia, known as the indirect pathway, flexibly supports the behavioural goals of the animal. They were able to trigger impulsive behaviour by manipulating neurons in this brain circuit, effectively uncovering an "impulsivity switch". Not only does this discovery have implications for Parkinson's and Huntington's Disease, it also provides a unique

opportunity to investigate

conditions of impulse control,

such as addiction and obsessivecompulsive disorder, which could lead to new treatments. Scientists from the Systems Oncology | Costa-Silva Lab discovered a new tool for improving pancreatic cancer care. Their study explored the therapeutic potential of extracellular vesicles (EVs). EVs are tiny sacs released by cells, and they showed that by monitoring EVs over time, doctors can better determine how well patients are responding to therapy. The team discovered that EVs coated with a type of protein called Immunoglobulin G increase during disease progression and decrease in response to therapy, meaning that these EVs are a new biomarker for evaluating a tumour's status, particularly for those patients that do not express the current standard biomarker. The research provides a significant step forward in the fight against pancreatic cancer, which is projected to be the second cause of cancer deaths by 2030.

#### Improving assessment of treatment response in pancreatic cancer

Nuno Couto et al., Cells, 2022.

#### How brain injury activates neural stem cells

Anabel Simões et al., Developmental Cell, 2022.

New biomarkers for multiple myeloma

Bruna Ferreira et al., Frontiers in Oncology, 2022. The Stem Cells and Regeneration | Rhiner Lab discovered a novel mechanism by which neurons and glia collaborate to promote neural regeneration. To understand how neural regeneration works, the team turned to the fly and mouse animal models, which, like humans, contain special cells in the brain called neural stem cells. These cells partially activate in response to tissue damage and can produce new neurons.

In a collaboration between the

Myeloma Lymphoma Research

João Lab and the Systems

Oncology | Costa-Silva Lab,

way to diagnose and monitor

multiple myeloma, the second

most frequent blood cancer

survival rate at five years of

around 50%. Instead of taking

a bone marrow biopsy, which is

invasive and can be unreliable,

particles in the blood called extracellular vesicles (EVs).

the researchers looked at small

in adults, with an average

this study looked at a new

They found that a transporter protein called Swim is critical for mounting a regenerative response to brain injury. Their work revealed that Swim is produced by glial cells in the injured brain area when oxygen levels drop, that it encapsulates Wg/Wnt, a known activator of neural stem cells. and that it carries it to the nearest stem cell, effectively turning it on. If a similar mechanism exists in humans, these findings may then be translated into therapies to help stimulate regeneration following severe head trauma or stroke.

They found that the protein content of these particles was related to the patient's immune function, survival, and response to treatment. The researchers identified a set of proteins that could potentially be used as new biomarkers for multiple myeloma, and suggest that EVs could be used as a minimally invasive way to monitor the disease in the future through blood samples. This project from the Neuropsychiatry Unit | Oliveira-Maia Lab found that repetitive transcranial magnetic stimulation (rTMS) can be a viable and effective treatment for depression in older adults. Previously, it was believed that rTMS was not suitable for older adults, but the study shows that older patients respond just as well to rTMS as younger patients. The effects may take longer to be felt, but the treatment is still effective. The study calls for a full review of policies and protocols around the use of rTMS to treat older patients with treatment-resistant depression, suggesting that further studies are needed to examine if the current treatment plan (typically 4-6 weeks) should be increased for the over-65s. Why brain stimulation should not be overlooked as an antidepressant treatment for older adults

Gonçalo Cotovio et al., Frontiers in Aging Neuroscience, 2022.

Together with colleagues from other research institutes, the Preclinical MRI | Shemesh Lab discovered a blood test that can detect patients with resistance to brain radiotherapy and have identified a drug that could reverse it. The study found that increased levels of the S100A9 protein are associated with limited sensitivity to radiotherapy. The researchers discovered that the S100A9 protein can be found in the blood of patients, which allows patients who are resistant to radiotherapy to be identified. The study also identified an existing drug that could be used to transform radioresistant metastases into sensitive ones. The findings could lead to a new approach to radiotherapy for cancer patients and could help identify patients who might benefit from radiotherapy.

#### Increasing the effectiveness of radiotherapy in brain metastases

Cátia Monteiro et al., Nature Medicine, 2022.



# Competitive External Funding\_

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 €50M was active at CR during 2022.
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 (FCT)

€50M Total Competitive External Funds active during 2022

#### \ a year of firsts

# // new sponsored programmes and calls pioneered by CF in 2022

- # Several consortia-based projects were secured by the CF under the Recovery and Resilience Funds Programme (PRR) for the first time, including the Centre for Responsible AI, led by Unbabel and involving CR's Joe Paton, Daniel McNamee, Zach Mainen, Memming Park and Christian Machens.
- # The first consortium-based project secured by the CF under the EC's Horizon Europe Mission Cancer Programme was GENIAL, led by the Université Libre de Bruxelles in Belgium and involving CR's Henrique Veiga-Fernandes.
- # The first consortium-based project secured by the CF in EC's Digital Programme was EUCAIM, led by the European Institute for Biomedical Imaging Research in Spain and involving CR's Nikolaos Papanikolaou.

- The first project secured by the CF under the NIH BRAIN Initiative was
   "Understanding feedforward and feedback signalling between neuronal populations", led by the Albert Einstein
   College of Medicine in the US and involving CR's Christian Machens.
- # The first project awarded to the CF by the Choroideremia Research Foundation's Throssell and Hillier Families Research Award will be led by CR's Miguel Seabra.

\ a year of continuity

// repeated wins in other
international funds

// continuous success
of CF's young researchers

- # 2022 saw CR's continued success in the "la Caixa" Foundation's Health Research programme with UPDOWNBOUND, led by CR's Leopoldo Petreanu.
- # CR's Ana Luísa Correia was also awarded an EMBO Installation Grant.

Year after year, early-stage researchers hosted by the CF secure some of the most competitive prestigious fellowships. 2022 was no exception:

- # The FCT Individual Call to Scientific Employment Stimulus was awarded to Ana Queirós (João Lab), Sílvia Henriques (Ribeiro Lab), and Rafael Henriques (Shemesh Lab).
- # The EC's Horizon Europe MSCA
   Postdoctoral Fellowship was awarded
   to Claire Rusch (Chiappe Lab) and Coralie
   Hérent (Carey Lab).
- # HFSP and EMBO Fellowships were awarded to Coralie Hérent (Carey Lab).
- # The "la Caixa" Foundation Junior Leader (Retaining) Fellowship was awarded to María Martínez-Lopez (Veiga-Fernandes Lab).
- # The Graduate Women in Science
   Fellowship was awarded to Filipa Barros
   (Alves da Silva Lab).
- # Bial's Maria de Sousa Award was awarded to Ana Rita Cruz (Costa-Silva Lab).





37 Portuguese

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, two main endeavours are the International Neuroscience & Cancer Doctoral Programme and the CAJAL Advanced Training Courses. >

\*21 nationalities amongst the student community: Austrian, Belarusian, Brazilian, British, Chilean, Dutch, Estonian, French, German, Hungarian, Indian, Italian, Korean, Polish, Portuguese, South African, Spanish, Swiss, Turkish, American, and Vietnamese

# \ the international neuroscience and cancer doctoral programme (indp)

director: Joe Paton

education committee: Ana Luísa Correia, Alfonso Renart, Bruno Costa-Silva, Susana Lima graduate studies coordinator: Miguel Seabra

**graduate studies officers:** Ana Rita Vozone, Joana Saraiva, Maria Teresa Dias **scientific advisory board:** Alessandro Treves, International School for Advanced Studies, IT; Darcy Kelley, Columbia University, US; Gilles Laurent, Max Planck Institute for Brain Research, DE; Maria Leptin, EMBO, DE Eleven students were recruited in the INDP22 call (-73% international students)

Andreia Gonçalves, PT Angelina Sanderson, GB Filip Kus, POL Francisco Azevedo, PT Hyungju Jeon, KOR Ildefonso Pica, NL Marcel Graetz, DE Marco Colnaghi, IT Maria Keridon, EE Marta Forcella, IT Raquel Sequeira, PT

#### # highlights

Hybrid Interviews & Open House: The recruitment process took place in hybrid format on 14th, 15th and 28th March. The event, organised by the Graduate Studies Office, involved 33 candidates from 16 different countries.

Orientation week for INDP students: From 12-16th September, the Student Welcome Committee, along with the Graduate Studies Office, organised the second edition of the INDP Orientation Week. Students were formally introduced to the Champalimaud Research community, its culture, mission, vision, and values. There were tours, talks, training activities, and entertainment initiatives aimed at welcoming the students into CR's vibrant community and to the city of Lisbon. The whole CR Community was actively involved in this initiative.

#### \ buddy programme

As part of the onboarding experience, the student community at CR has developed the Buddy Programme, a useful and creative tool to welcome and support newcomers, providing a fantastic opportunity for students to meet their peers, exchange ideas, tips, and advice.

The INDP 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 amongst the students, as they forge their path towards becoming innovative scientists and researchers. INDP students come from all over the world and from a range of backgrounds, including the life sciences, physics, psychology, mathematics, and computational sciences. covered basic topics in contemporary biology and neuroscience. The courses have a strong practical component, as well as a focus on quantitative skills. In the first year of their PhD, students also perform laboratory rotations, which allow them to familiarise themselves with the research done across different labs and select the lab in which they will conduct their doctoral research. Students are supported by a thesis committee that monitors their progress and provides input throughout their PhD. The INDP is an accredited programme and degrees are granted by one of our two academic partners, ITQB NOVA - Instituto de Tecnologia Química e Biológica António Xavier, Universidade Nova de Lisboa, and ISPA - Instituto Universitário de Ciências Psicológicas, Sociais e da Vida. PhD students at the Champalimaud Foundation enjoy a vibrant academic environment, with a weekly schedule of seminars featuring internal and external speakers across both basic and clinical research domains, as well as access to a wide range of meetings and workshops.

In 2022, students attended courses that

# \ cajal advanced neuroscience training programme

#### In 2022, the CAJAL Advanced Neuroscience Training Programme encompassed eight courses. Three of these were held at the Champalimaud Centre for the Unknown, while the remaining five took place at Bordeaux Neurocampus. These two institutes were chosen to pioneer recurring neuroscience training courses in Europe, emulating a successful model that has been operating in the United States for several decades.



#### # highlights

Following a two-year hiatus due to the COVID-19 pandemic, Cajal Courses were once again organised in-person at the CF. In 2022, three courses were held, involving a total of 68 faculty members, 26 teaching assistants and 62 students:

 # Cajal Quantitative Approaches to Behaviour

#### 22nd May - 11th June

directors: Gonzalo de Polavieja (CF, PT), Benjamin de Bivort (Harvard University, US), Greg Stephens (VU University Amsterdam, NL), Gordon Berman (Emory University, US), Orit Peleg (University of Colorado, US)

# Cajal Interacting with Neural Circuits
 19th June - 9th July

**directors:** Tiago Branco (Sainsbury Wellcome Centre, UK), Michael Hausser (University College London, UK), Susana Lima (CF, PT), Claire Wyart (Institut du Cerveau, FR)

# Cajal Computational Neuroscience
 17th July - 6th August

directors: Brent Doiron (University of Chicago, US), Maria Geffen (University of Pennsylvania, US), Julijana Gjorgjieva (Technical University of Munich, DE), Joe Paton (CF, PT), Caminiti\* (Bordeaux Venue Administration) Champalimaud Foundation hosted the Cajal General Assembly Annual meeting. It was the first time the annual meeting took place in Lisbon.

# 1st Cajal General Assembly Annual meeting at Champalimaud Centre for the Unknown

#### 16th-17th May

participants included: Eero Castrén (President), Tom Otis (Treasurer), Tracy Bale\* (IBRO Representative), Sarah Caddick\* (The Gatsby Charitable Foundation Representative), Jean-Antoine Girault (FENS Representative), Christophe Mulle (University of Bordeaux Representative), Christian Machens (CF Representative), Nicolas Caesar Petersen (Treasurer-Elect), Sonja Hofer\* (President-Elect), Elena Dreosti & Mathilde Maughan (Cajal Central administration), Lars Kristiansen (IBRO Office), Tasia Asakawa (FENS Office), Maria Teresa Dias (CF's Venue Administration) (Bordeaux Venue Administration)

\*online attendance



# Scientific Events\_

In 2022, following scientif	g the COVID-19 global pandemic, ic events at CCU came back in full swing.
	=> With strong support from the Communication, Events & Outreach team, over eighty scientific events were successfully delivered across a wide range of formats, from onsite to online to hybrid.
	=> By offering this flexibility, the team was able to facilitate scientific dialogue both within and beyond CF throughout the year. < In addition, the expansion of our activities to the CF Warehouse gave birth to new types of events, enabling us to diversify the events that we develop and produce, and to organise fruitful scientific discussions on trending topics such as AI, machine learning, virtual reality and digital therapeutics. >

#### \ champalimaud research symposium 2022

// tumour microenvironment:
from cancer initiation to metastasis
19th-21th october

By bringing together experts who have greatly contributed to the understanding of the tumour microenvironment, the Champalimaud Research Symposium 2022 (#CRSy22) provided its several hundred attendees with access to the most recent developments in basic and clinical research in this complex and increasingly important topic. Comprising lectures by 18 invited speakers, as well as lectures selected from abstracts, poster sessions and other social and networking activities such as "Meet the Speaker", the symposium was organised in a hybrid format, allowing for in-person and/or online participation.



## quanto cancer **C**



**invited speakers** 14 onsite, 4 remote

selected speakers 6 onsite

**posters** 49 onsite, 1 virtual

**attendance** 286 in-person, 16 online

#### countries of attendees

Austria, Belgium, Brazil, Chile, France, Germany, Israel, Italy, Japan, Jordan, Netherlands, Portugal, Spain, United Kingdom, United States of America

#### keynote speakers

Shahin Rafii, Weill Cornell Medicine, US Gerard Evan, University of Cambridge, UK Fátima Cardoso, Champalimaud Foundation, PT Joan Massagué, Memorial Sloan Kettering Cancer Centre, US

#### other invited speakers

Vera Gorbunova, University of Rochester, US Jacky Goetz, Inserm – National Institute of Health and Medical Research, FR Yasuyuki Fujita, Kyoto University, JPN Michelle Monje-Deisseroth, Stanford University & Howard Hughes Medical Institute, US Bruno Silva-Santos, IMM, PT Leila Akkari, Netherlands Cancer Institute & Oncode Institute, NL Markus Maeurer, Champalimaud Foundation, PT Jeffrey Pollard, University of Edinburgh, UK Ana Luísa Correia, Champalimaud Foundation, PT Neta Erez, Tel Aviv University, IL Héctor Peinado Selgas, Centro Nacional de Investigaciones Oncológicas, ES Salvador Aznar Benitah, IRB Barcelona – Institute for Research in Biomedicine, ES Sarah-Maria Fendt, VIB-KU Leuven Centre for Cancer Biology, BE Cédric Blanpain, Université Libre de Bruxelles, BE



#### \ the champalimaud internal seminar series

The weekly Champalimaud Internal Seminar Series (CISS) began with the establishment of CR, and is held at the CCU's Seminar Room, with the possibility of online attendance. These seminars normally feature two 25-minute presentations by CR investigators that present their work to the community and receive feedback in a quick five-minute Q&A session. The CISS helps to create a community where everyone is familiar with each other's work, and cooperation and collaboration are facilitated.

#### \ the 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). The Brain-Body Interactions Virtual Seminar Series hosted 16 events in 2022.

# Culture\_



As the CR community grows, its culture evolves with it.
=> Mainly driven by volunteers and supported by administrative staff, new initiatives emerge,
accompanying others that have been running for years.
=> Through it all, regular social gatherings promote a positive atmosphere and a sense of community.

#### // retrospect, reconnect, regrow...



The CR Retreat '22 took place at Herdade da Granja (BoomLand), Idanha-a-Nova, from 14th-17th June. This four-day event marked the first time since the COVID-19 global pandemic that the CR community was able to gather together in a special location, far from our routines and close to nature. Combining scientific events with creative, cultural and social activities, the main goal for this comeback was to rebuild the CR's social fabric by fostering a forum where researchers, staff and trainees could discuss the past (retrospect), present (reconnect) and future (regrow) of research.

cr retreat 2022 committee Ana Luísa Correia António José Monteiro Daniel McNamee Eric DeWitt Francisco Azevedo Gonçalo Guiomar Inês Laranjeira Inês Soeiro Laura Silva Tiago Quendera Zach Mainen

## \ psc mental health subcommittee

**team:** Elena Collins, Rita Cardoso-Figueiredo, Diogo Duarte, Jaime Arlandis, Tiago Quendera & Naz Belkaya

The Mental Health Subcommittee of the PhD Student Committee (PSC) actively facilitates the dissemination of mental health resources at the CCU. Our team, composed of volunteer students, is in the process of establishing a seminar series on mental health in academia to raise awareness and promote best practices for mental well-being. Besides this, we continue to advocate for and facilitate access to existing mental health services for students and the wider CCU community, ensuring robust support in addressing the mental health challenges in academic life and beyond.

#### \ sports & arts

The CR community actively partakes in diverse activities, with initiatives fostered through social interactions and community involvement. Sports are central to these interactions, including team-based activities like volleyball, basketball, and football. CR members also partake in sailing, demonstrating a love for adventure and the great outdoors, along with salsa dancing, offering a blend of rhythm and physical fitness.

In the realm of arts, the Book Club serves as a critical platform, enabling intellectual conversations and thought-provoking exchanges inspired by literature in a friendly environment. Moreover, it organises museum visits related to the books read, thus adding a tangible, cultural context to the discussions. The community also looks forward to CCU Movie Nights, organised by the Social Subcommittee Core of the PhD Students Committee, bringing everyone together to enjoy cinematic narratives while fostering deeper social bonds.

// happy hour makes
a comeback

// magusto 2022:
a tradition to keep
11th November

The Green Team @CCU is a proactive grassroots movement composed of CCU staff, focused on reducing waste, energy and water consumption to enhance environmental performance. Their mission is to pioneer the CCU's transformation into a beacon of environmental sustainability across research, medicine, and workplace practices.

#### # highlights

2022 proved to be an incredibly fruitful year for the Green Team. They successfully organised two "Clean Up & Green Up" weeks in April and November, featuring workplace cleaning and Swap Shops, resulting in almost 2,000 donations and over 1,000 collections, promoting conscious consumption. The leftover items were donated to local organisations. They also held two coastal clean-ups, collecting more than 64 kg of litter.

The "Art on the Stairwells" initiative encouraged using stairs over elevators while promoting the work of artist scientists.

The team successfully lobbied for more bicycle parking spaces and established a service station.

They also made an appearance at the European Researchers' Night, explaining the environmental impact of biomedical research, and recruited more members at the Champalimaud Research Annual Retreat.

Small but meaningful reminders were placed around the CCU to promote eco-friendly habits.

They also developed a resource database to guide CCU employees towards more sustainable daily practices. As a community, in addition to creating moments of learning and sharing knowledge, we are always exploring ways of connecting and strengthening our internal network. In what has become an essential part of CR culture, Happy Hour returned in September 2022 after a break due to COVID-19. This much missed weekly social gathering is co-organised by the Research Groups, Support Units, Platforms and CEO team. After the success of last year's Magusto, the Support Units, Platforms and PhD Students organised a traditional Magusto, a cheerful event that gathers the whole CF community to celebrate Autumn at the Amphitheater, with roasted chestnuts and traditional beverages such as Jeropiga and Vinho do Porto.





# Science Communication

Une 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 at and
outside of the Champalimaud Foundation.
CR's science communication and outreach
activities are promoted and facilitated by the
Communication, Events & Outreach Team. >
# **\ science education programmes**

# // metamorfoses

This national contest challenges high school students and teachers to build a bionic object and to create a story around it as a way of integrating disciplines that are typically taught separately: science, technology and literature. As in previous editions, a team from CF 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.

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



// ciência di noz manera

// neuronautas

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

The goal of this programme is to open students' horizons and contribute to more informed choices for their future, as well as to demystify scientists and empower the scientific community. While the programme's pilot edition worked with one school, the second edition (2022/2023) will expand to include three schools, involving scientists from both CF and Instituto de Medicina Molecular.

In 2022, CNM received a MSCA & Citizens Grant as one of the two Researchers at Schools programmes under the umbrella of the project RAISE – Researchers in Action for Inclusion in Science and Education. After a virtual edition in 2021, Neuronautas returned to CF's Teaching Lab in 2022 for its third edition, this time in a hybrid format. A summer academy for students aged 15-17 interested in starting a journey to explore the future of neuroscience, the aim of Neuronautas is to democratise science using opensource software and low-cost tools. which kids can use to do experiments in the field or at home. From 29th August -10th September, 30 students embarked on the "Long flight" option (2-week in-person version), while another 15 students took the "Short flight" option (1-week online version). With students from as far away as Porto, Spain and the Azores, this group of curious young minds came together to become new explorers of the brain.

Neuronautas received funding from the Calouste Gulbenkian Foundation in 2019 and is one of the 100 Academias Gulbenkian do Conhecimento spread across Portugal.

# // ar event - evolving emotions: getting a feel for the world

// brain awareness week

Ar Events returned to the CF Auditorium after a more than two-year hiatus (during which events happened online) due to the COVID-19 pandemic. This event was held on 21st May as part of the Emotions Brain Forum series of conferences celebrating women in science, an initiative of BrainCircle Italia, a non-profit NGO founded by journalist Viviana Kazam and the famous Italian neurobiologist and Nobel laureate Rita Levi-Montalcini (1909-2012).

To explore how emotions help individuals, from insects to humans, relate to the world, and to get a feel for their surroundings, the Ar team invited five scientists: Marta Moita from CF, Suzanne Oosterwijk from the Amsterdam Interdisciplinary Centre for Emotion, Eva Jablonka from the Cohn Institute for the History and Philosophy of Science and Ideas, Valeria Gazzola from the Netherlands Institute for Neuroscience and Elizabeth Phelps from Harvard University.

In this event, the complex spectrum of emotions was also explored from an artistic perspective, provided by dancers and choreographers Sofia Dias and Vitor Roriz, singer, composer and poet Lula Pena, and Tupac Martir and Clo Bourgard, artists in residence at CF supported by the arts and science initiative Bridges to the Unknown: Crossing Art with Science. At long last, CR researchers were finally able to celebrate Brain Awareness Week in the best way possible: doing science with kids! The activities took place over two days, one at a school in Amadora (16th March) and the other at Lisbon's Science Centre, called "Pavilhão do Conhecimento" (17th March).

At the Pedro D'Orey da Cunha school in Amadora, the event kicked off with presentations from CR members to an audience of 80 fourth graders, who then moved from one science station to another, learning about robots, recording the activity of their own muscles, and fishing for banana DNA.

At Pavilhão do Conhecimento, 50 second and fourth graders explored the realm of the senses. After finding out how an animal without ears can hear and discovering that our brain contains a sensory map, it was time for some olfactory action! What is that smell? Where does it take you? And how does the brain associate smells with places? // raise - researchers in action for inclusion in science & education & first european researchers' night at cf

RAISE – a new consortium comprising the NGO Native Scientist, Instituto de Medicina Molecular João Lobo Antunes and CF – was created with the ultimate goal of reaching members of society that continue to be left out of, or who feel detached from, science. Funded by the Marie Skłodowska-Curie Actions programme, RAISE is taking a multifaceted approach that will combine Researchers at Schools activities, such as CF's mentorship programme Ciência di Noz Manera, with European Researchers' Night (ERN) public events.

On 30th September, CF hosted its first ERN. Around 1200 people visited six different sites and, over the course of nine hours, explored a programme consisting of 60 activities: from dance to workshops, from music to hands-on science stations, from lab visits to stand-up comedy. There was even speed dating aboard a catamaran, which linked our programme to that of the Pavilhão do Conhecimento – Centro Ciência Viva. The event also involved roundtables, podcasts, football and much more.

In addition, the partners in the RAISE consortium developed activities and programmes for schools located in areas prioritised for educational support: Ciência de Noz Manera (Science Our Way), run by CF, and Cientista Regressa à Escola (Scientist Goes Back to School), coordinated by Native Scientist. These programmes involved scientists, students and teachers, and it was great to see the results of these interactions bear fruit at RAISE's ERN.



# // science snapshots videos

Science Snapshots is a series of short videos about big discoveries! This series features the most recent breakthroughs made by CR investigators as they tackle some of biology's greatest mysteries. In 2022, three Science Snapshots were produced: Circuits of Action and Suppression (Learning Lab); (Re)Generating Neurons (Stem Cells & Regeneration Lab) and How Neuro-Immune Interactions Burn Deep Fat (Immunophysiology Lab).

# science snapshots

The Champalimaud Centre for the Unknown is only as inventive, vibrant and resourceful as the people inside. In 2022, we launched the second edition of the series "Zoom-In on Champalimaud", where we explored a written format and, in each chapter, turned the spotlight on a different member of our community: John Lee (English Teacher and Content Developer), João Lourenço (Radiologist), Ana Carolina Pádua (Postdoctoral Researcher), Terufumi Fujiwara (Postdoctoral Researcher), Justyna Kociolek (Radiation Oncologist), Charlotte Rosher (PhD Student), Gonçalo Cotovio (PhD Student), Ana Saraiva Ayash (Grants Manager), Liad Hollender (Science Writer),

Ana Beatriz Machado (PhD Student), Ignacio Herrando (PhD Student) and Joana Fontes (Administrative Assistant).

# //zoom-in on champalimaud //awareness campaigns

In 2022, the Communication, Events & Outreach team worked with members of our community to create original awareness campaigns for online dissemination.

 # World Parkinson's Day – A look into lesser known symptoms and treatments
 11th April

As the world's fastest growing neurological disorder, the lifetime risk of Parkinson's disease is now 1 in 15. For World Parkinson's Day, we discussed the possible causes of the disease, less recognised symptoms and treatments, and the work being done at CF to combat it.

# National Scientist's Day – The birth of a scientist
 16th May

How are scientists made? To commemorate National Scientist's Day, we told the origin stories of three scientists at CF. From the undersea world of Jacques Cousteau documentaries to Cape Verdean cuisine, we looked at what memories and moments led them to pursue a life in science, and how the past shaped their present.

 # World Movement Disorders Day

 Not all movement disorders are equal, but early diagnosis can help fight them all

 29th November

We marked the first edition of World Movement Disorders Day. While some of these conditions, such as Parkinson's disease, are widely talked about, other conditions are not and, even if these different movement disorders have some features in common, treatments may be very different.

# \ champalimaud research

Please bring our Annual Report to a close, continuing in the style of Shakespeare.

# \ chatgpt

Of this noble compendium, the final leaf we pen, Champalimaud Research's tale, heard from glen to glen. So here's the end of another year, yet the journey's far from done, The morrow whispers with promise, a new day's race to run.

In honour of your devoted staff, who, with dedication wrought, In this annual report their wisdom, their insights dearly sought. And thus, we close this chapter, 'neath the starry vault above, United in our quest for knowledge, in our ceaseless labour of love.

# \ champalimaud research

Thank you. For a thorough look at our collective accomplishments of 2022, we'll end with an annex that we like to call "The Nitty Gritty".

# \ chatgpt

An excellent course thou hast chosen! Methinks it a wise plan, to offer the curious reader such a thorough annex, an abundant fount of thine endeavours and accomplishments. From publications to theses valiantly defended, from generous funds to the grandest of scientific and outreach events, the past year's bounty lies in wait!

The Nitty Gritty
=> For those who want to know more about what we've done.
<
Publications Annex
Theses Annex
External Funding Annex
Scientific Events Annex
Outreach Annex >

# \ publications

# // research articles

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// phd theses # JANUARY

**\ theses** 

Bruno Cruz <u>Striatal circuits supporting</u> action production and <u>suppression</u> Supervisor: Joe Paton

Maria João Susano Postoperative Delirium in the Elderly: Implications of Baseline Neurocognitive Disorder, Frailty and Cerebral Oxygenation Supervisor: Fernando Abelha (Faculdade de Medicina da Universidade do Porto)

# FEBRUARY

Ana Filipa Cardoso <u>Regulation of type 2 innate</u> <u>lymphoid cells at barrier sites</u> Supervisor: Henrique Veiga-Fernandes

Marcelo Mendonça <u>Substantia Nigra in Parkinson's</u> <u>Disease: Exploring the encoding</u> of movement kinematics by Dopaminergic Neurons Supervisor: Rui Costa

# MARCH

Jovin Jacobs Investigating the role of various cerebellar circuit elements in locomotion and its adaptation Supervisor: Megan Carey

Bruna Velosa Ferreira <u>The role of exosomes</u> <u>in Multiple Myeloma</u> Supervisor: Cristina João Co-supervisor: Bruno Costa-Silva

Mert Erginkaya <u>Movement-dependent central</u> <u>processing of visual feedback</u> for self-motion estimation in <u>Drosophia melanogaster</u> Supervisor: Eugenia Chiappe

# APRIL

Cristina Ferreira <u>Neuronal control of</u> <u>suppression, initiation and</u> <u>completion of egg deposition</u> <u>in Drosophila melanogaster</u> Supervisor: Luísa Vasconcelos

António Dias <u>Hypothalamic circuits</u> for female social behaviour: <u>investigating the role</u> <u>of PMv-DAT neurons</u> Supervisor: Susana Lima

Mariana Santos Elucidating mechanisms of damage-induced stem cell activation in the adult Drosophila brain Supervisor: Christa Rhiner Gabriela Ribeiro <u>Reward-related markers</u> <u>of excess weight and weight</u> <u>loss predictors in bariatric</u> <u>wsurgery</u> <u>Supervisors: Albino J. Oliveira-Maia,</u> <u>Durval Costa, Tiago Vaz Maia</u> (Universidade de Lisboa)

Josue Nassar Bayesian Machine Learning for Analysing and Controlling Neural Populations Supervisor: IL Memming Park, Mónica Bugallo (Stony Brook University)

lan Jordan <u>Metastable Dynamics Underlying</u> <u>Neural Computation</u> Supervisor: IL Memming Park

# MAY

Vanda Póvoa Dissecting Intra-tumour Clonal Dynamics and its Cross-talk with the Microenvironment in a Zebrafish Xenograft Model Supervisor: Rita Fior

# JUNE

Tatiana Silva Neuronal mechanisms of cerebellar associative learning: investigating acquisition and consolidation of eyeblink conditioning in mice Supervisor: Megan Carey

Tomás Cruz <u>Multimodal self-motion</u> integration for multilevel control of walking in Drosophila Supervisor: Eugenia Chiappe

# JULY

Florian Dehmelt <u>Reliable spike coding despite</u> <u>communication delays: effects</u> <u>of signal dimension, variability</u> <u>and redundance</u> Supervisor: Christian Machens

Gabriela Fioreze <u>The contribution of cortical</u> feedback projections to sensory representations in the mouse primary visual cortex Supervisor: Leopoldo Petreanu

Mayra Fernanda Martínez-López Zebrafish Avatars as a Model for Immunotherapy Response in Bladder Cancer Supervisors: Rita Fior, Jocelyne Demengeot (IGC)

# SEPTEMBER

Miguel Gaspar <u>Mate competition drives</u> <u>aggressive behaviour in</u> female Drosophila Supervisor: Luísa Vasconcelos

# NOVEMBER

Severin Berger <u>Towards a normative</u> <u>understanding</u> of higher-order brain activity Supervisor: Christian Machens

# // msc theses

# JANUARY

Maria Inês Ribeiro Glass microspheres liver radioembolization dosimetry methods: S-values and Monte Carlo - 6ATE Supervisors: Paulo Ferreira, João Cruz (Universidade NOVA de Lisboa)

Jessica Kamiki <u>Mucosal-associated invariant</u> <u>T-cells: novel players in</u> <u>pancreatic cancer</u> Supervisors: Markus Maeurer, Joana Lérias, Carolina Gorgulho

# APRIL

Mariana Silva <u>Automatic classification</u> of bone lesions on scintigraphic images using machine-learning techniques Supervisors: Durval Costa, Francisco Dilveira, Lina Vieira (Instituto Politécnico de Lisboa)

Rita Oliveira Influence of EARL1 and EARL2 specifications on quantification of PET/CT studies with gallium-68 Supervisors: Durval Costa, Francisco Oliveira, Lina Vieira (Instituto Politécnico de Lisboa)

# JULY

Guilherme Kihara Pata Influence of exposure statistics on cerebellar learning Supervisor: Megan Carev

# SEPTEMBER

Domenico Calafato Exploring Drug-Induced Innate Immune Rejection of Colorectal Cancer Xenografts in Larval Zebrafish Supervisors: Rita Fior, Ruud Brakenhoff (Amsterdam UMC)

Sofia Marques <u>The impact of education</u> in the primacy and recency <u>effects in cognitively</u> <u>healthy ageing</u> Supervisor: Raquel Lemos

Guillermo Martin (University of Tuebingen) <u>A coordinated spiking</u> network model of the hippocampus accounts for remapping and inhibitory perturbations Supervisor: Christian Machens

Pedro Dias <u>A mouse head-fixed task to</u> assess the spatial dependency of audiovisual interactions Supervisor: Leopoldo Petreanu

# # OCTOBER

Diana Lourenço Establishment of a Novel and Personalized Bone Marrow <u>3D Ex vivo Model for Multiple</u> <u>Myeloma Treatment</u> Supervisor: Cristina João, Ana Bela Sarmento Ribeiro (Faculty of Medicine of University of Coimbra)

# # NOVEMBER

Andrea Castaneda Moreno <u>Tumour organoids as a model</u> to compare paediatric and adult <u>skin cancer response to therapy</u> Supervisors: Adriana Sánchez-Danés, Cecília Rodrigues (Faculty of Pharmacy, University of Lisbon)

Ana Mara Fonseca Implementation and optimization of personalised dosimetry during targeted radionuclide therapy Supervisor: Paulo Ferreira, João Cruz (Universidade NOVA de Lisboa)

Filipa Alexandra Mesquita Amorim <u>Ovarian Cancer Zebrafish</u> <u>Avatar for Personalized Therapy</u> Supervisors: Marta Estrada, Rita Fior

# DECEMBER

Natacha Valador Evaluation of the potential of machine-learning techniques in the differential diagnosis of Parkinson's disease based on molecular imaging Supervisors: Francisco Oliveira, Paulo Ferreira, Lina Vieira (Instituto Politécnico de Lisboa)

Maria Inês Gonçalves Qualitative and quantitative evaluation of SPECT image using phantoms: study in different gamma camera models Supervisors: Rui Parafita, Lina Vieira (Instituto Politécnico de Lisboa)

Rita Margarida Branco de Almeida Exploring Immune Checkpoint Therapies in Zebrafish Xenografts Supervisors: Rita Fior, Claúdia Lobato (IST)

Patrícia António <u>The effect of Sphingosine-1-</u> <u>Phosphate in Lymphocytes of</u> patients with pancreatic cancer Supervisor: Carolina Gorgulho, Joana Lérias, Markus Maeurer, Jacinta Serpa (Nova Medical School)

Frederico Mateus <u>Driving Th1 pancreatic TIL</u> <u>polarization by inhibiting</u> <u>Th17-inducing mechanisms</u> Supervisors: Carolina Mendonça Gorgulho, Markus Maeurer, Cláudia Alexandra Martins Lobato da Silva (Instituto Superior Técnico)

Inês Gonçalves <u>Generation and characterization</u> of transgenic zebrafish lines for the study of vertebrate brain structure and function Supervisor: Ana Catarina Certal

# \ external fundina

#### The list below includes external competitive funds that were awarded during 2022, as well as external competitive funds that were awarded previously and were actively running at the CCU during 2022.

# // 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: 01/07/20-31/03/24

## 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

# Portugal 2020 (PT2020)

FCImuno – Centro de Valorização e Transferência de Tecnologia em Imunoterapia da Fundação D. Anna de Sommer Champalimaud e Dr. Carlos Montez Champalimaud Call/Programme: LISBOA-46-2018-22 Active period: 01/01/19-31/12/22

# // research projects/grants

# **Beug Foundation**

Ana Luísa Correia Harnessing neuron-NK cell interactions to prevent metastasis Call/Programme: Metastasis Prize Active period: 2021-2022

### **Bial Foundation**

Rita Fior Zebrafish avatars, towards personalized cancer treatment. a multidisciplinary venture Call/Programme: Prémio Bial de Medicina Clínica Mencão Honrosa Active period: 01/05/21-30/04/24

## Brain and Behavior **Research Foundation**

José Oliveira (Oliveira-Maia Lab) Influence of markers of immune dysfunction on orbitofrontal cortex recruitment during a decision making task in obsessive-compulsive disorder Call/Programme: NARSAD Young Investigator Active period: 15/07/19-14/07/22

#### **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: 01/08/20-01/02/23

## **Chan Zuckerberg Initiative**

Henrique Veiga-Fernandes Coordination: Harvard Medical School Unraveling neuro-immune interactions at the single cell level Call/Programme: Chan Zuckerberg Initiative DAF Active period: 01/09/20-31/08/22

#### 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: 01/06/21-31/05/22

#### **European Commission** - Horizon 2020

Gonzalo de Polavieja (Polavieja Lab) 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

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

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

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

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

Eugenia Chiappe Circuit mechanisms of self-movement estimation during walking Call/Programme: ERC-2017-STG Active period: 01/11/17-30/04/24

Bruno Costa-Silva (Coordinated by: STICHTING VUMC) European Liquid Biopsies Academy – Towards widespread clinical application of blood-based diagnostic tools Call/Programme: H2020-MSCA-ITN-2017 Active period: 01/01/18-30/09/22

Susana Lima Hypothalamic circuits for the selection of defensive and mating behaviour in females Call/Programme: ERC-2017-COG Active period: 01/03/18-28/02/23

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

Albino J. Oliveira-Maia & Nikolaos Papanikolaou (Coordinated by: HELSINGIN JA UUDENMAAN SAIRAANHOITOPIIRIN KUNTAYHTYMÄ – HUS. \*Coordinator at CCU: Fatima Cardoso) Predicting Effective Adaptation to Breast Cancer to Help Women to BOUNCE Back Call/Programme: H2020-SC1-2017-CNECT-2 Active period: 01/11/17-30/04/22

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

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 Épiniere – ICM) Zebrafish Neuroscience nterdisciplinary Training Hub (ZENITH) Call/Programme: H2020-MSCA-ITN-2018 Active period: 01/10/19-30/09/23

Joe Paton Basal ganglia circuit mechanisms underlying dynamic cognitive behavior Call/Programme: ERC-2017-COG Active period: 01/04/18-01/04/23

#### Henrique Veiga-Fernandes Understanding Gene ENvironment Interaction in ALcohol-related hepatocellular carcinoma (GENIAL) Call/Programme: HORIZON-MISS-2021-CANCER-02-03 Active period: 01/01/23-31/12/27

Nikolaos Papanikolaou **EUropean Federation for** CAncer Images (EUCAIM) Call/Programme: DIGITAL-2022-CLOUD-AI-02-CANCER-IMAGE Active period: 01/01/23-31/12/26

# IAPMEI

Joe Paton (Digital Therapeutics Programme) Center for Responsible Al Call/Programme: PRR Agendas/ Alianças mobilizadoras para a Inovação Empresarial Active period: 12/04/22-31/12/25

# 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: 15/03/22-28/02/25

# APCI

# Cristina João Study of the neuronal role on the interplay between NK cells and Multiple Myeloma (NeuriMM)

Call/Programme: Bolsas de

Investigação Mieloma Múltiplo

Active period: 01/11/22-31/10/23 CRF

# Miguel Seabra CRISPR-Based Gene Editing for Choroideremia Call/Programme: Throssell and Hillier Families Research Award Active period: 01/01/23-30/06/24

**European Commission** - Marie Skłodowska-Curie Actions

#### Susana Lima Anatomical and functional characterization of the neural circuits controlling ejaculation Call/Programme: H2020-MSCA-IF-2017-799973-<u>SEG</u> Active period: 01/06/20-31/05/22

#### European Foundation for the Study of Diabetes & Novo Nordisk

Roksana Pirzgalska (Veiga-Fernandes Lab) A neuroepithelial circuit responsible for intestinal metabolism Call/Programme: EASD Rising Star Symposium and EFSD Rising Star Fellowship Active period: 01/06/21-31/05/22

# European Molecular Biology Organization (EMBO)

Rita Fior

Carlos Ribeiro

Rita Fior

Dissect the tumor

Ovarian Cancer Avatars

for personalized therapy, a

combination of in vivo & ex-vivo

every patient (Z&CTSAvatars) Call/Programme: FCT 2021SR&TD

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

controlling exploration-exploitation

Call/Programme: FCT 2021SR&TD

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

microenvironment to battle cancer

Call/Programme: FCT 2021SR&TD

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

Comparing pediatric and adult

cancer progression and therapy

radioresistance and immune

escape (RADIORESISTANCE)

Adriana Sánchez-Danés

David Brea-López

Project Grants

(Veiga-Fernandes Lab)

RegulATIon Of iNtestinAL

Call/Programme: SR&TD

ImmuniTy by brain-derivEd Signals

Active period: 01/03/21-29/02/24

models to guarantee a test for

Characterizing neural circuits

tradeoffs in nutrient foraging

decisions (ExploreExploit)

Bruno Costa-Silva Project Title: Not applicable Call/Programme: EMBO Installation Grants Active period: 01/06/18-31/05/23

# Ana Luísa Correia

Harnessing neuron-NK cell interactions to prevent metastasis Call/Programme: EMBO Installation Grants Active period: 01/01/23-31/12/25

# Fundação para a Ciência e a Tecnologia

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

Joana Maia (Costa-Silva Lab) Unraveling the role of postsecretion protein interactions

Call/Programme: FCT 2021 PeX

response (CancerPediAdult) Call/Programme: SR&TD Project Grants Active period: 01/01/21-31/12/23 in tumor extracellular vesicles biogenesis (SecretEV)

Active period: 01/12/21-31/05/23 Alfonso Renart The neural basis of Weber's Law (WeberNeural) Call/Programme: FCT 2021 SR&TD Active period: 17/01/22-16/01/25

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

# 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

Daniela Pereira 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

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

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

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

Maria Martínez Lopez (Veiga-Fernandes Lab) Commensal microbiota regulation of neuro-immune networks

(NEUMIC) Call/Programme: SR&TD Project Grants Active period: 01/03/21-29/02/24

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

Henrique Veiga-Fernandes Deciphering pulmonary neuroimmune circuits in health and disease (NeurImm KISS) Call/Programme: SR&TD Project Grants Active period: 01/03/21-29/02/24

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

Catarina Brás (Moreno Lab) The role of healthy cells on the elimination of premalignant cells (DangerCellDeath) Call/Programme: SR&TD Project Grants Active period: 01/03/21-29/02/24

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Leopoldo Petreanu Hierarchical looped interactions in <u>cortical processing</u> (CORTICALOOP) Call/Programme: SR&TD Project Grants Active period: 29/03/21-28/03/24

Megan Carey <u>The nature of error signals</u> <u>during locomotor learning</u> Call/Programme: 02/SAICT/2017 Active period: 01/10/28-31/07/22

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

Bruno Costa-Silva Coordination: Maria Paula Macedo, Universidade Nova de Lisboa <u>Metabolic chronic diseases</u> <u>stratification: a case for gut-liver</u> <u>axis derived exosomes</u> Call/Programme: 02/SAICT/2017 Active period: 01/10/18-30/09/22

Cristina João (Co-PI: Bruno Costa-Silva) The role of metastatic microenvironment in Multiple Myeloma extramedullary disease (EMphAsIS: Extramedular MyelomA mlcroenvironment Study) Call/Programme: 02/SAICT/2017 Active period: 01/10/18-30/09/22

Rita Fior Zebrafish patient derived xenografts to predict anti-cancer drug response for personalized medicine Call/Programme: 02/SAICT/2017 Active period: 01/10/19-30/09/22 Christian Machens & Alfonso Renart

Robustness and Energy-Efficiency of Spiking Neural Networks Call/Programme: 02/SAICT/2017 Active period: 14/06/18-13/06/22

Bassam Atallah (Mainen lab) Spatial Attention: dissecting the cortical and subcortical circuitry during rapid routing of sensory information Call/Programme: 02/SAICT/2017 Active period: 01/06/18-31/05/22

Eran Lottem (Mainen Lab) <u>Serotonergic Control of</u> <u>Decision-Making and Impulsivity</u> Call/Programme: 02/SAICT/2017 Active period: 01/09/18-30/06/22

Cindy Poo (Mainen Lab) Odors and memory: neural mechanisms for encoding contextual information in olfactory cortex Call/Programme: 02/SAICT/2017 Active period: 01/10/18-30/09/22

Zachary Mainen Neural mechanism of value based decision making of staying or leaving - Deciding when to initiate locomotion to move to the next reward location Call/Programme: 02/SAICT/2017 Active period: 03/10/18-31/07/22 Albino J. Oliveira-Maia (Pl) (Co-Pl: Zachary Mainen) Cognitive flexibility. cortical excitability and antidepressive effect of psilocybin Call/Programme: 02/SAICT/2017 Active period: 03/10/18-30/09/22 Albino J. Oliveira-Maia

Coordination: University

pathways (EurDyscover)

**Howard Hughes** 

Joe Paton

Medical Institute

Hospital Wurzburg Pathophysiology of dystonia – role

of gene-environment interaction

and common pathophysiological

Call/Programme: ERA-NET call

to accelerate diagnosis and/or

mechanisms of rare diseases"

HHMI International Research

Research Scholars Program

"la Caixa" Foundation

Henrique Veiga-Fernandes Neurimm KISS – Unravelling

during infection

Research 2020 Call

Mireia Castillo-Martin

en Biociencias

Research 2017 Call

Bruno Costa-Silva

pancreatic cancer

Leopoldo Petreanu

Research 2017 Call

Leopoldo Petreanu

in health and disease

(UPDOWNBOUND)

Carlos Ribeiro

Oncológicas Carlos III

Scholars Program 2017 Call/Programme: HHMIInternational

Active period: 01/09/17-31/08/22

pulmonary neuroimmune circuits

Call/Programme: "la Caixa" Health

Active period: 31/12/20-31/12/23

Coordination: Arkaitz Carracedo.

Eradicating prostate cancer metastasis before clinical

manifestation (HiddenMETS)

Call/Programme: "la Caixa" Health

Active period: 01/09/19-31/10/22

Coordination: Maria Abad, Centro

Call/Programme: "la Caixa" Health Research 2018 Call

Active period: 15/09/19-31/01/23

circuits for sensory expectations

Call/Programme: "la Caixa" Health

Active period: 01/12/18-01/12/22

Optical dissection of cortical

Identifying and testing the

brain function and behavior Call/Programme: "la Caixa" Health Research 2017 Call

metabolites generated by two

psychoactive gut bacteria to alter

Active period: 31/12/18-31/12/22

Circuit mechanisms for associating high-order cortical activity with

expected sensory representations

Call/Programme: "la Caixa" Health

Nacional de Investigaciones

Defining the role of exosome-

secreted micropeptides in

Asociación Centro de Investigatión

explore disease progression and

Active period: 01/07/20-30/06/23

"Transnational research projects

João Corrêa (Oliveira-Maia Lab) Obsessive-compulsive disorder and reinforcement learning: exploring the role of the orbitofrontal cortex Call/Programme: 02/SAIC72017 Active period: 01/06/18-31/05/22

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

Michael Orger <u>Whole-brain mechanisms of</u> <u>operant learning in zebrafish:</u> <u>cells, circuits and behaviour</u> Call/Programme: 02/SAICT/2017 Active period: 17/07/18-16/01/22

Nikolaos Papanikolaou (Co-PI) (PI: Leonardo Vanneschi, Universidade Nova de Lisboa) Improving Bio-Inspired Deep Learning for Radiomics Call/Programme: 02/SAICT/2017 Active period: 01/10/18-30/07/22

Leopoldo Petreanu <u>Cortical circuits for sensory</u> <u>expectations</u> Call/Programme: 02/SAICT/2017 Active period: 14/06/18-13/06/22

Christa Rhiner <u>Molecular mechanisms of adult</u> <u>neural stem cell activation</u> following brain injury in Drosophila Call/Programme: 02/SAICT/2017 Active period: 01/08/18-28/02/22

Carlos Ribeiro <u>Microbiome, nutrients and the</u> <u>brain: Identifying the molecular</u> programs underlying the impact of essential amino acids and the <u>microbiome on brain function</u> Call/Programme: 02/SAICT/2017 Active period: 17/07/18-16/03/22

Zita Santos (Ribeiro Lab) Call/Programme: Norma Transitória BPD Active period: 2019-2024

Henrique Veiga-Fernandes <u>Circadian regulation of</u> <u>innate lymphoid cells</u> Call/Programme: 02/SAICT/2017 Active period: 14/06/18-13/06/22

Manuela Ferreira (Veiga-Fernandes Lab) Coordination: Instituto Nacional de Saúde Doutor Ricardo Jorge. IP (INSA, IP) <u>Early-life exposure to MYCOtoxins</u> and its impact on health Call/Programme: 02/SAICT/2017 Active period: 01/10/18-31/05/22

Research 2022 Call Active period: 31/12/22-30/12/25 Maratona da Saúde

> Adriana Sánchez-Danés Pediatric brain tumors: deciphering the mechanisms leading to therapy resistance Call/Programme: Prémios Maratona da Saúde 2019 – Investigação em Cancro Active period: 01/10/20-30/09/22

Paul G. Allen Family Foundation

Henrique Veiga-Fernandes Deciphering peripheral neuroimmune architecture by intercellular labelling Call/Programme: Allen Distinguished Investigators Program Active period: 15/12/18-30/11/22

# Portugal 2020

Durval Costa Coordination: Neadadvance LyRaCAD: Sistema CAD para análise de imagens PET/CT com FDG em linfomas – uma abordagem Radiomics Call/Programme: 31/SI/2017 Active period: 12/08/19-11/08/22

#### Santa Casa da Misericó<u>rdia de Lisboa</u>

misericoi ula 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 Coordination: University of Pittsburgh <u>Communication between neural</u> <u>populations: circuits, coding,</u> <u>and behavior</u> Call/Programme: Life Sciences - Simons Collaboration on the Global Brain Research Award Active period: 01/07/17-30/06/23

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

Megan Carey Coordination: Emory University Simons-Emory International Consortium on Motor Control Call/Programme: Chief Scientist Fund-Targeted Active period: 01/03/20-28/02/23

University College London/ Wellcome Trust

Call/Programme: Strategic Support

Zachary Mainen International Brain Laboratory

- Science application Active period: 01/04/20-31/03/25

# VolkswagenStiftung

Michael Orger <u>How spontaneous behaviour</u> <u>emerges from brain-wide neural</u> <u>network dynamics</u> Call/Programme: VWS-VolkswagenStiftung (Life) Active period: 01/01/19-31/12/23

# // individual funding & fellowships

# Boehringer Ingelheim Fonds

Catarina Costa (Moreno Lab) Novel players involved in Flowerdependent cell competition Call/Programme: PhD Fellowships Active period: 01/06/20-31/05/22

#### **Cancer Research Institute**

Roeland Wolterink (Veiga-Fernandes Lab) Deciphering the architecture and language of pulmonary neuroimmune communication Call/Programme: CRI Irvington Postdoctoral Fellowship Program Active period: 01/04/20-31/03/23

#### BIAL

Ana Rita Cruz (Costa-Silva Lab) Extracellular Vesicles binding to IFNy as regulators of IFNy signaling and antitumor immunity Call/Programme: Premio Maria de Sousa Active period: 01/02/23-31/01/25

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: 01/09/21-31/08/23

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: 01/09/21-31/08/23

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

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: 01/10/21-31/08/23

Constanze Lenschow (Lima Lab) <u>Anatomical and functional</u> <u>characterization of the neural</u> <u>circuits controlling ejaculation</u> Call/Programme: H2020-MSCA-IF-2017 Active period: 01/06/20-31/05/22 Lamiae Abdeladim (Petreanu Lab) Mesoscale holographic interrogation of visual circuits mediating predictive coding (HoloPredict) Call/Programme: H2020-MSCA-IF/ Global fellowships Active Period: 01/09/20-31/08/23

Claire Rusch (Chiappe Lab) Sensorimotor Integration, Motor Planning and Learning In FLY Call/Programme: MSCA Postdoctoral Fellowships (MSCA-PF) Active Period: 01/09/23-31/08/25

Coralie Hérent (Carey Lab) <u>Cell-specific functional</u> <u>connectivity of cerebellar outputs</u> <u>for locomotor learning</u> Call/Programme: MSCA Postdoctoral Fellowships (MSCA-PF) Active Period: 01/09/23-31/08/25

European Commission - Widening Fellowships

María Martinez López (Veiga-Fernandes Lab) Commensal microbiota regulation of neuro-immune networks Call/Programme: H2020-WF-01-2018 Active period: 01/09/20-31/10/22

European Molecular Biology Organization (EMBO)

Marko Sestan (Veiga-Fernandes Lab) <u>It takes two for tango:</u> <u>Neuroimmune regulation</u> <u>of metabolic homeostasis</u> Call/Programme: Long-Term Fellowships Active period: 01/03/20-28/02/22

Coralie Hérent (Carey Lab) <u>Cell-specific functional</u> <u>connectivity of cerebellar outputs</u> <u>for locomotor learning</u> Call/Programme: Postdoctoral Fellowships Active period: 01/03/22-28/02/24

#### Fundação para a Ciência e a Tecnologia

Filipa Barahona (João Lab) <u>COntribution of noninvasive</u> <u>biomarkers for Multiple myeloma</u> <u>Prognosis ASSessment</u> (COMPASS) Call/Programme: 2021 FCT PhD Research Fellowships Active period: 01/10/21-30/09/25

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: 01/09/21-31/08/25 161: CR AR 22

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

Ana Sofia Margues (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

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

Solène Sautory (Mainen & Petreanu Labs) Examining the serotonergic mechanisms involved in shaping predictive sensory processing Call/Programme: 2021FCT PhD Research Fellowships Active period: 01/09/21-31/08/24

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

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

Merit Kruse (Carey 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

**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

Joaquim Alves da Silva (Oliveira-Maia Lab) Disentangling cued from selfpaced actions in corticostriatal circuits Call/Programme: Individual Call to Scientific Employment Stimulus 3rd Edition - Junior Researcher Active period: 01/09/21-31/08/26

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

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

**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

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

Nuno Rito (Chiappe Lab) Neural basis of a visually guided oriented behavior in Drosophila melanogaster Call/Programme: 2017 PhD **Fellowships** Active period: 01/08/18-31/07/22

Daniela Pereira Call/Programme: Individual Call to Scientific Employment Stimulus Active period: 01/06/19-31/05/25 María Martínez-Lopez (Fior Lab) Zebrafish Avatars as a model for chemotherapy and immunotherapy response in bladder cancer Call/Programme: IGC-IBB PhD programme Active period: 01/03/18-01/03/22

Kcénia Bourgrova (Mainen Lab) The serotonergic-medial prefrontal cortex circuits underlying action decisions Call/Programme: 2019 PhD Fellowships

Active period: 01/01/20-31/12/23

Matheus Farias (Moita Lab) On the mechanisms by which descending neurons control defensive behaviors of fruit flies Call/Programme: 2017 PhD Fellowships Active period: 2018-2022

Mirjam Heinemans (Moita Lab) Social modulation of defensive behaviours in Drosophila Call/Programme: 2019 PhD Fellowships Active period: 2020-2024

Mariana Reis (Moreno Lab) Cell competition in Drosophila organs: the effects of suboptimal cells accumulation and insights into the winner-loser communication in a competition scenario Call/Programme: 2018 PhD Fellowships Active period: 01/01/19-31/12/22

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

Gonçalo Cotovio (Oliveira-Maia Lab) Antidepressant mechanisms of psilocybin: from cortical excitability to brain functional connectivity Call/Programme: 2017 PhD Fellowships Active period: 01/08/18-31/07/22

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

Lucas Martins (Orger Lab) Light-sheet imaging of functional networks underlying optic-flow processing in the zebrafish brain Call/Programme: 2017 PhD Fellowships Active period: 01/08/18-31/07/22

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

**Filipe Rodrigues** (Paton Lab) Disentangling cognitive & movement parameters in interval timing Call/Programme: 2017 PhD Fellowships Active period: 01/08/18-31/07/22

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

**Rita Figuereido** (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

Cristina Godinho Silva (Veiga-Fernandes Lab) Control of innate lymphoid cells by circadian clock signals Call/Programme: 2016 Individual Postdoctoral Fellowships Active period: 03/01/17-28/02/23

# 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

Ana Queirós (João Lab) Understanding epigenetic mechanisms in haematological disorders Call/Programme: 2022 FCT PhD Research fellowships Active period: 01/07/22-30/06/28

Silvia 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: 01/07/22-30/06/28

**Rafael Henriques** (Shemesh Lab) Correlation Tensor MRI: a paradigm shift for stroke imaging Call/Programme: 2022 FCT PhD Research fellowships Active period: 01/10/22-30/09/28

**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: 01/09/22-31/08/25

# **Fulbright Portugal**

Andreia Maia (Castillo-Martin Lab) NK Cell Gene Manipulation and Therapy Call/Programme: Fulbright fellowship with the support of FCT, Fundação Luso-Americana para o desenvolvimento (FLAD) and QuantOCancer Active Period: 2022 (Jan-Oct)

Human Frontier Science Program

Constanze Lenschow (Lima Lab) Anatomical and functional characterization of the neural circuits controlling ejaculation Call/Programme: HFSP Postdoctoral Fellowships Active period: 01/07/18-31/08/22

Camille Mazo (Petreanu Lab) Do cortical feedback connections store statistical knowledge of the environment? Call/Programme: HFSP Postdoctoral Fellowships Active period: 31/03/19-30/09/22

# "la Caixa" Foundation

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

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

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 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

Andrada lanus (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 Miguel Pinto (Moreno Lab) Mechanical cell competition in health and disease Call/Programme: Doctoral INpHINIT

Fellowships Programme Active period: 30/11/20-29/11/23 María Martínez-Lopez (Veiga-Fernandes Lab) Dendritic cells, bridging neuromodulation and immunity

Call/Programme: Junior Leader Fellowships (Retaining) Active period: 01/11/22-31/10/25

Graduate Women in Science Fellowship

Filina Barros (Alves da Silva Lab) <u>Understanding cerebellar</u> stimulation as a tool to treat dystonia: the role of the cerebellothalamo-striatal pathway in dystonic movement Call/Programme: GWIS National Fellowship Program Active period: 10/10/22-09/10/223

#### TWCF

Niccolo Bonacchi (Digital Therapeutics Programme) 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: 01/01/23-31/12/23

# **European Commission**

// educational

projects

Communication, Events and Outreach Team Researchers in Action for Inclusion in Science and Education (RAISE) Call/Programme: HORIZON-MSCA-2022-CITIZENS-01 Active period: 01/05/22-30/04/24

ART

Charlotte Rosher (Behavioural Neuroscience lab) Science on the Walls Call/Programme: ART Science Communication (SciComm) Grants Active period: 01/03/22-01/09/23

# **\ scientific** events

CISS: Champalimaud Internal Seminar Series

# # JANUARY [03] CISS

Tiago Quendera | Rita Alves Deciding in Obsessive Compulsive Disorder – An analysis of OCD behaviour in multiple cognitive tasks Resolving kurtosis sources in stroke via Correlation Tensor MRI [10] CISS

Raquel Mendes Zebrafish PDX model – towards personalised Breast Cancer therapy

[14] Careers Workshop Richard Sever (Cold Spring Harbor Laboratory) A Career Beyond the Bench

[17] CISS Tatiana Silva | Rodrigo Días Locomotor activity shifts the consolidation window for associative cerebellar learning Effects of Visual Experience on Cortico-Cortical Feedback

[24] CISS André Marques & Tomás Cruz **Optimal Multimodal Integration** Supports Steering Control in Walking Drosophila

[31] CISS Inês Franco Champalimaud Foundation Biobank (CFB) Activities

# FEBRUARY

[07] CISS Pedro Rodrigues Ana Carolina Rodrigues Explicit knowledge is a primary determinant of human model-based action Prediction of Prostate Cancer Disease Aggressiveness using biparametric MRI Radiomics

[11] Careers Workshop Rebecca Leshan (Cold Spring Harbor Laboratory) Science for Policy & Policy for Science

[14] CISS Susana Lima Nature, nurture and sex

[14] Ad-hoc Seminar Tiago Marques Building integrative systems-level models for neuroscience and artificial intelligence

[17] Ad-hoc Seminar Mariana Silva Meet COLife: Collaboration for Life Sciences in Lisbon and Oeiras

[21] CISS William Podlaski The dynamical regime of mouse visual cortex shifts from cooperation to competition with increasing visual input

# # MARCH

[07] CISS Maria Bettencourt | Cláudia Constantino Physiological relevance of Flower during aging and cancer progression Uncovering metabolic biomarkers extracted from PET images in lymphoma patients

[14] CISS Margarida Sousa & Pawel Bujalski Mariana Santos Dopamine responses reveal an efficient distributional map of the future | Signatures of early regenerative clusters in the adult fly brain

[18] Careers Workshop Elizabeth Rickenbacher (4G Clinical) Paths to Pharma, Clinical Trials

[21] CISS Carlos Bilreiro Identifying Pancreatic Intraepithelial Neoplasia with Diffusion-weighted MRI

[28] CISS Pedro Castelhanito | Tânia Carvalho How we chew gum and walk at the same time Investigative pathology: finding what gets lost in translation

## # APRIL

[04] CISS Romain Ligneul | Joana Lérias Something new under the sun: serotonergic control of exploratory behaviors Antigen-reactive tumor infiltrating lymphocytes (TILs): implications in cancer

[08] Careers Workshop Milda Maisonyte (NZYTech) Paths to BioTech in Europe

[11] CISS Jonathan Cook Hypothalamic circuits mediating sexual arousal and ejaculation

[21] Postdoc Exchange Seminar Tiago Gomes (ITQB) Integrative Structural Biology of Full-length Smad Transcription Factors – Key Drivers of TGFβ Signaling

[28] Ad-hoc Seminar Joe Howard Dendrite branching morphogenesis in Drosophila: dynamics, scaling laws, experiments and theory

# # ΜΔΥ

[02] CISS Gokul Rajan | Ruth Diez del Corral Introducing Danionella cerebrum Anatomy and Development of Diencephalic Populations Involved in Visual Processing in Zebrafish

[05] Postdoc Exchange Seminar Isaura Vanessa Antunes Martins Targeting senescent cells improves functional recovery after spinal cord injury

# JULY

[04] CISS

António Dias | Cristina Godinho Silva

Hypothalamic circuits for female

regulation of pulmonary health

[07] Postdoc Exchange Seminar

by neuroendocrine signals

Sandra Vaz (iMM)

hippocampal LTP

[29-31] Workshop

# SEPTEMBER

[19] CISS

[26] CISS

[01-05] Workshop

Hands-on Molecular Tools

Visual Experience shapes

Optimal Control of Spiking

neuro-immune circuits

CISS | Tiago Costa

Neural Networks

# OCTOBER

[03] CISS

Radhika Rajan | Masha Aliseychik

laminar-specific cortico-cortical

feedback | Tracing of pulmonary

Ibrahim Tastekin | Mafalda Oliveira

Mapping the sensorimotor

protein-specific appetites in

Drosophila melanogaster

Segmentation of lymphoma

lesions on [18F]FDG PET images

using deep learning techniques

connectome underlying

Immersion: Technical

Demonstration & Hackathon

# AUGUST

social behaviour: Investigating the

[09] CISS Clara Ferreira Behavioural and neuronal mechanisms of social cue processing in defence behaviours

[16] CISS Esha Madan | Nuno Rito & Miguel Paço Mechanism of fitness fingerprint regulation between tumour and microenvironment cells Understanding high-performance, love directed locomotion in the fly

#### [23] CISS Ana Maia | Ana Sofia Marques

Impact of childhood trauma on immune regulatory gene expression in obsessive-compulsive disorder Uncovering the similarities and differences in metastasis formation in adult and paediatric skin cancer

[30] CISS Joana Carmona | Vera Constâncio Modeling the dynamics of inter-areal communication Extracellular Vesicles in Prostate Cancer Aggressiveness

## # JUNE

[02] Postdoc Exchange Seminar Jessica Thompson (IGC) Finding Salmonella's Sweet Spot: Host Gluconeogenesis During Salmonella Infection

[06] CISS Eric DeWitt | Guilherme Pata Looking for learning in early olfactory areas | Remember to Switch: The Influence of Exposure Statistics on Locomotor Learning

[14-17] CR Retreat Herdade da Granja (aka BoomLand), Castelo Branco

[20] CISS Fanny Cazettes | Sofia Freitas Facial movements and their neural correlates reveal latent decision variables in mice Probing the mechanisms of temporal control of behaviour

#### [27] CISS Diana Lourenço | António Palma Establishment of a Personalized 3D Ex vivo Model for Multiple Myeloma | Flower alternative splicing impacts the competitive status of the microenvironment in ovarian cancer

# **# NOVEMBER**

[07] CISS Piotr Sokol | Eric de Sousa A Theory on Recurrent Networks That Don't Forget Small Nudges role of PMv-DAT neurons Circadian TCRcloud: a Screening Tool for Biologically and Clinically Relevant TCR Repertoire Landscapes

> [11] Social Magusto

Astrocyte-derived adenosine is implicated on BDNF effect upon [14] CISS Adrianna Bielowka | Guillermo Martin Tumour Extracellular Vesicles as Potential Regulators of Contact Inhibition of Locomotion

Spike Coding Networks Unify Hippocampal Remapping and Recruitment

> [21] CISS Frederico Severo | Emilie Carneiro Evidence for an Intercollicular Auditory BOLD Push/pull Mechanism Extracellular Vesicles: the Next Biomarkers for Multiple Myeloma?

[21-25] Course Stem Cell Technologies Course

[28] Champalimaud OPen Seminar (COPS) Rita Fior | Megan Carey

# DECEMBER

[05] CISS Basma Husain | Denise Camacho Swipe Left or Swipe Right? The Ventromedial Hypothalamus in Female Sexual Behaviour Identification of a Novel hFlower Partner and its Role in Cell Competition

[12] CISS Lucas Martins | Merit Kruse Multi-modal Microscopy: Fast and High Throughput In-vivo Imaging of Large Fluorescent Volumes | Mechanisms for Generalisation of Learning

[04-05] Conference Neuro, Digital & Al Innovation Summit [10] CISS Catarina Dias | Teresa Duarte Annexins in Neuronal Membrane Repair in Cultured Human Neurons

and Drosophila Differential Contributions of Basal Ganglia and Cerebellum to Discrete and **Continuous Motor Control** 

[10-12] Meeting Sussex University & Champalimaud Foundation Meeting

[19-21] Conference Champalimaud Research Symposium 2022 - Dialogues on Neural and Machine Intelligence

[24] Champalimaud OPen Seminar (COPS) Joe Paton Henrique Veiga-Fernandes

# **\ outreach**

# JANUARY

[07] Ar Magazine Article 2021 Champalimaud Research Graduates | Doutorados do Champalimaud Research 2021 (online)

[27] Zoom-In 2nd edition, Issue 1 (online)

[29] Workshop Metamorfoses (online and at Pavilhão do Conhecimento)

# FEBRUARY

[09] Ar Magazine Article Getting Excited Twice Duplamente excitado (online)

# MARCH

[02] Zoom-In 2nd edition, Issue 2 (online)

[10] Ar Magazine Article A guestion of control Uma questão de controlo (online)

[16] Brain Awareness Week Workshop Presentations, Science on the Walls, Robots, Hands-On Activities (School Pedro d'Orey da Cunha, Amadora

[17] Brain Awareness Week Article Flickering neurons, Moving robots, Shining Stencils, Inquiring Noses & much more! Neurónios a piscar, Robots a mexer, Stencils a brilhar, Narizes a indagar & muito mais! (online)

[17] Brain Awareness Week Workshop How does the brain associate smells with places? (Pavilhão do Conhecimento - Ciência Viva)

[24] New consortium funded by Marie Skłodowska-Curie Actions & Citizens Grant RAISE- Researchers in Action for Inclusion in Science and Education (online)

[27] Hackathon COLife Hackathon - The Future of Food Challenge (Pavilhão do Conhecimento - Ciência Viva)

[30] Zoom-In 2nd edition, Issue 3 (online)

# APRIL

[11] Ar Magazine Article and Awareness Campaign World Parkinson's Day Dia Mundial da Doença de Parkinson (online)

#### # ΜΔΥ

(online)

[04] Zoom-In 2nd edition, Issue 4 (online) [06] Ar Magazine Article Newly discovered neural circuits gets visual and motor circuits in sync | Descoberta rede neural que sincroniza circuitos visuais e motores

[16] Ar Magazine Article and Awareness Campaign National Scientist Day Dia Nacional do Cientista "How are scientists made?" (online)

[19] Ar Magazine Article Better keep the instructions | Melhor guardar as instruções (online)

[21] Ar Event Evolving emotions: getting a feel for the world (Champalimaud Foundation Auditorium)

[26-27] Educational Programme Ciência di Noz Manera (Escola Pedro d'Orey da Cunha)

[27] Ar Magazine Article Evolving emotions getting a feel for the world

[27-28] Exhibit Metamersion – Science, Technology & Art (Champalimaud Warehouse)

[30] Educational Programme Ciência di Noz Manera (Champalimaud Foundation)

#### # JUNE

[01] Presentations & Hands-on Activities <u>Children's Day</u> (School EB2,3 D. Fernando II, Sintra)

[04, 11, 15] Educational Programme Ciência di Noz Manera (Escola Pedro d'Orey da Cunha)

[06] Ar Magazine Article The brain uses data compression for decision-making O cérebro usa compressão de dados no processo de tomada de decisões (online)

[07] Zoom-In 2nd edition, Issue 5 (online)

[09] Ar Magazine Article Il Memming Park - deciphering neuro chatter II Memming Park - a decifrar conversas neurais (online)

[16] Public presentation of projects Metamorfoses ed. 2021/2022 (Encontro Ciência, Centro Congressos de Lisboa)

[17] Ar Magazine Article Neurons and glia collaborate to drive neural regeneration following brain injury | Cientistas descobrem como as lesões cerebrais ativam as células estaminais neurais (online)

[24] Ar Magazine Article Greater threat, greater syntony Maior a ameaça, maior a sintonia (online)

[30] Educational Programme Ciência di Noz Manera (Champalimaud Foundation)

### # JULY

[06] Ar Magazine Article Scientists discover how the brain keeps the urge to act in check Cientistas descobrem como o cérebro controla o impulso para agir (online)

[06] Article Two life scientists in Portugal elected as EMBO members Dois investigadores em Portugal nomeados membros da EMBO (online)

[06] Science Snapshot Video Circuits of Action and Suppression (online)

[06] Ar Magazine Article How pregnancy and the lack of nutrients alter brain function to shape cravings Como a gravidez e a falta de nutrientes alteram a função cerebral para moldar <u>os desejos</u> (online)

[19] Ar Magazine Article Why brain stimulation should not be overlooked as an antidepressant treatment for older adults | Porque é que a estimulação cerebral não deve ser negligenciada como um tratamento antidepressivo das pessoas mais velhas (online)

[20] Zoom-In 2nd edition, Issue 6 (online)

[28]Science Snapshot Video How Neuro-Immune Interactions Burn Deep Fat (online)

# AUGUST

[09] Zoom-In 2nd edition, Issue 7 (online)

[18] Science Snapshot Video (Re)Generating Neurons (online)

[22] Zoom-In 2nd edition, Issue 8 (online)

[24] Article How multiple myeloma cells disrupt immunity Como as células do mieloma múltiplo perturbam o sistema imunitário (online)

[29-31] Summer Academy Neuronautas: Long Flight (Teaching Lab, Champalimaud Foundation)

[01-10] Summer Academy Neuronautas: Long Flight (Teaching Lab, Champalimaud Foundation)

[05-10] Summer Academy Neuronautas: Short Flight (Champalimaud Foundation and online)

# SEPTEMBER

[09] Article New tool for improving pancreatic cancer care Nova ferramenta para melhorar cuidados no cancro pancreático . (online)

[15] Zoom-In 2nd edition, Issue 9 (online)

[20] Article Caixa Research announces funding awardees: Leopoldo Petreanu among winners | Caixa Research anuncia resultados: Leopoldo Petreanu entre os selecionados (online)

[26] Article Female flies enter the ring of sexual competition | As moscas fêmeas também entram no ringue da competição sexual (online)

[30] Outreach Event RAISE' European Researchers' Night (Champalimaud Foundation)

### # OCTOBER

[06] Article The multiple dimensions of the first European Researchers' Night at the Champalimaud Foundation As múltiplas dimensões da primeira Noite Europeia dos Investigadores na Fundação Champalimaud (online)

[26] School visits to CF Escola Secundária de Gago Coutinho (Champalimaud Foundation)

[27] Zoom-In 2nd edition, Issue 10 (online)

10+ years already?!?! 10+ anos, já?!?! (online)

(online)

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[03] Article Searching for the fine details of the complex interplay between cancer metastasis and their environment À procura das especificidades da complexa interligação entre o cancro, as metástases <u>e o meio envolvente</u> (online)

[04] Article Work from CF Researcher Acknowledged by Eppendorf & Science Prize for Neurobiology Trabalho de Investigadora CF Reconhecido pelo Prémio Eppendorf & Science -Neurobiologia (online)

[24] National Day of Scientific Culture Launching of Ciência di Noz Manera (2nd edition)

[28] School visits to CF Instituto Superior Técnico and Medical University of Lodz, Poland (Champalimaud Foundation)

[29] Article and Awareness Campaign World Movement Disorders Day Dia Mundial das Doenças do Movimento (Online)

[30] Zoom-In 2nd edition, Issue 11 (online)

# DECEMBER

## [04] Scientific-Technological Workshop Metamorfoses ed 2022/2023 (Pavilhão do Conhecimento, Lisboa)

[05] School visits to CF Lycée Français Charles Lepierre (Champalimaud Foundation)

[15] Educational Programme Ciência di Noz Manera Phase II (Escola Pedro d'Orey da Cunha)

[16] Ar Magazine Article Happy Holidays Card Playing with infinity Jogar com a infinidade (online)

[22] Ar Magazine Article

[22] Zoom-In 2nd edition, Issue 12

- > The concept and design for the 2022 CR Annual Report drew from two themes of the year: the ascendance of AI, particularly in image and text generation, and community reconnection. Like the intricate layers and parameters that define deep neural networks, Champalimaud Research is built on a multitude of interests, aspirations, and connections.
- In this Report, we fused a digital, machine-oriented aesthetic with an organic, human-centric touch, underscoring the symbiotic relationship between human and machine. The chosen fonts signify the synergy between humans and technology, while the lines and shapes encapsulate the evolution of ideas, projects, and people.
- > The AI surge has paved the way for unprecedented opportunities, even if the human ability to create unfamiliar combinations of familiar ideas may be in the process of being hacked. As we navigate this novel landscape, the role of visual and language proficiency, alongside interpersonal communication and health and scientific literacy, remains as important as ever, fueling innovation at Champalimaud Research and beyond.
- Carla Emilie Pereira, Hedi Young & Catarina Ramos

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materials and information.

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