

# Annual Report 2019



GULBENKIAN  
SCIENCE



# Annual Report 2019

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# Foreword from the Director



## A walk through 2019

The IGC was founded as a multidisciplinary research centre in 1961. Already back then, it established a vision that research is done at its best when scientists are given full intellectual freedom and support to individual initiative and creative power. Only such commitment can lead to the collective generation of knowledge in fundamental science. The result of this early commitment is that the IGC of today is a world reference for research institutions where original discovery-driven scientific questions in the life sciences are pursued in a multidisciplinary, international and collaborative environment. This in turn fosters open discoveries which is aligned with the Gulbenkian Foundation mission of benefiting humankind.

2019 was an intense year for the IGC. Several programmes were launched as defined by its 2018-2022 scientific strategic plan that is based on three complementary and synergistic pillars: i) excellence of research, ii) internationalization of people and research, and iii) impact on society. In the 2018-19 evaluation by the National Agency for Science and Technology (FCT), the IGC was ranked at the top in the country, with the maximum mark in all evaluated parameters.

## A new scientific advisory board in 2019

The strategy of IGC is set and driven by the IGC Board of Directors, with the input and approval of its International Scientific Advisory Board (IGC SAB) and of the Board of Trustees of the Calouste Gulbenkian Foundation. The SAB also oversees the recruitment and later evaluation of our group leaders. Following a long-standing tradition, we are proud to have the privilege to count on internationally recognized scientific leaders, and this was further emphasized when a new SAB was appointed in 2019. This new board of outstanding scientists includes its Chair, Herbert Jaeckle (former vice-President of the Max Planck Society (MPI), MPI for Biophysical Chemistry, EMBO member), the Vice-Chair, Anthony Hyman (Director of the MPI-CBG, EMBO member), Jo Bury (Director of the VIB, EMBO member), Leslie Vosshall (Rockefeller University, HHMI, NAS member), Luis Serrano (Director of the Centre for Genomics Regulation, EMBO member), Nancy Moran (University of Texas, NAS member), Akiko Iwasaki (Yale University, HHMI, NAS, NAMS member) and Patrick Cramer (MPI for Biophysical Chemistry, EMBO member). This new board broadly covers all areas of science at the IGC. Even more importantly, it is composed of scientists that share the IGC values: the understanding of the importance and impact of discovery and collaborative interdisciplinary research, the empowerment of young creative scientists and the centrality of promoting science and critical thinking in society. In 2019, Martin Raff (LMCB, FRS, EMBO member) visited the IGC for the last time as member of our board after more than 20 years of service! We are forever grateful to Martin for his unique balance of scientific insight and human qualities which have shaped and will certainly keep inspiring our Institute and its ethos.

## IGC's vision to understand the assembly and homeostasis of biological systems at different scales


The scientific strategic plan of the IGC has focused on organism-centered research in the past and will continue to excel on this front, strengthening its research on development, physiology and inter-organ communication. In 2019, several publications from the IGC revealed important aspects of metabolism in inter-system communication in homeostatic conditions and but importantly also in disease. Moreover,

the 2019 IGC symposium explored the “Crosstalk of Immunity and Metabolism”. This was an extremely successful meeting organised by PhD students and Postdocs.

Our 2018-2022 scientific strategic plan aims at building in addition and in parallel to those achievements an agenda that adds a critical variable: the environment in all its dimensions, biological, physical and social. Empowered by the advent of new technologies and analytical tools, this essential perspective will catalyze the necessary integrated understanding of complex systems from organismal homeostasis and disease to the establishment and sustainability of communities. In 2019, the IGC has strengthened its international standing in the host-pathogen interaction and microbiota fields with publications on the flow of information in microbial communities, and the highly successful hosting of the 3rd summer school on Host-microbe symbioses organised by Luis Teixeira and Karina Xavier.

## Strengthening an interdisciplinary and quantitative research agenda

This overarching goal of our scientific strategic plan for 2018-2022 requires the fostering of interdisciplinarity approaches that come with an increased need for quantitative biology. To implement this agenda, the IGC recruited a new Deputy Director for Science, Caren Norden coming from the MPI-CBG in 2019. Caren promotes quantitative and multi-scale approaches, in particular biophysics and modelling of organ development. Moreover, following the 2018 summer call, the IGC recruited Elias Barriga from University College London as a new junior group leader who also explores the biophysical bases of developmental processes, specifically the coordinated motion of groups of cells in development, tissue repair and disease. He is further interested how mechanical and electrical cues influence those processes. To push this agenda, of quantitative approaches even further, a new Unit for Digital and Quantitative Science was launched, led by Tiago Paixão who joined us from the IST in Austria. This Unit aims to support groups in their efforts to engage in rigorous and robust quantitative research, through strong statistical and mathematical frameworks, as well as promoting electronic lab books, proper data management and open science within IGC. Moreover, the IGC started a pioneer postdoctoral programme, “Biology by Numbers”, that brings PhD holders from the exact sciences and engineering to IGC to pursue multidisciplinary research projects on fundamental biological questions. 2019 also saw the recruitment of two



new leaders for the bioinformatics facility (JingTao Lilue) and the genomics facility (Ricardo Leite), two critical infrastructures for our new research agenda. All of this is anchored in a large investment from the Gulbenkian Foundation to expand and modernize the Institute's computational and networking infrastructure.

## IGC: where new partnerships and collaborative work starts

The promotion of interdisciplinarity mentioned above also takes form in the creation of the International Collaborative Centre. This initiative, headed by Luis Valente who was recruited from EMBO, includes the organisation of international scientific conferences and courses that will facilitate the discussion of topics across scientific fields. It will further promote the dissemination of cutting-edge technologies, the organization of collaborative scientific retreats, and the Oeiras International Sabbatical Programme. A taste of this initiative and its enrichment of the IGC international environment was already given through the hosting of 10 sabbatical visitors over the course of 2019. This initiative is sponsored by the Oeiras City Council, and aims to propel internationalization to a new and advanced level by establishing the IGC and Oeiras, but also the greater Lisbon region, as a hub of Science and Innovation of international relevance.

In line with this overall strategy, 2019 also saw the emergence of another important initiative spearheaded by the IGC, which was the creation of COLife, an alliance of six research institutes in the life sciences located in Lisbon and Oeiras: IGC, the Chronic Diseases Research Centre - NOVA Medical School (CEDOC-NMS), Champalimaud Research - Fundação Champalimaud, Instituto de Biologia Experimental e Tecnológica (iBET), Instituto de Medicina Molecular João Lobo Antunes (iMM) and Instituto de Tecnologia Química e Biológica António Xavier da Universidade NOVA de Lisboa (ITQB NOVA). This alliance aims to maximize our visibility, influence, resources and potential, in terms of research facilities, scientific services and scientific expertise. This will be achieved by sharing infrastructures and know-how in addition to fostering synergies and collaboration between the six research institutes involved and towards society. The first meeting between the different Institutes occurred at the Gulbenkian Foundation on the 24th April 2019, and the coordinator of this alliance, Mariana Silva joined from the Vienna Biocenter in the fall of 2019. The COLife website was recently launched under: <https://colife.eu>.

## Supporting researchers by giving them the best technological facilities

Our efforts to harness beneficial scaling effects by bringing together know-how and infrastructures in the Oeiras and Lisbon area occurred on top of the IGC's continued commitment to house state-of-the-art facilities. Sydney Brenner, 2002 Nobel Prize and Chair of our Scientific Advisory Board and Management Committee from 1998-2015, frequently states that "progress in science depends on new techniques, new discoveries and new ideas, probably in that order." In 2019 we organised an external review of the facilities, headed by Ivan Baines from the MPI-CBG and including the Heads of 4 technological platform from leading European institutions. This committee was highly impressed by possibilities at IGC and even more so by its people which made all of us including the Direction, extremely proud. In the words of this board: "the IGC is a truly remarkable research institute. Simply stated, IGC stands for outstanding life sciences in Portugal and has significant visibility in Europe and beyond. The panel were literally blown away by the motivation, commitment, intelligence and organization of the technicians".

Several recommendations were made to improve our facilities that are now being implemented. A focus will lay on career structure communication and improvements, infrastructure renewal and communication. In particular a commitment to improve the microscopy as well as the flow cytometry facility was given. The possibilities for microscopy were enhanced with a new confocal and a new light sheet microscope. New flow cytometers will be purchased, as well as metabolic racks that facilitate the study of organism physiology.

## Empowering the outstanding and generous IGCers

The success of the IGC is the result of its amazingly generous and incredibly talented people that make science happen every day, take science to society and make the IGC more visible, attractive and impactful at a global scale. 2019 started with the first annual retreat, organised by Vera Martins together with a committee of students, technicians, PIs and postdocs, that brought us all together. It was amazing to be in this community that included everybody from security guards to scientists, following our moto of "ScienceFromALL4ALL". We wholeheartedly thank everyone for this effort! It was a great 2-day event where people enjoyed some time together outside the everyday work context and learned first-hand what each of



these people are actually doing and committed to at the IGC. Moreover, it was also an opportunity to meet IGC alumni and ex-members (Maria Mota, IMM director, and António Jacinto, CEDOC director), illustrating how the IGC goes beyond its walls and leaves a permanent mark on shaping science in Portugal and beyond. Maria Mota and António Jacinto are two examples of the role of the IGC in the renewal of the Life Sciences in Portugal following the institute's strategy since 1998 of nurturing young leaders in full autonomy in a collaborative environment. In line with this mission, some groups left the IGC in 2019, taking the "IGC spirit" to other institutions, including Miguel Godinho who went to IRCAN in France, Diogo Castro who left for I3S in Porto, and Claudine Chaouiya who went to the Mathematics Institute of Marseille. We wish them all the best and success and hope that we continue to work together towards promoting the same values in science and society. We also assume that we see each other as often as possible, as we are all part of the same "IGC family".

The creation of a new Human Resource Unit at the IGC coordinated by Teresa Carmona as well as the reinforced training Unit headed by Ana Aranda da Silva, reaffirm the institutional continued commitment to maximize the professional potential and wellbeing of everyone working at the IGC. In that respect and together with the implementation of the seal of excellence of the EU HR4 Research, we are consolidating the institutional structure necessary to ensure the harmonious integration and close mentoring of all IGC personnel.

## Closer to society, democratising science

Finally, in partnership with the City Council and local science institutions we extended our science in society programme, always in close partnership with our Institutional Communication headed by Ana Morais. We created a local joint knowledge and technology transfer office (TTO), headed by Marta Ribeiro, who came from University College London, to promote the application of original findings and to foster links with industry. Moreover, we have implemented an extensive program to foster citizen science and inclusiveness, taking science to hospitals, schools, the parliament and media where we advocate fundamental research and our values. Dialogue between scientists and society as a whole is crucial, both to engage all groups in the social implications of research and for a greater understanding of the scientific process underlying research and discovery. Art and exhibits are another form to engage with the general public. In 2019, IGC group lead-

er Rui Oliveira organised a wonderful exhibit focused on the Brain at the Gulbenkian Foundation Museum, while IGC's artist in residence ALAgrApHY worked on an artistic visualization of data generated by scientists, using artificial intelligence. Moreover, we started a wonderful collaboration with Gulbenkian Music, whereby our scientists talk about their science in the beginning of concerts, being exposed to more than a 1000 people. Finally, as part of IGC's commitment to support science in developing countries, together with governmental, non-governmental, and private partners, we have coordinated a series of initiatives aimed at high-level training, improving research capacity in the Portuguese-speaking African countries (PALOP). Here, we are using science and technology as effective tools for development in low-income countries. This program is now locally coordinated by Leonor Ruivo. I further want to highlight the creation of the "António Coutinho Prize" in honour of Professor António Coutinho, former director of the IGC and unquestionable central figure of the paradigm change operated in the Life Sciences in Portugal over the last three decades. This prize results from a partnership with the Merck Family Foundation and Câmara Municipal de Oeiras (CMO), and awards three fellowships to PALOP citizens for developing original projects and boost scientific research in their home countries.

As I write these words in May 2020, we go through one of the greatest challenges to our mode of life as individuals and scientists, as communities and societies, in our homes, workplaces and as a dominant species on planet Earth. The nature and complexity of this global challenge fits well with our scientific strategy, in studying the organism within its environment. However, and more importantly, in these difficult times, the IGC spirit of collaboration, mutual respect, rationality and wholehearted engagement with science and society has proven to be more than words, a genuine, concrete and truly uplifting way of life I have the honour to share with you all. More importantly than ever it is time to thank you for making the IGC the special place to be!

*Monica Bettencourt Dias*

**Monica Bettencourt Dias**  
IGC Director

# Organisation



## Gulbenkian Science

Founded in 1961, the Instituto Gulbenkian de Ciência (IGC) is part of the Calouste Gulbenkian Foundation (FCG), a private charitable foundation promoting innovation in charity, arts, education and science. Our Mission, Vision and Values are fully aligned with Calouste Gulbenkian Foundation principles. The direct governance of the Institute goes through the Director, a managing Director, and two Deputy Directors for Science. The Director is responsible to responde to the FCG Board of Trustees. An eminent external Scientific Advisory Board oversees the scientific activities of the IGC, whereas the Ethics Committee ensures the ethical conduct of the scientific activities related to vertebrate animals or humans. The Scientific Advisory Board and the Ethics Committee are appointed by FCG Board of Trustees.

## BOARD OF TRUSTEES

**Isabel Mota**  
President

**Teresa Gouveia\***

**Martin Essayan**

**José Neves Adelino**

**Guilherme d'Oliveira Martins**

**Carlos Moedas\*\***

**Emílio Rui Vilar**  
(Non-executive)

**Graça Andresen Guimarães**  
(Non-executive)

**António Feijó**  
(Non-executive)

**Pedro Norton**  
(Non-executive)

\* Term ended on September 30, 2019

\*\* Term started on January 7, 2020

## BOARD OF DIRECTORS GULBENKIAN SCIENCE

**Mónica Bettencourt-Dias**  
Scientific Director

**Manuel Schmidt**  
Managing Director

**Élio Sucena**  
Deputy Director for Science

**Caren Norden**  
Deputy Director for Science

### Scientific Advisory Board

The Scientific Advisory Board oversees the scientific progress, graduate programmes, recruitment and overall performance of staff and research groups, advising the Board of the Gulbenkian Foundation on all matters related to the mission of the Institute.

**Herbert Jaekle**  
President  
(Max Planck Institute, Göttingen, Germany)

**Anthony Hyman**  
Vice-President  
(Max Planck Institute, Dresden, Germany)

**Joe Bury**  
(VIB, Flandres, Belgium)

**Leslie Vosshall**  
(Rockefeller University, New York, USA)

**Luis Serrano**  
(Centre for Genomic Regulation, Barcelona, Spain)

**Nancy Moran**  
(University of Texas, Austin, USA)

**Martin Raff**  
(University College London, UK)

**Akiko Iwasaki**  
(Yale University, New Haven, USA)

### Ethics Committee

The Ethics Committee reviews all research projects involving humans and animals to ensure that full consideration has been given to animal welfare and the ethical implications of the research. The Ethics Committee is an interdisciplinary body composed by 4 IGC members and 6 external members, 2 being laypersons.

**Tânia Carvalho**  
PhD, DVM, President

**Carlos Penha-Gonçalves**  
PhD, DVM – Instituto Gulbenkian de Ciência

**Manuel Rebelo**  
PhD – Instituto Gulbenkian de Ciência

**Vera Martins**  
PhD – Instituto Gulbenkian de Ciência

**Ana Cristina Borges**  
PhD – Instituto Gulbenkian de Ciência

**Leonor Saúde**  
PhD, iMM, External Member

**Ana Pina**  
MD, External Member

**Cláudia Faria**  
MD, External Member

**Maria de Athayde Tavares**  
Lawyer, External Member

**Vasco Trigo**  
Jornalista – External Member



# ORGANIGRAM

## CALOUST GULBENKIAN FOUNDATION

### BOARD OF DIRECTORS

### SCIENTIFIC ADVISORY BOARD

**Herbert Jaeckle**  
(Chairperson)

### ETHICS COMMITTEE

**Tânia Carvalho**  
(Chairperson)

### OMBUDSOFFICE

### DIRECTION

**Mónica Bettencourt-Dias**  
Director

**Manuel Schmidt**  
Managing Director

**Caren Norden**  
Deputy Director (from Oct/19)

**Élio Sucena**  
Deputy Director

**33 RESEARCH GROUPS**

**10 CORE FACILITIES**

**13 SERVICES**



# About the IGC



## About the IGC

As part of Calouste Gulbenkian Foundation, Instituto Gulbenkian Ciência (IGC) is an institute dedicated to biological and biomedical research and innovative post-graduate training, placing science into the heart of society.

The IGC is a world leading research institute that fosters open science and discovery towards the benefit of humankind, aligned with the vision of the Gulbenkian Foundation of knowledge-based progress towards a sustainable planet. An institution where individuals are empowered to pursue original discovery-driven scientific questions in life sciences, propelled by cutting-edge technology, in a cross-disciplinary, inclusive and collaborative environment.

Structured into research groups, core facilities and support services, the IGC strives to instil into society the values of intellectual independence, integrity, excellence, plurality, cooperation, generosity and responsibility.

Set up as an extra-university research center in 1961, in 1985, the IGC became an institute exclusively dedicated to postgraduate research and training in the biological sciences. Since its foundation IGC has played a crucial role in research in Portugal and abroad.

Ten doctoral programs were designed in-house, from biology, medicine, neuroscience, to computational biology, which produced more than 600 doctorates, 70% to work in research or higher education, 13% in industry and 9% in science support areas. The success of these Programmes has been replicated in several countries and research centers.

Integrated into national and international research structures and networks, the IGC is part of the Oeiras Campus, home to several other basic and applied research centres in biology, biotechnology, chemistry and benefiting from the ecosystem developed by the Oeiras City Council.

# IGC in Numbers



**390**  
PEOPLE

WOMEN 230 × MEN 160



**284**  
RESEARCHERS

WOMEN 164 × MEN 120



**44**  
NATIONALITIES

15  
VISITORS

87  
PhD

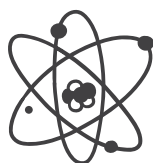
77  
POSTDOC

17  
MSc

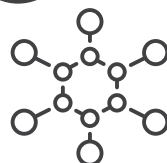


**33**  
GROUP LEADERS

WOMEN 15 × MEN 18



**10**  
CORE  
FACILITIES



**13**  
SERVICES

**120**

COLLABORATIONS  
WITH OTHER  
INSTITUTIONS

94 National 26 Internal

**104**

PUBLICATIONS

In the last 6 years

855 Peer-reviewed publications  
from IGC Research Groups

107 Peer-reviewed publications from  
Associated Groups & PhD programmes

**23**

THESES

02 BSc

07 MSc

14 PhD

**19** PRIZES &  
HONOURS  
IN 2019

SEMINARS  
AND MEETING  
PARTICIPATION

75 National | 121 International

ORGANIZING

32 Meetings  
Conferences  
Workshops

210 IGC  
Seminars



BUDGET

122  
Projects

28  
New  
projects

261  
Grants in the  
last 5 years

► TOTAL BUDGET

**17.4M€**

48% CORE FUNDING  
52% EXTERNAL FUNDING



**122**

PROJECTS  
BY FUNDING

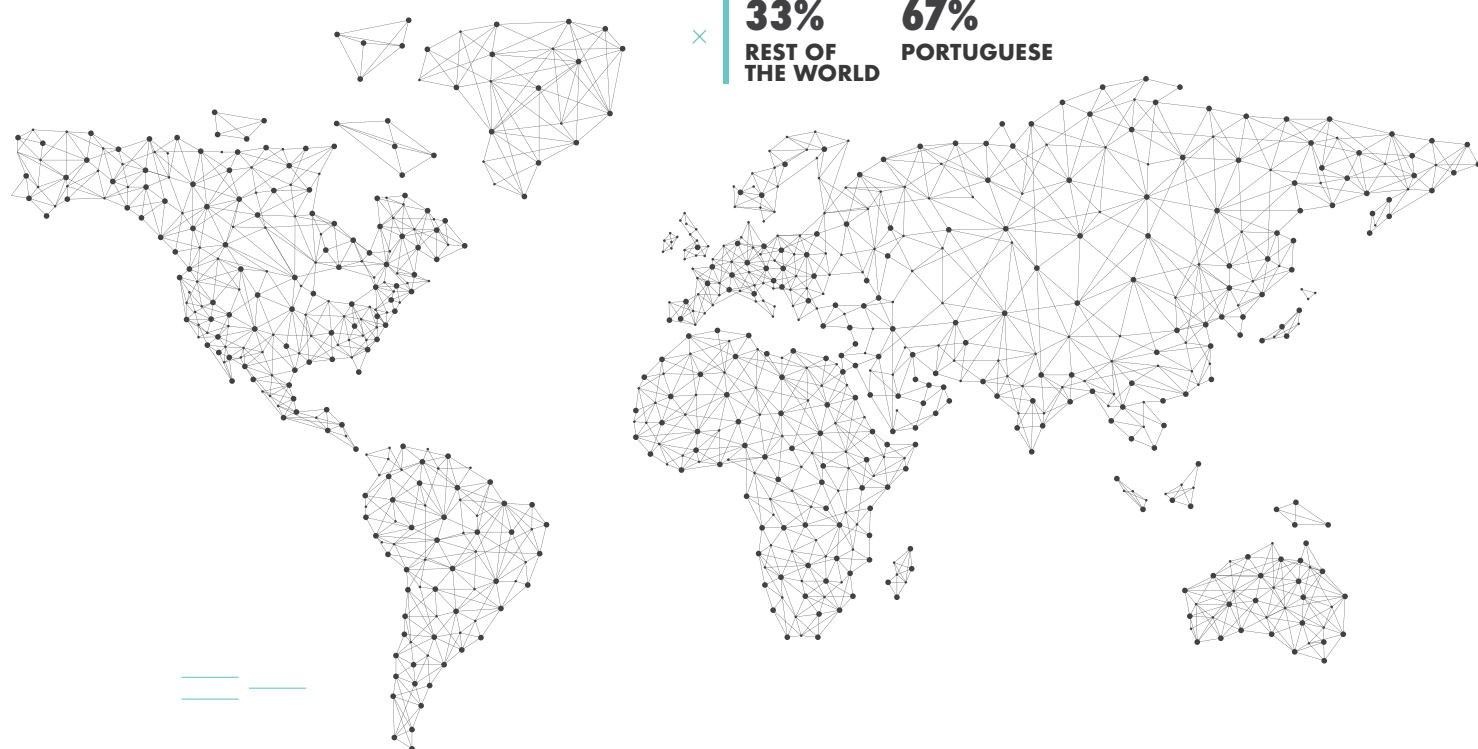
► 13% EU  
► 57% FCT  
► 17% INTERNATIONAL  
► 13% OTHER NATIONAL

**390**  
PEOPLE

**44**  
NATIONALITIES

**33%**  
REST OF  
THE WORLD

**67%**  
PORTUGUESE







**SCIENTIFIC FINDINGS**  
**VERA MARTINS**

Study shows that leukemia can emerge as a consequence of prolonging the presence of precursor cells in the thymus. Published in The Journal of Immunology.



**"BRAIN: WIDER THAN THE SKY"**

Curated by Rui Oliveira, this science exhibition for the general public received 85.000 visitors at the Gulbenkian Foundation.

**MERCK FAMILY FOUNDATION DONATION**

The largest donation ever to the IGC for Science Education in Africa.

18  
**January**

**February**

**March**



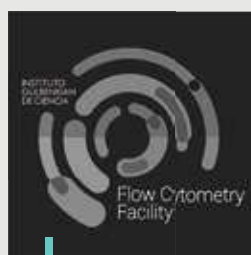
**FIRST IGC RETREAT**  
**In Vimeiro, Hoje Golf Mar, Vimeiro**

An opportunity to gather all the IGC staff to debate science and to develop team work activities.



**SCIENTIFIC FINDINGS**  
**MIGUEL GODINHO**

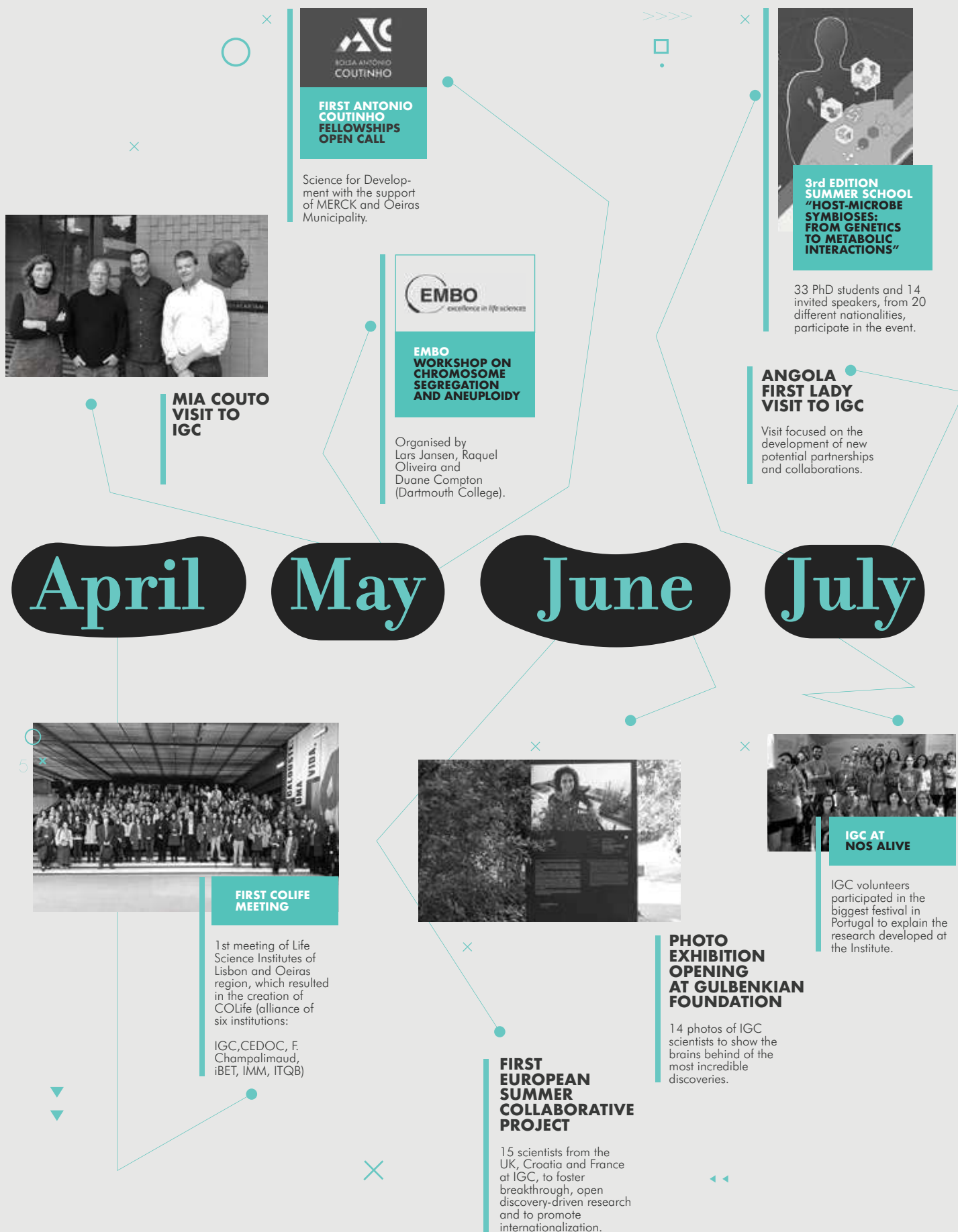
In a study published in EMBO Journal, teams led by Jose Escandell and Miguel Godinho discovered a key aspect of the regulation of telomeres.

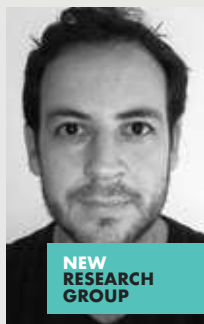


**CYTOMETRY DATA ANALYSIS IN FLOWJO V10, FEBRUARY 8TH, AT IGC**

Step-by-step workshop of basic and advanced use of FlowJo software for flow cytometry analysis.







**NEW  
RESEARCH  
GROUP**

Mechanisms of Morphogenesis team lead by Elias Barriga starts at IGC.

**OEIRAS CITY  
COUNCIL  
STRATEGY FOR  
SCIENCE &  
TECHNOLOGY  
2020-2025**

Oeiras City Council launches the Strategy to produce a lasting and sustained impact on the territory and to support IGC on several activities.

**INNOVATION  
OFFICE**

Launch of Innovation Office with the support of Oeiras Municipality and in partnership with ITQB Nova.

**INTERNATIONAL  
COLLABORATIVE  
CENTRE**

The new strategy to attract leading global research groups and companies to IGC with the support of the Oeiras Municipality.

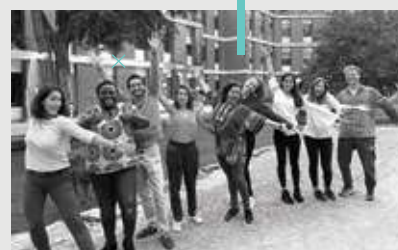


**IGC NEW  
DEPUTY  
DIRECTOR  
OF SCIENCE**

Caren Norden has the mission, together with Monica Bettencourt Dias, to make the institute one of the leading places for life science in Europe and beyond.

**PhD PROGRAMME  
IN INTEGRATIVE  
BIOLOGY AND  
BIOMEDICINE**

New group of PhD students started.



20

**August**

**September**

**October**



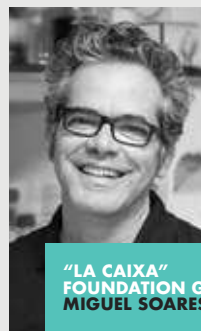
**SCIENTIFIC  
FINDINGS  
ISABEL GORDO**

Pioneer study published in Proceedings of the National Academy of Science – USA, discovered a pivotal role for bacterial sex in the evolution of the mammalian microbiome.



**YOUNG SCIENTISTS  
RETREAT**

Joint initiative from Instituto Gulbenkian de Ciência and Institut Curie.



**"LA CAIXA"  
FOUNDATION GRANT  
MIGUEL SOARES**

"Can we cure sepsis by regulating metabolism?" is the main research question of the project lead by Miguel Soares funded with 500.000 €.

**3rd IGC SYMPOSIUM:  
CROSSTALKS OF  
IMMUNITY AND  
METABOLISM**

Aimed at bringing together experts in Immunity and Metabolism to discuss new advances in whole-organism physiology.



#### SCIENCE MEETS MUSIC AT GULBENKIAN

1st edition of a cycle of concerts with the participation of IGC scientists. Mónica Bettencourt-Dias explained how scientists film what happens inside the cells.



#### NEW EU LIFE CO-CHAIR

Mónica Bettencourt-Dias was appointed co-chair of EU-LIFE as of 1 January 2020 for a two-year mandate

## November



#### GILEAD GENESE PROGRAM AWARD

Carlos Penha Gonçalves awarded by Gilead Sciences, project on endothelial cells in liver damage.



#### EMBO WORKSHOP PROTEOSTASIS: FROM ORGANELLES TO ORGANISM AT ERICEIRA

Integrate all approaches for the understanding of proteostasis, from the molecular to organismal level (33 Speakers, organized by Colin Adrain(IGC), Pedro Domingos(ITQB) and Sivan Henis-Korenbli (Bar Ilan University). 15-19 November

## December



#### CHRISTMAS PARTY IGC

Event targeted at all IGC staff and families under the theme of cultural diversity.

# News from 2019

22

## NEW RESEARCH GROUPS

### Cell Biology of Tissue Morphogenesis Research Group

CAREN NORDEN

Caren Norden is a cell and developmental biologist who is the head of the Cell Biology of Tissue Morphogenesis new Research Group at IGC. The Research Group lead by Caren aims to understand 'how cells form tissues' using the vertebrate retina as a model system and investigating phenomena across scales and using cross-disciplinary approaches.

Caren's work has previously been recognized by an HFSP Career Development Award and the José A. Campos-Ortega Young Scientist Award of the German Society for Developmental Biology. In addition, she became a member of the EMBO Young Investigator Network in 2015. Caren Norden is also the deputy director of science of the Instituto Gulbenkian de Ciência since October 2019.

RUNNING GRANTS

European Research Council

### Mechanisms of Morphogenesis Research Group

ELIAS BARRIGA

The long-term goal of the multidisciplinary group lead by Elias Barriga is to understand how cells attain synchronised collective migratory behaviour. To do so, they study the mechanisms that trigger and direct collective cell motion. The main goals of the new IGC research group are to understand the molecular basis by which migratory cellular clusters integrate and respond to diverse mechanical inputs at the onset of collective cell motion *in vivo*, explore whether and how endogenous electric fields trigger and guide collective cell migration during embryogenesis and study how cells attain directionality in complex multi-cue migratory environments *in vivo*.



## NEW CORE FACILITIES & SERVICES

### Bioinformatics & Computational Biology

#### JINGTAO LILUE

After a re-structuring in August 2019, the Bioinformatics Facility has a new system to interact actively with internal and external laboratories, ranging from experimental design and data processing to statistics and data visualization. The facility provides a broad range of support in data analysis and computational biology for all research groups in IGC.

### Quantitative & Digital Science

#### TIAGO PAIXÃO

The new unit aims to assist researchers in the field of experimental design, analysis and data presentation, including statistical analysis and mathematical modelling. The unit will develop customized data analysis solutions, including solutions based on machine learning techniques. It will also rely on data management methodologies and processes in order to improve the scientific workflow and data storage.

### Human Resources Unit

#### TERESA CARMONA

The Human Resources team supports all people in the IGC by maintaining and expanding training and personal development opportunities, by providing payment support, and by developing a wide range of wellbeing initiatives and benefits for all staff.

### Innovation Unit

#### MARTA RIBEIRO

The Innovation Unit is dedicated to supporting scientists from the point of view of innovation and translational research. It aims at the identification, protection and adequate exploitation of ideas with added value, that will boost relations with the industry and business. This structure is based on two ideas: the creation of an Innovation Unit for the Life Sciences - in a first instance shared between the Gulbenkian Institute of Science and ITQB NOVA, and the creation of a proof of concept financing program. The unit will increase the impact of science for society, as well as its visibility and international reputation.

## Institutional Communication

### ANA MORAIS

The Institutional Communication Unit was created in May 2019 to define and implement the communication and marketing strategy of the Institute communication, in close articulation with the Board of Directors and the Calouste Gulbenkian Foundation teams. With special focus on the digital channels, media relations and internal communication, the team enrolls in activities to promote IGC brand awareness.

## International Collaborative Centre

### LUIS VALENTE

The International Collaborative Centre aims to combine collaborative initiatives to explore highly innovative projects, which occupy a wide space in research and innovation, from fundamental research to proof of concept works. The Centre will also be a dynamic venue for sabbatical activities, courses, workshops, summer schools and other postgraduate training activities. It aims to attract leading global research groups and companies by promoting interaction among themselves and with local and national groups in a “pre-competitive” space and, also, bringing researchers, entrepreneurs, and doctors to the environment.

## Public Engagement

### ANA MENA

The Public Engagement unit was created in May 2019 to imagine new ways that empower a more critical society through science. The outreach programs that were conducted within the former Science Communication and Outreach unit are being reshaped into a cohesive program of science education, public events and citizen science that aims at addressing a big theme every two-years. The 2019-2021 topic is “searching the truth, engaging the society”.

## Science for Development Programme

### LEONOR RUIVO

Using science, technology and education as its tools, the Programme contributes towards promoting diversity in the scientific community, research capacity building and science education in Portuguese-speaking African Countries (PALOP). Four different projects span all levels of education and scientific training – the Lab in a Box, aimed at middle- and high-school students and teachers, contributes towards hands-on science education; the António Coutinho Fellowships programme, dedicated to bachelor and masters students, professors and researchers from the PALOP who want to develop research projects in the fields of Life, Health and Exact sciences; Science for Development PhD programme contributes to the training and excellence of researchers and professors from the PALOP; and the Lab in a Suitcase, designed to provide young researchers with portable, custom-made, serviceable labs to support the start-up of their own labs.

# Science Stories 2019

26



Science  
Stories





## Understanding the emergence of leukaemia

VERA MARTINS

A study published in the Journal of Immunology shows that leukemia can emerge as a consequence of prolonging the presence of precursor cells in the thymus. The IGC team led by Vera Martins tested several genetic factors in mice known to be involved in the formation of T lymphocytes. The results showed that in all conditions tested there was an incidence of T-ALL i 80% of this type of leukemia, demonstrating that thymus autonomy bears a high risk of leukemia. "Our study shows the importance of investigating in detail the cellular, genetic and physiological mechanisms associated with the process of normal cell differentiation, and opens the door to understand how leukemia can appear in cells that should be learning to defend our body," says Vera Martins.

## Drug Interactions: Women are more affected and risk increases with age

LUÍS ROCHA

First longitudinal study on adverse reactions to drugs caused by drug-drug interactions, carried out by researchers from IGC, Blumenau University and Indiana University published in npj Digital Medicine. The study reveals that women have 60% more risk of being prescribed drugs that will have drug interactions. These values rise to 90% when only drug interactions that lead to serious side effects are considered.

The occurrence of drug interactions, from the prescription of multiple drugs, is a public health problem worldwide. A problem that affects both individuals and health systems: it is known that patients with complications due to drug interactions have returned to the health system at a level that will involve higher costs, namely hospital costs.

## What controls the tips of our chromosomes?

MIGUEL GODINHO FERREIRA

Researchers discovered a key aspect of the regulation of telomeres, a protective cap that prevents our genetic material from unfolding and corroding away. There is an increasing number of human syndromes attributed to telomeres malfunction. One such disease was recently identified as the result of a malfunction of a protein complex known as CST, which is responsible for maintaining telomeres. The researchers discovered that STN1 (the protein that corresponds to the S component) is regulated by a chemical modification that results in the insertion of phosphorus in this protein, and it can be reversed by an enzyme, the phosphatase SSU72. This discovery reveals the importance of this process for the correct functioning of cells and opens new avenues to the discovery of therapies capable of dealing with debilitating diseases associated to defects in telomeres. Research conducted by Jose Escandell and Miguel Godinho Ferreira, conducted at the Instituto Gulbenkian de Ciência in collaboration with Instituto de Tecnologia Química e Biológica António Xavier and RCM, CNRS, Inserm, Aix-Marseille University (France).



## Bacterial sex drives evolution of microbes

ISABEL GORDO +

A pioneer study published in Proceedings of the National Academy of Science – USA, led by Isabel Gordo, in collaboration with researcher Michael Lässig of Cologne University (Germany), used healthy mice to study real-time gut colonization and discovered a pivotal role for bacterial sex in the evolution of the mammalian microbiome. This discovery constitutes a paradigm shift and opens the possibility to design phage-targeted therapies capable of dealing with the aftermath of infection and antibiotic usage, as well as antibiotic-resistant bacteria. Standard experimental models suggest that bacteria colonizing the gut evolves through mutations, but the work of the IGC researchers shows that horizontal gene transfers (HGT) is actually the evolutionary mechanism driving bacterial evolution in a healthy gut. This research indicates that classical evolution model does not apply in healthy hosts. With this work, researchers now “understand better how evolution works in normal, healthy hosts”, says Nelson Frazão, junior author of the publication.

## Mechanism to form influenza. A virus discovered

MARIA JOÃO AMORIM

A new study by Maria João Amorim's team, published in the journal Nature Communications, reveals where the genomes of the influenza A virus are assembled inside infected cells. The results may contribute to therapies that prevent or combat new strains of influenza viruses. The study of Maria João Amorim's team revealed that the selection of the genetic material is made in viral-induced compartments called viral inclusions. The researchers found that these compartments are not delimited by a membrane, as the traditional organelles in the cell. Instead, viral inclusions are separated from the surroundings by a process called liquid-liquid phase separation. This process is similar to what happens with vinegar and olive oil when placed together. In this way, the genetic material of the virus are segregated and confined to a small space where it is easier to assemble the sets of eight pieces that form the genome. “Our results pave the way for alternative therapies that could target genome formation, or the place where the genome is formed,” says Maria João Amorim and explains that “this work is innovative because it is one of the initial observations that demonstrates that viral infections use phase separation processes.”

# Research groups

## RESEARCH GROUPS

GROUP NAME

### LYMPHOCYTE DEVELOPMENT AND LEUKEMOGENESIS

RESEARCH GROUP LEADER

Vera Martins

The development of T lymphocytes occurs mostly in the thymus in a process that involves high cellular turnover, in turn partly regulated by cell competition among precursor cells. Compromising turnover and cell competition can change the steady state of T lymphocyte development and contribute to the development of leukemia. Vera Martins' lab focuses on the identification and characterization of the cellular and molecular mechanisms governing cell competition in normal thymus turnover, and on the changes occurring during thymus autonomy and leukemia.

#### / Highlights

This group has shown that, when performing thymus transplantation experiments in mice, thymus autonomy can occur in several experimental conditions, and all are permissive to the development of T cell acute lymphoblastic leukemia. (Ballesteros-Arias, *et al*, 2019; 1st peer reviewed paper of the lab).

LAB MEMBERS IN 2019

**Camila Ramos**, PhD Student, 2017 IBB

**Vasco Correia**, Technician | Left in March 2019

**Ricardo Paiva**, Postdoc | Started in March 2019

**Diogo Vale**, Research Assistant | Started in April 2019

**Nuno David**, summer student

**Sara Azenha**, MSc Student | Started in September 2019

**Marta Nogueira**, MSc Student | Started in September 2019"

RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia



## GROUP NAME

## PLANT MOLECULAR BIOLOGY

## RESEARCH GROUP LEADER

**Paula Duque**

Using *Arabidopsis thaliana* as a model system, Paula Duque's lab investigates how plants perceive and respond to environmental stress at the molecular level. Two interlinked lines of work aim at understanding plant abiotic stress responses and survival. One focuses on the role of alternative splicing, a key posttranscriptional mechanism in biology, and another aims at uncovering roles for transporters of the Major Facilitator Superfamily (MFS).

### / Highlights

After analyzing the physiological roles of the conserved SR protein family, key modulators of alternative splicing, this group has discovered that loss of function of most arabidopsis SR proteins causes impaired sensitivity to the abscisic acid (ABA) stress hormone during seed germination and early seedling development. Duque's lab also conducted an in-depth phylogenetic analysis of the *A. thaliana* MFS of transporters, reporting that it includes 75% more members than previously thought. (Niño-González, *et al*, 2019).

## LAB MEMBERS IN 2019

**Tom Laloum**, Postdoc  
**Guiomar Martín**, Postdoc  
**Esther Novo-Uzal**, Postdoc  
**Dóra Szakonyi**, Postdoc  
**Alba Díez**, PhD student, IBB 2016  
**María Niño-González**, PhD Student  
**Rui Albuquerque-Martins**, PhD Student  
**José Pedro Melo**, PhD Student  
**Beatriz Capitão**, Trainee | Left August 9, 2019

## MAIN PUBLICATIONS IN 2019

• Niño-González M.\*, Novo-Uzal E.\*, Richardson D.N., Barros, P.M., Duque P. (2019) More transporters, more substrates: The Arabidopsis Major Facilitator Superfamily revisited. *MOL PLANT* 12(9): 1182-1202

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## LYMPHOCYTE PHYSIOLOGY

## RESEARCH GROUP LEADER

**Jocelyne Demengeot**

The Demengeot group addresses the fundamental mechanisms of immune regulation and their dysfunction in the context of autoimmune diseases, cancer and immune therapies, using mice and humans as model systems.

### / Highlights

Previous studies from the lab have documented the developmental time window for T cells to acquire a regulatory phenotype. This group is currently exploring the impact of this restriction in the context of tumor immune-surveillance and gene therapy, as well as what specifies which organs and tissues are targeted in autoimmunity. Moreover, the group has gathered the first data related to a novel research program where they interrogate genetic components in immune regulation versus disease specific genetic architecture in autoimmune diseases, like type 1 diabetes. In each of these settings, work from the Demengeot lab highlights inter-individual variation as a biological relevant phenomenon to be further dissected.

## LAB MEMBERS IN 2019

**Íris Caramalho**, Postdoc  
**Vital Domingues**, PhD Student, 2015 IBB  
**Eleonora Tulumello**, PhD Student, 2015 IBB  
**José Santos**, PhD Student, 2014 IBB  
**Vânia Silva**, PhD Student, 2013 PIBS  
**Marie Louise Bergman**, Lab Manager  
**Inês Cabral**, Technician  
**Paula Matoso**, Technician  
**Francisca Fontes**, Visitor  
**Sandra Gama**, Visitor | left in August 2019  
**Daniel Sobral**, Visitor





GROUP NAME

## OBSESITY

RESEARCH GROUP LEADER

**Ana Domingos**

Ana Domingos' laboratory investigates the neuroimmune mechanisms underlying obesity. This group focuses on sympathetic neurons, that innervate the adipose tissue and have the capacity to drive fat mass reduction, with the goal of understanding their biology and pave the way to the development of anti-obesity therapies.

### / Highlights

Part of the team was involved in the organization of the 3th IGC Symposium.

LAB MEMBERS IN 2019

**Noelia Martínez-Sánchez**, Postdoc | Left in May**Inês Mahú**, PhD student, 2014 IBB**Bernardo Arús**, Masters Student | Left in January**Raquel Mendes**, Technician**Sinem Ozcan** | Started in April**Andreia Barateiro**, Visitor**Miguel Vasques**, Visitor

MAIN PUBLICATIONS IN 2019

• Larabee, C.M., Neely, O.C. & Domingos, A.I. Obesity: a neuroimmunometabolic perspective. *Nat Rev Endocrinol* 16, 30–43 (2020). <https://doi.org/10.1038/s41574-019-0283-6>

• Seoane-Collazo, P., Liñares-Pose, L., Rial-Pensado, E., Romero-Picó, A., Moreno-Navarrete, J. M., Martínez-Sánchez, N., ... & Malone, S. A. (2019). Central nicotine induces browning through hypothalamic K opioid receptor. *Nature communications*, 10(1), 1–12.

RUNNING GRANTS

**HHMI** - Howard Hughes Medical Institute**Wellcome Trust****EMBO** - European Molecular Biology Organization**Human Frontier Science Program (HFSP)****FCT** - Fundação para a Ciência e Tecnologia

GROUP NAME

## MEMBRANE TRAFFIC

RESEARCH GROUP LEADER

**Colin Adrian**

The Adrian lab studies how membrane protein biogenesis, trafficking or degradation, within the secretory pathway, regulates metabolic homeostasis.

### / Highlights

Research from this lab has shown that rhomboid pseudoprotease iRhom2 acts as a negative regulator of thermogenesis, of particular importance to metabolic regulation in mice. Furthermore, this group has generated a panel of mice mutant for various components of the endoplasmic reticulum membrane complex (EMC) in order to identify novel 'client' proteins whose membrane insertion requires the EMC. Other studies focused on the role of protein quality control in adipose tissue homeostasis, in particular of the adaptor protein Ubxd8, important for the dislocation and proteasomal degradation of various client proteins.

LAB MEMBERS IN 2019

**Marina Badenes**, Postdoc**Miguel Cavadas**, Postdoc**Abdulbasit Amin**, PhD Student**Ioanna Oikonomidi**, 2014 IBB PhD student | Left in Oct 2019**Catarina Gaspar**, External PhD student**Emma Burbridge**, Lab Manager | Left in December 2019**Érika de Carvalho**, Research Assistant

MAIN PUBLICATIONS IN 2019

• Badenes M, Adrain C (2019) iRhom2 and TNF: Partners or enemies. *Sci Signal*, 12(605)

RUNNING GRANTS

**Fundació La Caixa Health Research****FCT** - Fundação para a Ciência e Tecnologia

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## GROUP NAME

## EVOLUTIONARY DYNAMICS

## RESEARCH GROUP LEADER

**Claudia Bank**

Research from the Bank laboratory focuses on the study of evolution, and in particular on the population genetics of adaptation and speciation. Questions at the interface of theoretical and empirical biology are approached through theoretical modelling, computational methods, and statistical data analysis, and via targeted collaborations with wet-lab researchers.

### / Highlights

This group has expanded their work on the theory of fitness landscapes, synthesizing existing work on fitness landscapes across the natural sciences and across multiple levels of biological organization. Other lines of work addressed the shape of fitness landscapes across environments, demonstrating that both fitness landscapes and epistasis change across environments in (so far) unpredictable ways. To address this challenge, this group has started to perform a systematic experimental screen of a fitness landscape in *E. coli* across environmental gradients, and to develop models that integrate environmental change with classical genotype-fitness models.

## LAB MEMBERS IN 2019

**Alexandre Blanckaert**, Postdoc | Left in September 2019

**Inês Fragata**, Postdoc | Left in April 2019

**Ana-Hermína Ghenu**, PhD student, 2017 IBB

**Marco Louro**, PhD student, 2017 IBB

**Massimo Amicone**, PhD Student, 2018 IBB

**Mark Schmitz**, Programmer | Left in May 2019

**Juan Li**, Postdoc | Started in June 2019

**André Amado**, postdoc | Started in May 2019

**Davide Cusceddu**, postdoc | Started in September 2019

**Dinis Seward**, Summer student | Started in Aug - Left in Sept 2019

**Vedanth Sriram**, Summer student | Started in May - Left in Jul 2019

## MAIN PUBLICATIONS IN 2019

• I. Fragata, A. Blanckaert, M.A.D. Louro, D.A. Liberles, and C. Bank. Evolution in the light of fitness landscape theory. Trends in Ecology and Evolution, doi: 10.1016/j.tree.2018.10.009

• E. Berdan\*, A. Blanckaert\*, R.K. Butlin, and C. Bank. Muller's ratchet and the long-term fate of chromosomal inversions. bioRxiv, doi: 10.1101/606012

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

**EMBO** - European Molecular Biology Organization

**ERC** - European Research Council

## GROUP NAME

## NETWORK MODELLING

## RESEARCH GROUP LEADER

**Claudine Chaouiya**

Complementary to experimental approaches, mathematical models allow insights into the functioning of complex regulatory networks and lead to testable hypotheses. The Chaouiya research group mainly relies on a discrete, logical framework, which can uncover key characteristics of the dynamics of genetic and signalling networks. Their activity is organised along three lines:

1. Theoretical work with the definition of efficient methods for the analysis of large models;
2. Computational work with the development of software tools;
3. Modelling work with the study of specific networks, in collaboration with experimentalists.

### / Highlights

Claudine's group has contributed to the study of Boolean networks, with a study of the link between negative circuits and oscillatory attractors, and with the structure of the ordered set of Boolean regulatory functions. The recent study from the lab on the impact of cell neighbouring relationships for a simple lateral inhibition model supports the choice of hexagonal cell shape for the implementation of the EpiLog software.

## LAB MEMBERS IN 2019

**Sara Canato**, Postdoc

**Ana Morais**, PhD Student, 2016 IBB

**Jorge Pereyra**, PhD Student

**Pedro Varela**, PhD Student | Left in September 2019

**Delora Baptista**, Technician | Left in October 2017

**Mehran Piran**, Technician | Left in January 2019

**Pedro Monteiro**, Visitor

## MAIN PUBLICATIONS IN 2019

• Varela PL, Ramos CV, Monteiro PT and Chaouiya C. EpiLog: A software for the logical modelling of epithelial dynamics [version 2; peer review: 3 approved]. F1000Research 2019, 7:1145

• E. Tonello, E. Farcot, and C. Chaouiya. Local Negative Circuits and Cyclic Attractors in Boolean Networks with at most Five Components SIAM J. Appl. Dyn. Syst. 18-1, pp. 68-79, 2019

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## PLANT STRESS SIGNALING

## RESEARCH GROUP LEADER

**Elena Baena González**

The González group is interested in the mechanisms underlying carbon sensing and management in plants. The group further seeks to understand how carbon management systems interact with other signalling pathways to drive adequate growth and developmental decisions. Current efforts aim at dissecting the SnRK1 pathway, one of the major players of carbon signalling.

### / Highlights

Research from Elena's lab has shown that SnRK1 represses TOR signalling in response to energy stress (as in animals), but also to abscisic acid (ABA), ultimately enabling plants to modulate growth in response to water availability and may have been critical for the water-to-land transition. In addition, this group has shown that specific nuclear pore components are essential for regulation of stress responses and growth by SnRK1.

Other studies have shown that the SnRK1 response changes during the day, as the sugar levels increase through photosynthesis, being much stronger in the earlier segments.

## LAB MEMBERS IN 2019

**Ana Confraria**, Postdoc

**Leonor Margalha**, Postdoc

**Mattia Adamo**, External PhD Student, LEFT November 2019

**Mónica Costa**, PhD Student

**Carlos Elias**, PhD Student, 2013 PIBS

**Filipa Lopes**, PhD Student

**Bruno Peixoto**, PhD Student

**Diana Reis**, PhD Student | Started in June 2019

**Américo Rodrigues**, Visiting Scientist | LEFT December 2019

**Liliana Ferreira**, Postdoc | Started in March 2019

**Borja Belda Palazón**, Postdoc | Started in September 2019

## MAIN PUBLICATIONS IN 2019

• Margalha L, Confraria A, and Baena-González E\* (2019) SnRK1 and TOR: modulators of growth-defense trade-offs in plant stress responses. J Exp Bot 70, 2261-2274

• Baena-González E\* and Lunn J (2020) SnRK1 and trehalose 6-phosphate - two ancient pathways converge to regulate plant metabolism and growth. In Press in Curr Opin Plant Biol (COPLBI-D-20-00003R1).

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## MATHEMATICAL MODELLING OF BIOLOGICAL PROCESSES

## RESEARCH GROUP LEADER

**Erida Gjini**

The research from Gjini's lab centers on mechanistic determinants of infection dynamics in a single host and transmission in populations. Considering host-pathogen scenarios with and without interventions, this group studies mathematically the role of host immune components in infection resolution, and their implications for strain competition, drug resistance management, and evolution. In polymorphic microbial ecosystems, the group also identifies key principles of strain interaction that drive coexistence and stability, interfacing advanced mathematics with ecology and evolution.

### / Highlights

The Gjini group has modelled interactions between N strains in co-colonization by deriving a closed expression (replicator equation) for collective coexistence dynamics, reducing their model from N<sup>2</sup> to N dimensions. This major analytical advance contributes to a better understanding of the ecology and evolution of endemic multi-type microbial communities. In a second line of research, the group harnesses the computational and analytical insights of this new modeling framework, describing several properties of the co-colonization process and key features of multi-type-selection, coexistence and emergent behaviour.

## LAB MEMBERS IN 2019

**Francisco Pauperio**, Master Student | Left in January 2019

**Afonso Dimas Martins**, Master student | Left in December 2019

## MAIN PUBLICATIONS IN 2019

• Gjini E, and Madec, S. (2020) The key to complexity in interacting systems with multiple strains bioRxiv(preprint)  
<https://doi.org/10.1101/2020.02.03.932806>

• Madec S. and Gjini, E. (2019) Co-colonization interactions drive explicit frequency-dependent dynamics among N types bioRxiv(preprint)  
<https://doi.org/10.1101/722587>

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia



## GROUP NAME

## EVOLUTION AND DEVELOPMENT

## RESEARCH GROUP LEADER

Élio Sucena

The Sucena lab explores the interplay between evolutionary and developmental biology. Studying this interface provides insight into the mechanisms at either level, as well as their interaction, ultimately shaping biological variation and diversity. This group approached this concept experimentally using the comparative method and through experimental evolution. Using *Drosophila melanogaster* as a reference model, and other insect species, the group seeks a mechanistic understanding of the immune response at the genetic, physiological and population levels.

### / Highlights

Immunity can be taken broadly as a multi-layered process that includes behavioural traits alongside immune responses strictu sensu, partitioned into resistance and tolerance mechanisms. The Sucena lab has shown that spider mites may rely mostly on avoidance behaviours to minimize bacterial infection, highlighting the complex nature of immune strategies present in arthropods. In addition, this lab has explored the roles of resistance and tolerance in the response of *Drosophila* to bacterial infections. Specifically, assessing the involvement of miRNAs in fighting off infections and pursuing their studies on the physiological and genetic bases for adaptation to bacterial oral infection.

## LAB MEMBERS IN 2019

**Catarina Nunes**, PhD Student, 2016 IBB

**Tânia Paulo**, 2017 IBB PhD Student

**Filipa Santos**, Masters Student

**Joana Carvalho**, Technician

**Diogo Roque**, Masters Student | Started in December 2019

**Nuno Martins**, Trainee | Left in June 2019

## MAIN PUBLICATIONS IN 2019

- F Zéle, G Santos-Matos, ART Figueiredo, C Eira, C Pinto, TG Laurentino, Élio Sucena\*, Sara Magalhães\* (2019) Spider mites escape bacterial infection by avoiding contaminated food. *Oecologia* 189 (1), 111-122

## GROUP NAME

## EVOLUTIONARY BIOLOGY

## RESEARCH GROUP LEADER

Isabel Gordo

Isabel's lab current research involves studying the eco-evolutionary dynamics of commensal bacteria colonizing the mammalian intestine. This group has two main aims: i) to understand how the fitness landscape of the gut shape the evolution occurring via mutation and/or horizontal gene transfer and ii) to discover new ways to specifically eliminate antibiotic resistant bacteria from the mammalian gut.

### / Highlights

The Gordo Lab has found that the pattern of evolution of a common gut commensal, *E. coli*, is remarkably predictable in the gut of mice, even if they carry a microbial ecosystem that can have different levels of species richness. The group has also found that the targets of evolutionary adaptation during colonization of aging mice are enriched for stress related genes/pathways, important to better understand the metabolic preferences of *E. coli* colonizing the intestine and modulate strain diversity with specific pre-biotics.

## LAB MEMBERS IN 2019

**Roberto Balbotin**, Postdoc

**Paulo Durão**, Postdoc

**Nelson Frazão**, Postdoc

**Anke Konrad**, Postdoc | Started in August 2019

**Anastasia Kottara**, Postdoc | Started in September 2019

**Ricardo Ramiro**, Postdoc | Left in December 2019

**Dragan Stajic**, Postdoc | Left in December 2019

**Massimo Amicone**, PhD Student, 2018 IBB

**Hugo Barreto**, PhD Student, 2017 IBB

**Luís Cardoso**, PhD Student, 2015 IBB

**Ana-Hermína Ghenu**, PhD Student | Supervised by Claudia Bank

**Daniela Güleresi**, Lab Manager

## MAIN PUBLICATIONS IN 2019

- Barreto HC, A Sousa, Gordo I (2020) The Landscape of Adaptive Evolution of a Gut Commensal Bacteria in Aging Mice. *CURRENT-BIOLOGY* D-19-01516.
- Frazão, N., Sousa, A., Lassig, M., Gordo, I. (2019) Horizontal gene transfer overrides mutation in *Escherichia coli* colonizing the mammalian gut. *PNAS* 116 (36), 17906-17915.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**University of Cologne / DFG**  
**JPI-AMR**

## GROUP NAME

## PHYSICAL PRINCIPLES OF NUCLEAR DIVISION

## RESEARCH GROUP LEADER

Ivo A. Telley

The Telley lab is a multidisciplinary team interested in the physical aspects of intracellular organization. As a model system, the lab studies the earliest stages of *Drosophila* development, from the oocyte to fertilization to preblastoderm cleavages. Work from the group focuses on:

1. The minimal chemical and physical cues that determine oocyte polarity;
2. The chemo-mechanical mechanisms leading to pronuclear fusion in the fertilized egg and how the syncytial embryo defines the inter-nuclear distance during syncytial divisions;
3. How intracellular microbes modulate these early developmental events to their advantage.

### / Highlights

Research from this group has shed light on a yet unresolved phenomenon of organelle spacing and how two microtubule associated proteins determine the minimal distance between syncytial nuclei. Related to this study, the group has solidified the understanding of the physical principles and the nature of force separating nuclei to a set distance, generating a regular array of nuclei.

## LAB MEMBERS IN 2019

**Jorge Carvalho**, Postdoc  
**Amid Massouh**, Postdoc  
**Diana Vieira**, Postdoc  
**Ojas Deshpande**, Postdoc  
**Margarida Araújo**, PhD Student 2017 IBB  
**Ana Milas**, PhD Student 2018 IBB  
**Catarina Nabais**, PhD student 2014 IBB  
**Pedro Sampaio**, External PhD Student  
**Gustavo Eduardo**, Technician | Left in September 2019

## MAIN PUBLICATIONS IN 2019

- Deshpande O, de-Carvalho J, Vieira D, Telley IA (2019) Astral microtubule crosslinking by Feo safeguards uniform nuclear distribution in the *Drosophila* syncytium. bioRxiv, DOI: 10.1101/859975.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**HFSP Young Investigator Grant**

## GROUP NAME

## PLANT GENOMICS

## RESEARCH GROUP LEADER

Jörg Becker

Becker's group is interested in mechanisms controlling sexual reproduction and early embryogenesis, studying these processes in two plant model species, *Arabidopsis thaliana* and *Physcomitrella patens*. A particular focus of this research group work lies on (epi)genetic mechanisms acting during male gametogenesis, in particular how the reprogramming events of male gametogenesis lead to changes in their transcriptome and epigenetic landscape. This group aims at understanding how these changes come about and what are their potential consequences after fertilisation.

### / Highlights

The Becker lab has made significant progress in their aim to decipher key components of spermatogenesis and sperm motility in *Physcomitrella patens*. A number of mutants have been obtained in separate projects and are currently being characterized at a functional level.

## LAB MEMBERS IN 2019

**Paulo Navarro Costa**, Postdoc  
**Anton Kermanov**, PhD Student, 2017 IBB  
**Armin Horn**, PhD Student  
**Carmen Santana**, PhD Student  
**Chandra Shekhar Misra**, PhD Student  
**Sonia Pereira**, PhD Student, 2017 IBB  
**Patricia Pereira**, PhD Student  
**Mário Santos**, Lab Manager  
**Joana Martins**, Master Student | Started in September 2019  
**Rui Martinho**, Visitor

## MAIN PUBLICATIONS IN 2019

- Zhang Y, Ramming A, Heinke L, Altschmied L, Slotkin R, Becker JD, Kappel C, Lenhard M: The poly(A) polymerase PAPS1 interacts with the RNA-directed DNA methylation pathway in sporophyte and pollen development. Plant Journal, 99 (4): 655-672 (2019) <https://doi.org/10.1111/tpj.14348>
- Ferrari C, Proost S, Janowski M, Becker J, Nikoloski Z, Bhattacharya D, Price D, Tohge T, Bar-Even A, Fernie A, Stitt M, Mutwil, M: Kingdom-wide comparison reveals the evolution of diurnal gene expression in Archaeplastida. Nature Communications, 10 (1): 737 (2019) <https://doi.org/10.1038/s41467-019-08703-2>

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**European Commission**

## GROUP NAME

## QUANTITATIVE ORGANISM BIOLOGY

## RESEARCH GROUP LEADER

**Jorge Carneiro**

Cells of multicellular organisms cooperate to ensure body development and maintenance throughout life.

Jorge's lab studies the multilevel mechanisms that give rise to properties of the whole organism, in search for general principles of biological organisation and, eventually, the design of artificial systems.

The main research interests of this group include the immune system and the morphodynamics of cells and tissues with special focus in fertilisation. The approach is two fold: on the one hand, they create mathematical models of specific exemplary systems aiming to uncover basic principles, and on the other hand, they develop the quantitative methods required to assess the properties and predictions of these models.

## LAB MEMBERS IN 2019

**Delphine Pessoa**, PhD Student, 2014 IBB  
**Eleonora Tulumello**, PhD Student, 2015 IBB

## MAIN PUBLICATIONS IN 2019

- Sepúlveda, N., J. Carneiro, E. Lacerda, L. Nacul. (2018) Myalgic Encephalomyelitis/Chronic Fatigue Syndrome as a hyper-regulated immune system driven by an interplay between regulatory T cells and chronic human herpesvirus infections. *Front. Immunol.* 10:2684. <https://doi.org/10.3389/fimmu.2019.02684>
- Priego-Espinosa, D, A. Darszon, A. Guerrero, A.L. Gonzalez-Cota, T. Nishigaki, Martinez-Mekler and J. Carneiro. (2020) Modular analysis of the control of flagellar Ca<sup>2+</sup>-spike trains produced by CatSper and CaV channels in sea urchin sperm. *PLoS Comput. Biol.* accepted.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## HOST-PATHOGEN CO-EVOLUTION

## RESEARCH GROUP LEADER

**Jonathan Howard**

The Howard lab studies the resistance of mice to the ubiquitous intracellular protozoan parasite, *Toxoplasma gondii*, a malaria relative, which infects about 40% of the human race. The success of *T. gondii* depends on an infectious cycle between cats, the primary hosts, and their prey. Mouse immunity against *T. gondii* uses inducible GTPases (IRG proteins) that cooperatively destroy the vacuole in which the parasite lives, mechanism in turn targeted by the parasite, via a family of kinases that inactivate IRG proteins, in a complex co-evolutionary dynamic. The work from Howard's lab stretches from ecological studies on wild mice to cell biological, biochemical and structural studies.

### / Highlights

In collaboration with a group in Freiburg, Germany, Jonathan's group has identified the main resistance molecule responsible for resistance of certain mouse genotypes against hypervirulent *T. gondii* strains. They analyzed for the first time the survival of a recently isolated wild-derived mouse strain to a *Toxoplasma* strain isolated in Brazil in 2012.

## LAB MEMBERS IN 2019

**Joana Loureiro**, Postdoc | Left February 2019  
**Ana Lina Rodrigues**, PhD Student, 2015 PGCD  
**Catalina Alvarez**, PhD Student, 2015 IBB  
**Cláudia Campos**, Lab Manager  
**Afonso Vieira**, Undergraduate Intern | Left February 2019  
**Dilşan Özcanoğlu**, Undergraduate Intern, Erasmus (July-September 2019)

## MAIN PUBLICATIONS IN 2019

- Currey N, Jahan Z, Caldon CE, Tran PN, Benthani F, De Lacavalerie P, Roden DL, Gloss BS, Campos C, Bean EG, Bullman A, Reibe-Pal S, Dinger ME, Febbraio MA, Clarke SJ, Dahlstrom JE, Kohonen-Corish MRJ. Mouse Model of Mutated in Colorectal Cancer Gene Deletion Reveals Novel Pathways in Inflammation and Cancer. *Cell Mol Gastroenterol Hepatol.* 2019;7(4):819-839. doi: 10.1016/j.jcmgh.2019.01.009.
- Murillo-León M, Müller UB, Zimmermann I, Singh S, Widdershooven P, Campos C, Alvarez C, Könen-Waisman S, Lukes N, Ruzsics Z, Howard JC, Schwemmler M, Steinfeldt T. Molecular mechanism for the control of virulent *Toxoplasma gondii* infections in wild-derived mice. *Nat Commun.* 2019 Mar 15;10(1):1233. doi: 10.1038/s41467-019-09200-2. Erratum in: *Nat Commun.* 2019 Apr 4;10(1):1645.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**MSCA-IF-2015-708694**



## GROUP NAME

**BACTERIAL SIGNALLING**

## RESEARCH GROUP LEADER

**Karina Xavier**

Xavier's lab main research interest is cell-to-cell interactions in bacteria and the role of these interactions in assembly, maintenance and recovery of bacterial consortia. In particular, this group's work focuses on cell-to-cell interactions mediated by quorum sensing signal molecules that foster inter-species interactions. Karina's lab has also deepened the understanding of how bacterial chemical interactions shape poly-species bacterial communities and highlighted the importance of inter-species interactions in modulating metabolic networks in bacterial communities such as the gut microbiota.

**/ Highlights**

Karina's group has shown that horizontal microbial transmission can accelerate post-antibiotic recovery of the microbiota, promoting colonization resistance against invasion by pathogens. Moreover, this group reported that *Klebsiella michiganensis* is sufficient for restoring colonization resistance against *Enterobacteriaceae* by a mechanism based on nutritional competition. Using experimental evolution, the group identified the major metabolic preferences of *E. coli* in the mouse gut and demonstrated that changes of the gut metabolon, shaped by the microbiota, drive metabolic adaptation of *E. coli* to the mouse gut.

## LAB MEMBERS IN 2019

**Vitor Cabral**, Postdoc  
**Tanja Dapa**, Postdoc  
**Ana Rita Oliveira**, PhD Student, 2015 IBB  
**Filipe Vieira**, PhD Student  
**Inês Torcato**, PhD Student  
**Margarida Correia**, Masters Student  
**Miguel Pedro**, Masters Student  
**Joana Amaro**, Lab manager  
**Carina Galhota**, Technician  
**Miguel Pedro**, Technician

## MAIN PUBLICATIONS IN 2019

- Identification of novel autoinducer-2 receptors in Clostridia reveals plasticity in the binding site of the LsrB receptor family. Torcato IM, Kasal MR, Brito PH, Miller ST, Xavier KB. J Biol Chem. 2019 Mar 22;294(12):4450-4463. doi: 10.1074/jbc.RA118.006938. Epub 2019 Jan 29.
- Recovery of the Gut Microbiota after Antibiotics Depends on Host Diet, Community Context, and Environmental Reservoirs. Ng KM, Aranda-Díaz A, Tropini C, Frankel MR, Van Treuren W, O'Laughlin CT, Merrill BD, Yu FB, Pruss KM, Oliveira RA, Higginbottom SK, Neff NF, Fischbach MA, Xavier KB, Sonnenburg JL, Huang KC. Cell Host Microbe. 2019 Nov 13;26(5):650-665.e4. doi: 10.1016/j.chom.2019.10.011.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**EU Seventh Research Framework Programme, Infect-ERA**

## GROUP NAME

**PATTERNING AND MORPHOGENESIS**

## RESEARCH GROUP LEADER

**Moises Mallo**

The ultimate goal of the Mallo's research group is to understand how patterning information is translated in morphogenetic processes during vertebrate embryonic development. This group aims at determining what regulates the function of the axial progenitors that make the different body elements and the role they play in the evolution of the vertebrate body plan.

**/ Highlights**

Moises' lab has shown that the formation of the mouse tail bud derives from the activation of a novel developmental module and involves an epithelial to mesenchymal transition (EMT) that is functionally different from that driving formation of mesodermal structures of the trunk, belonging to the category of incomplete transitions. The group has also shown that this EMT is triggered by the concerted activity of TgfbRI and Snai1, while improving a method to increase the efficiency of genomic editing by homologous recombination in mouse oocytes.

## LAB MEMBERS IN 2019

**André Dias**, PhD Student, 2017 IBB  
**Anastasiia Lozovska**, PhD Student, 2017 IBB  
**Irma Varela Lasheras**, PhD student, 2011 PIBS | Left June 2019  
**Patrícia Duarte**, PhD student, 2018 IBB  
**Ana Casaca**, Laboratory Manager  
**Kyriel Pineault**, Visitor | Left September 2019  
**Triin Tekko**, Postdoc | Started January 2019

## MAIN PUBLICATIONS IN 2019

- Aires, R., de Lemos, L., Nóvoa, A., Jurberg, A. D., Mascres, B., Duboule, D. & Mallo, M. (2019). Tail bud progenitor activity relies on a network comprising Gdf11, Lin28 and Hox13 genes. Dev. Cell 48, 383-395.
- Pineault, K. M., Novoa, A., Lozovska, A., Wellik, D. M. & Mallo, M. (2019). Two CRISPR/Cas9-mediated methods for targeting complex insertions, deletions, or replacements in mouse. MethdosX 6, 2088-2100. doi.org/10.1016/j.mex.2019.09.003.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

**INFECTIONS & IMMUNITY**

## RESEARCH GROUP LEADER

**Michael Parkhouse**

The Parkhouse lab is mainly interested in pathogen modulation of host cell biology and innate immunity, as well as in the control of neurocysticercosis.

**/ Highlights**

Research from Michael's lab has shown that one African Swine fever gene contains a SH1 domain and the expression of viral genes inhibiting the IFN response results in mammalian cells with an increased yield of virus. Moreover, the lab has deleted the African Swine Fever Virus gene DP148R and aim at testing it an attenuated live virus vaccine. This group has also developed a monoclonal antibody for *Taenia solium* to be applied to the detection of adult *Taenia solium* in Africa.

Furthermore, researchers from the Parkhouse lab have made the first demonstration that cerebrospinal fluid from patients with extraparenchymal neurocysticercosis have detectable levels of autoantibodies.

## LAB MEMBERS IN 2019

**Sílvia Correia**, Postdoc**Ana Ferreira**, BIC | Left in August 2019**Inês Moreira**, Masters Student**Joana Almeida**, Trainee | Left in June 2019

## MAIN PUBLICATIONS IN 2019

• Hernández M, Astudillo OG, Diego G, de-la-Rosa-Arana JL, Meza-Lucas A, García-Rodea R, Romo ML, Toledo A, Parkhouse RM, Garate T, Sciutto E, Fleury A. "Immunodiagnosis of human neurocysticercosis: comparative performance of serum diagnostic tests in Mexico" *Parasitol Res.* 2019 Oct; 118 (10): 2891-2899. doi: 10.1007/s00436-019-06425-4.

• Rojas G, Martínez M, Corrales Y, Mijares V, León L, Medina C, Ferrer E, Parkhouse RME, Cortéz MM. "Four cases of *Taenia saginata* taeniasis in urban Venezuelan communities" *J Helminthol.* 2019 Mar 15; 94: e45. doi: 10.1017/S0022149X1900021X.

## RUNNING GRANTS

**PTDC-CVT-EPI-0123-2014**

## GROUP NAME

**INFLAMMATION**

## RESEARCH GROUP LEADER

**Miguel Soares**

The Soares lab aims at understanding the biology of inflammation and immunity as it pertains to the maintenance of homeostasis and to identify and develop therapeutic strategies with an impact on human diseases associated with major morbidity and/or mortality.

**/ Highlights**

This group has unveiled a functional relationship between organismal iron metabolism, energy expenditure, and adaptive thermoregulation with implications to the understanding of energy expenditure and thermoregulation in mammals. Miguel's lab has also identified a tissue damage-control mechanism that operates specifically in the kidneys to prevent the pathogenesis of severe forms of malaria. In collaboration with Prof. M. Bauer and Dr. S. Weis, the group demonstrated that trained immunity can be induced by labile heme, providing long-lasting adaptation to a variety of immune-mediated inflammatory diseases.

## LAB MEMBERS IN 2019

**Patricia Amador**, Postdoc | Left in April 2019**Fauzi Braza**, Postdoc | Left in February 2019**Ana Rita Carlos**, Postdoc | Left in August 2019**Rui Martins**, Postdoc**Susana Ramos**, Postdoc**Jessica Thompson**, Postdoc**Temitope Ademolue**, PhD Student IBB 2018**Vital Domingues**, PhD Student, IBB 2015**Sumnima Singh**, PhD Student, PIBS 2013**Susana Martins**, Masters Student**Sofia Rebelo**, Lab Manager**Sílvia Cardoso**, Research Technician**Joana Gomes**, Visitor

## MAIN PUBLICATIONS IN 2019

• Renal control of disease tolerance to malaria. Ramos S., Carlos A.R., Sundaram B., Jeney V., Ribeiro A., Gozzelino R., Bank C., Gjini E., Braza F., Martins R., Ademolue T.W., Blankenhau B., Gouveia Z., Faisca P., Trujillo D., Cardoso S., Rebelo S., Barrio L., Zarjou A., Bolisetty S., Agarwal A., Soares M.P. *Proceedings of the National Academy of Sciences* March 19, 2019 116 (12) 5681-5686. <https://doi.org/10.1073/pnas.1822024116>

• Disease Tolerance as an Inherent Component of Immunity. Martins R., Carlos A.R., Braza F., Thompson J.A., Bastos-Amador P., Ramos S., Soares M.P. *Annual Review of Immunology* 2019 37:1, 405-437. <https://doi.org/10.1146/annurev-immunol-042718-041739>

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia**European Commission - Marie Skłodowska-Curie Actions****EMBO** - European Molecular Biology Organization**ESCMID** - European Society of Clinical Microbiology and Infectious Diseases**"La Caixa" Foundation**

GROUP NAME

## CHROMOSOME DYNAMICS

RESEARCH GROUP LEADER

**Raquel Oliveira**

Researchers at the Oliveira lab study how chromosome architecture contributes to faithful genome segregation at each round of cell division. This laboratory adopts a multidisciplinary approach to evaluate how dynamic mitotic chromosomes are assembled and how their morphology influences the mechanical aspects of chromosome movement and cell cycle checkpoint signalling. In parallel, the group aims to dissect how different cells respond to compromised chromosome cohesion and condensation, both at the cellular and organism level, unravelling new routes to aneuploidy that underlie several human conditions, including developmental diseases, cancer and infertility.

### / Highlights

This lab has developed a genetic tool for *Drosophila melanogaster* manipulation that allowed them to study cellular and developmental consequences of aneuploidy and show that the developing brain is the most sensitive tissue to aneuploidy. Raquel's lab has also developed an optimized protocol for *Drosophila* embryos microinjection that allows them to study with high temporal resolution cell division processes.

LAB MEMBERS IN 2019

**Sara Carvalho**, Postdoc  
**João Coelho**, Postdoc  
**Leonardo Guilgur**, Postdoc | Left in February  
**Inês Milagre**, Postdoc  
**Arunabha Bose**, Post-Doc | Started in November  
**Cíntia Ramos**, PhD Student, 2014 PGCD | Left in Dec. 2019  
**Margarida Araújo**, PhD Student, 2017 IBB  
**Catarina Carmo**, PhD Student, 2017 IBB  
**Mário Soares**, PhD Student, 2015 IBB | Left in Dec. 2019  
**Salma Rahme**, Master Student | Started in Sept. 2019  
**Carolina Pereira**, Research Technician | Started in Sept. 2019  
**Ana Boavida**, Research Technician | Started in Feb. 2019  
**Alexandra Tavares**, Lab Manager

MAIN PUBLICATIONS IN 2019

- Mirkovic M, Guilgur LG, Tavares A, Passagem-Santos D, Oliveira RA. 2019. Induced aneuploidy in neural stem cells triggers a delayed stress response and impairs adult life span in flies. *PLoS Biol.* Feb 22;17(2):e3000016. doi: 10.1371/journal.pbio.3000016.
- Carmo C, Araújo M, Oliveira RA. 2019. Microinjection Techniques in Fly Embryos to Study the Function and Dynamics of SMC Complexes. *Methods Mol Biol.* 2004:251-268. doi: 10.1007/978-1-4939-9520-2\_19.

RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**European Research Council**  
**European Molecular Biology Organization**

GROUP NAME

## INTEGRATIVE BEHAVIOURAL BIOLOGY

RESEARCH GROUP LEADER

**Rui F. Oliveira**

The main research interest of the Oliveira lab is the integrative study of social behaviour, namely understanding how brain and behaviour can be shaped by social environment, and how the cognitive, neural and genetic mechanisms underlying plasticity in the expression of social behaviour have evolved. Using zebrafish and other selected fish species, the group's current research questions centre on four topics:

1. Evolution of social cognition and of its neuromolecular mechanisms;
2. Genomic and epigenomic mechanisms of social plasticity;
3. Neuroendocrinology of social interactions;
4. Cognitive bias and susceptibility/resilience to disease.

### / Highlights

Rui's lab has shown that social and asocial learning have distinct genetic architecture and neural circuits in zebrafish. The lab has also performed a detailed characterization of the androgen response to social interactions and how it mediates behavioral flexibility through regulation of gene expression in the forebrain.

LAB MEMBERS IN 2019

**Felipe Espigares**, Postdoc  
**Ana Nunes**, Postdoc  
**Magda Teles**, Postdoc  
**Susana Varela**, Postdoc  
**Victoria Alvarado Fernandez**, Postdoc | Started in April  
**Kyriakos Kareklas**, Postdoc | Started in April  
**Fred Mery**, visitor on sabbatical leave | Started in Sept. 2019  
**Cláudia Gonçalves**, PhD Student, 2017 PGCD  
**Ibukun Akinrinade**, PhD Student, 2015 IBB  
**Carla Henriques**, PhD Student, 2018 IBB  
**Renato Sousa**, PhD Student, 2017 IBB | Left in Feb. 2019  
**Sara Cardoso**, External PhD Student | Left in January 2019  
**Ana Sofia Félix**, External PhD Student | Left in Dec. 2019  
**Júlia Pinho**, External PhD Student | Left in July 2019  
**Manuela Brandão**, External PhD Student | Left in July 2019  
**Miguel Correia**, Masters Student | Left in December 2019  
**Benedita Cyrne**, Masters Student | Left in June 2019  
**Gil Costa**, Staff | Left in June 2019  
**Joana Marcos**, Research Technician

MAIN PUBLICATIONS IN 2019

- Varela S.A., Teles M.C., Oliveira R.F. 2019. The correlated evolution of social competence and social cognition. *Functional Ecology*, 34: 332-343.
- Almeida O., Felix A.S., Oliveira G.A., Lopes J.S., Oliveira R.F. 2019. Fighting assessment triggers rapid changes in activity of the brain social decision-making network of cichlid fish. *Frontiers in Behavioral Neuroscience*, 13: 229.

RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**FEDER grant "SOCIALPEPTIDES"**



## GROUP NAME

## POPULATION AND CONSERVATION GENETICS

## RESEARCH GROUP LEADER

**Lounès Chikhi**

The amount of genetic diversity and the differentiation observed today within or between individuals or populations is the result of a complex history that includes demographic events such as population collapses, expansions, or admixture. This also includes spatial processes whereby populations may go through periods of connectivity or disconnection, without mentioning selection acting in complex ways across populations and genomic regions. To study these processes, researchers at the Chikhi lab develop new methods to improve the understanding of the recent evolutionary history of species, in particular the way genetic and genomic data are influenced by it. The lab also, and crucially, wants to understand the limits of genetic or genomic data as inferential tools.

### / Highlights

Previous work from Lounès' lab discussed the importance of integrating population structure in human evolution, favouring a model in which the whole African continent was involved in the make-up of human genetic diversity, not just a small region in Eastern or Southern Africa. Recently this group has argued against several misconceptions that are widespread in human evolution and proposed to use meta-population approaches to study and analyze genomic data for humans (and other species). Moreover, the lab has deepened the understanding of the genetic diversity of lemurs species living in fragmented landscapes of Madagascar.

## LAB MEMBERS IN 2019

**Bárbara Parreira**, Postdoc  
**Inês Carvalho**, Postdoc  
**Tânia Rodrigues**, Postdoc  
**Gabriele Sgarlata**, PhD Student, 2016 IBB  
**Barbara Le Pors**, Technician | Left in December 2019  
**Filipa Borges**, Visitor  
**Patricia Santos**, Visitor  
**Beatriz Mourato**, NOS Alive Fellow 2018  
**Margarida Henrique**, NOS Alive Fellow 2019 | Started in Dec. 2019

## MAIN PUBLICATIONS IN 2019

- 2. Pires AE, Detry C, Chikhi L, Rasteiro R, Amorim IR, Simões F, Matos J, Petrucci-Fonseca F, Ollivier M, Hänni C, Cardoso JL, Arias P, Diniz M, Araújo AC, Bicho N, Sousa AC, Moreno-García M, Arruda AM, Fernández-Rodríguez C, Porfírio E, Morais Arnaud J, Valente A, Gonçalves D, Alves L, Götherström A, Davis SJM, Ginja C (2019) The curious case of the Mesolithic Iberian dogs: An archaeogenetic study, *Journal of Archaeological Science*, 105, 116–129.
- 4. Scerri EML, Chikhi L, Thomas MG (2019) Beyond multiregional and simple out-of-Africa models of human evolution. *Nature, Ecology & Evolution* 3(10):1370-1372. doi: 10.1038/s41559-019-0992-1.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## CELL CYCLE REGULATION

## RESEARCH GROUP LEADER

**Mónica Bettencourt - Dias**

The Bettencourt-Dias laboratory is interested in general principles in biology regarding the counting and assembling of complex cytoskeletal assemblies. In particular, centrioles, that assemble centrosomes, and cilia/flagella, that are critical structures for cell division, polarity, motility and signaling, which are often deregulated in human disease. This group follows three complementary research lines: mechanisms of biogenesis, maintenance & function, disease (cancer) and evolution.

### / Highlights

Researchers from Mónica's lab have recently discovered that the pericentriolar material (PCM) that surrounds the centriole and is important for microtubule nucleation, is also important to recruit critical centriole components. Pcp1/Pericentrin, a component of the matrix, recruits a critical centriole constituent, SAS-6 and this interaction is conserved and important for centriole biogenesis and elongation in animals. In collaboration with N. Morais, the group has derived a centriole amplification signature (CA20) and showed that CA20 upregulation is positively associated with genomic instability, alteration of specific chromosomal arms and C>T mutations. Furthermore, the lab has proposed novel molecular players associated with CA in cancer, ultimately contributing to solidify the idea of centriole deregulation as a recurrent feature of cancer cells.

## LAB MEMBERS IN 2019

**Ana Rita Marques**, Postdoc  
**Carla Lopes**, Postdoc  
**Daisuke Ito**, Postdoc | Left in April 2019  
**Nuria Marin**, Postdoc  
**Swadhin Jana**, Postdoc  
**Tânia Perestrelo**, Postdoc  
**Catarina Nabais**, Postdoc  
**Irina Fonseca**, PhD Student, 2017 PGCD  
**Sonia Pereira**, PhD Student, 2017 IBB  
**Catarina Peneda**, PhD Student  
**Marco Louro**, PhD Student, 2017 IBB  
**Mariana Faria**, Lab Manager  
**Paulo Duarte**, Technician  
**Ksenia Volkova**, Trainee | Left in February 2019

## MAIN PUBLICATIONS IN 2019

- Pericentrin-mediated SAS-6 recruitment promotes centriole assembly; Ito D, Sihem Zitouni, Swadhin Chandra Jana, Paulo Duarte, Jaroslav Surkont, Zita Carvalho-Santos, José B Pereira-Leal, Miguel Godinho Ferreira, Mónica Bettencourt-Dias, *eLife* 2019;8:e41418 DOI: 10.7554/eLife.41418
- Pan-cancer association of a centrosome amplification gene expression signature with genomic alterations and clinical outcome; Bernardo P. de Almeida, André Vieira, Joana Paredes, Mónica Bettencourt-Dias, Nuno Barbosa-Morais; *PLoS Comput Biol* 15 (3), e1006832 DOI: 10.1371/journal.pcbi.1006832

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**European Research Council**

GROUP NAME

## VARIATION: DEVELOPMENT AND SELECTION

RESEARCH GROUP LEADER

**Patrícia Beldade**

Eco-Evo-Devo research at Beldade's lab combines concepts and approaches from different disciplines to characterize genetic and environmental factors accounting for intra-specific variation, the raw material for natural selection and a universal property of biological systems. Understanding the mechanisms that generate variation in complex traits is a key challenge in biology, with societal impact. What are the genetic changes that contribute to segregating variation? How do they interact with environmental factors to regulate phenotype expression? For the dissection of variation, the lab uses two complementary insect models: *Bicyclus anynana* butterflies and *Drosophila melanogaster* flies.

### / Highlights

Patrícia's lab focused on analyzing the effects of external environment conditions on phenotypic variation, through effects on phenotype expression (via phenotypic plasticity), as well as the genetic basis of novel traits. The group published a review/perspectives paper about developmental plasticity, including its evolution and genomic underpinnings. And also described effects of combinations of developmental and adult temperature on different *B. anynana* traits associated to alternative seasonal strategies for survival and reproduction. The group also explored the role of candidate novel genes to the development of novel traits and validated one such candidate in formation of scale-based color patterns in *B. anynana*.

LAB MEMBERS IN 2019

**Roberto Arbore**, Postdoc | Started in September 2018

**Ana Eugénio**, PhD student, 2017-2018 IBB

**Nuno Soares**, Postdoc | Left in October 2019

**Yara Rodrigues**, PhD student, 2015 PGCD

**Cátia Patrício**, Technician

MAIN PUBLICATIONS IN 2019

• Van Bergen E, Beldade P (2019). Seasonal plasticity in anti-predatory strategies: Matching of color and color preference for effective crypsis. *Evolution Letters* 3, 313-320

• Lafuente E, Beldade P (2019). The genomics of developmental plasticity: recent progress in animal models. *Frontiers in Genetics* 10, 720

RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

GROUP NAME

## HOST-MICROORGANISMS INTERACTIONS

RESEARCH GROUP LEADER

**Luís Teixeira**

The Teixeira group is studying the interaction of the model organism *Drosophila melanogaster* with different microorganisms, in particular intracellular ones. *D. melanogaster* has been successfully used as a model system to study innate immunity against many pathogens.

### / Highlights

The 3rd Edition of the Summer School "Host-microbe symbioses: from genetics to metabolic interactions" was co-organized by L. Teixeira (IGC), M. Blaser (New York Univ.), M. McFall-Ngai (U. of Hawaii) and T. Bosch (U. of Kiel).

LAB MEMBERS IN 2019

**Manon Bonneau**, Postdoc

**Catarina Carmo**, Postdoc

**Sergio López Madrigal**, Postdoc

**Gonçalo Santos Matos**, 2016 IBB PhD Student

**Miguel Correia Landum**, PhD Student

**Rita Valente**, Lab Manager

**Teresa Gonçalves Maia**, Technician

**Beatriz Reis**, Technician

**Pedro Marinho**, Technician

**Rafael Caetano**, Technician

MAIN PUBLICATIONS IN 2019

• S. López-Madrigal, E. H. Duarte, Titer regulation in arthropod-Wolbachia symbioses. *FEMS Microbiol Lett.* 366, 118-9 (2019).

• F. J. D. Vieira, P. Nadal-Jimenez, L. Teixeira, K. B. Xavier, Quorum sensing regulation in *Erwinia carotovora* affects development of *Drosophila melanogaster* infected larvae. *bioRxiv*, 2019.12.13.876318 (2019).

RUNNING GRANTS

**European Research Council**



## GROUP NAME

## INNATE IMMUNITY AND INFLAMMATION

## RESEARCH GROUP LEADER

**Luís Moita**

Recent evidence from Moita's lab shows that, in mice, anthracycline drugs prevent organ failure without affecting the bacterial burden in a model of severe sepsis, a systemic inflammatory condition with high mortality rates. This group proposes that strategies aimed at targeting organ protection have extraordinary potential for the treatment of sepsis and possibly for other inflammation-driven conditions. The central goal of the lab's research program is to identify and characterize novel protective mechanisms, with a focus on DNA damage response dependent protection activated by anthracyclines.

### / Highlights

The Moita lab has identified: 1) an olfactory receptor with a non-canonical role and for which we now have substantial evidence that is important for an effective immune response, 2) a novel class of drugs that induce disease tolerance and are protective in sepsis, 3) a possible etiologic factor for acute appendicitis and 4) the role of GDF15 in sepsis.

## LAB MEMBERS IN 2019

**Ana Costa**, *Postdoc*  
**Katharina Willmann**, *Postdoc*  
**Henrique Colaço**, *PhD Student, 2015 IBB*  
**Isa Santos**, *PhD Student*  
**Tiago Velho**, *PhD Student*  
**Elsa Seixas**, *Laboratory Manager*  
**André Barros**, *PhD Student, 2019 Interface*  
**Dora Pedroso**, *Technician*  
**Catarina Moita**, *Visitor*

## MAIN PUBLICATIONS IN 2019

- A Th2 Cytokine Profile in Appendicular Lavage Fluid Suggests Allergy as a Possible Etiology for Acute Appendicitis. Carvalho N, Barros A, Coelho HO, Moita CF, Neves-Costa A, Pedroso D, Borges FC, Moita LF\*, Costa PM. *Mediators Inflamm.* 2019 Oct 28;2019: 8146257. doi: 10.1155/2019/8146257. \*Corresponding author.
- Deletion of iRhom2 protects against diet-induced obesity by increasing thermogenesis. Badenes M, Amin A, González-García I, Félix I, Burbridge E, Cavadas M, Ortega FJ, de Carvalho É, Faísca P, Carobbio S, Seixas E, Pedroso D, Neves-Costa A, Moita LF, Fernández-Real JM, Vidal-Puig A, Domingos A, López M, Adrain C. *Mol Metab.* 2020 Jan;31: 67-84. doi: 10.1016/j.molmet.2019.10.006. Epub 2019 Oct 31.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia  
**European Research Council**

## GROUP NAME

## COMPLEX ADAPTIVE SYSTEMS AND COMPUTATIONAL BIOLOGY

## RESEARCH GROUP LEADER

**Luís Rocha**

The Rocha group is particularly interested in the informational properties of natural and artificial systems which enable them to adapt and evolve. This means both understanding how information is fundamental for controlling the behavior and evolutionary capabilities of complex systems, as well as abstracting principles from natural systems to produce adaptive information technology.

### / Highlights

First longitudinal study on adverse reactions to drugs caused by drug-drug interactions, carried out by the research team, Blumenau University and Indiana University published in *npj Digital Medicine*.

## LAB MEMBERS IN 2019

**Andrea Sofia Teixeira**, *Postdoc*  
**Rion Brattig Correia**, *Postdoc*

## MAIN PUBLICATIONS IN 2019

- City-wide electronic health records reveal gender and age biases in administration of known drug-drug interactions. Rion Brattig Correia, Luciana P. de Araújo Kohler, Mauro M. Mattos & Luis M. Rocha *npj Digital Medicine* volume 2, Article number: 74 (2019)





GROUP NAME

## DISEASE GENETICS

RESEARCH GROUP LEADER

**Carlos Penha Gonçalves**

Disease and organ dysfunction are in many cases controlled by genetic factors. The research group lead by Carlos Penha Gonçalves is interested in uncovering how these factors work in specific cell types to drive organ inflammation trajectories and infectious disease outcomes, ultimately contributing to bridge the fields of infectious diseases and metabolic disorders.

Using human samples, mouse models and cell cultures, current lines of research aim at understanding:

1. The protective roles of trophoblast cells in placental malaria.
2. The action of brain endothelial cells in propagating inflammation in cerebral malaria.
3. Kupffer cells responses to liver damage.

### / Highlights

A project lead by Carlos Penha Gonçalves was one of the projects distinguished by Gilead Sciences in the Gilead Génese Program among 56 applications. The project will study Viral and Metabolic Liver Diseases.

LAB MEMBERS IN 2019

**Inês Couto Coelho**, *Postdoc*  
**Maria Teresa Pais**, *Postdoc*  
**Abdul Mukhtadir Shafi**, *2017 IBB PhD Student*  
**Hajrabibi Aguiar Ali**, *Msc Student*  
**Nádia Cristina Duarte**, *Lab manager*  
**Carolina Amaral da Piedade**, *Technician*  
**Diego Olshchowsky Borges**, *Visitor*  
**Rita Patarrão**, *Visitor*

MAIN PUBLICATIONS IN 2019

- Brain Endothelium: The "Innate Immunity Response Hypothesis" in Cerebral Malaria Pathogenesis. Teresa F. Pais and Carlos Penha-Gonçalves. *Front. Immunol.*, 29 January 2019
- Genetics of Malaria Inflammatory Responses: A Pathogenesis Perspective. Carlos Penha-Gonçalves. *Front. Immunol.*, 30 July 2019

GROUP NAME

## MOLECULAR NEUROBIOLOGY

RESEARCH GROUP LEADER

**Diogo Castro**

The progression of progenitor cells throughout distinct cellular stages of the neuronal lineage relies on the activity of transcription factors and the epigenetic landscape. These are part of an intrinsic programme that integrates local extracellular signals or long range cues, resulting in the progression of a coherent programme of cellular differentiation during vertebrate neurogenesis. Using genomics and stem cell techniques, Diogo Castro's lab aims at understanding how such global programmes of gene expression are regulated during vertebrate neurogenesis.

LAB MEMBERS IN 2019

**Mário Fonseca Soares**, *Postdoc*  
**Abeer Heskol**, *2017 IBB PhD Student*  
**Vera Teixeira**, *Lab Manager*

MAIN PUBLICATIONS IN 2019

- Falcão AM, Meijer M, Scaglione A, Rinwa P, Agirre E, Liang J, Larsen SC, Heskol A, Frawley R, Klingener M, Varas-Godoy M, Raposo AASF, Ernfors P, Castro DS, Nielsen ML, Casaccia P, Castelo-Branco G. PAD2-Mediated Citrullination Contributes to Efficient Oligodendrocyte Differentiation and Myelination. *Cell Rep.* 2019 Apr 23;27(4):1090-1102.e10.

## GROUP NAME

## CELL BIOLOGY OF VIRAL INFECTION

## RESEARCH GROUP LEADER

**Maria João Amorim**

The Amorim lab is interested in understanding the interactions between influenza A virus and the infected host at different levels. By identifying the host machinery necessary to sustain viral infection we seek to understand the viral lifecycle and unravel key aspects of the biology of the cell. Also, by studying the host response to viral challenge, the lab aims at unraveling host innate immune responses and ways to control viral infection.

### / Highlights

The Amorim lab has made important contributions for the understanding of viral assembly during infection, particularly regarding the influenza genomic complex formation inside the host cell. Until recently, it was postulated that interactions between the RNA segments of the viral genome drive viral inclusion formation inside the host cell. The lab has challenged this view and found that viral inclusion formation precedes and does not require such interactions. Maria João's lab also found that viral inclusions have particular properties that make them sites dedicated to the assembly of the influenza genome. The lab's contributions extend even further to the identification of mechanisms that attenuate or increase the virulence of influenza, associated to the proteins hemagglutinin and neuraminidase.

## LAB MEMBERS IN 2019

**Marta Alenquer**, Postdoc

**Sílvia Costa**, Postdoc

**Filipe Ferreira**, Postdoc

**Temitope Etibor**, PhD Student, 2017 IBB

**Nuno Santos**, PhD Student, 2017 PGCD

**Daniela Brás**, PhD student, 2019 Interface

**João Diamantino**, Masters Student

## MAIN PUBLICATIONS IN 2019

- Sloan, E., Alenquer M, Chung L, Clohisey SMR, Dinan AM, Gifford RJ, Gu Q, Irigoyen N, Jones JD, van Knippenberg I, Rezelj VV, Wang B, Wise H, Amorim MJ, Baillie JK, Brierley I, Digard P, Firth A, MacLeod MK and Hutchinson E, Upstream translation initiation expands the coding capacity of segmented negative-strand RNA viruses (2019). bioRxiv, 795815. doi:10.1101/795815. Collaborative work that reveals novel to increase viral protein expression. For pre-print in BioRxiv: URL <https://www.biorxiv.org/content/10.1101/795815v1?rss=1>

- Alenquer M, Vale-Costa S, Sousa AL, Etibor TA, Ferreira F and Amorim MJ, Influenza A virus ribonucleoproteins form liquid organelles at endoplasmic reticulum exit sites (2019). Nature Communications, 10:1629. doi: 10.1038/s41467-019-09549-4. Press release: Mechanism to form influenza A virus discovered. This report identified for the first time that influenza explores membraneless compartments to support viral replication.

## RUNNING GRANTS

**FCT** - Fundação para a Ciência e Tecnologia

## GROUP NAME

## PROTEIN-NUCLEIC ACIDS INTERACTIONS

## RESEARCH GROUP LEADER

**Alekos Athanasiadis**

Aleko's group is interested in the study of the molecular mechanisms involved in such diversification of RNA and DNA sequence as well as understanding the consequences of such processes for molecular evolution dynamics. In this direction, this group is employing the tools of computational, molecular and structural biology in the study of RNA and DNA editing.



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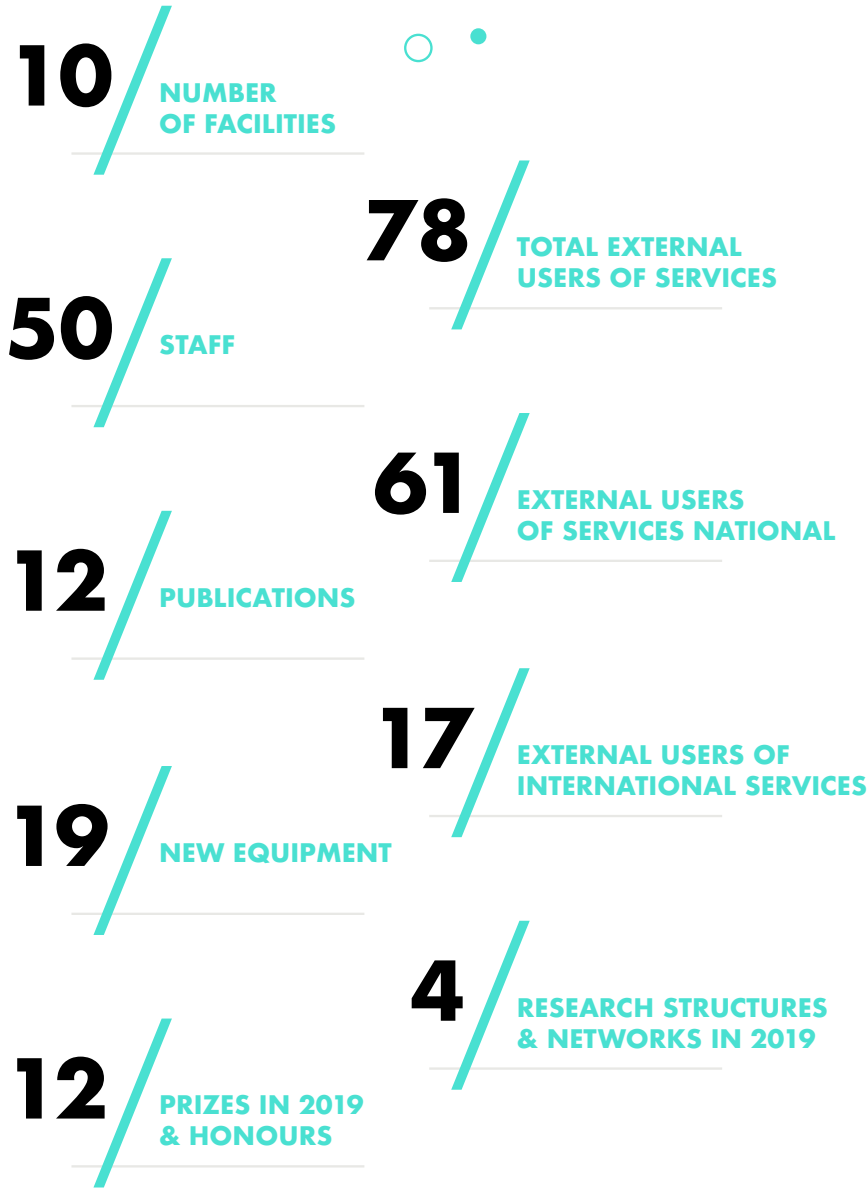
# Research Support

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# CORE FACILITIES

The IGC features Core Facilities that provide to the research groups ultimate support to the research groups and to help them streamline their research. The IGC Core Facilities bring together a range of essential research support services and expertise, fundamental pillars to establish the IGC as a world leading research institute.



## Transgenics Unit

HEAD

**Moisés Mallo**

The Transgenics Unit generates genetically modified mouse and *Drosophila* strains for research groups at the IGC.

### / Highlights

In 2019 this unit has produced 38 mouse lines and embryos from 21 different projects to introduce targeted genomic modifications using CRISPR/Cas9, including straight knock-outs, introduction of tags (small epitopes and fluorescent proteins) as well as cre recombinase, introduction of specific deletions, engineering complex replacements of functional modules and introduction of LoxP sites. This unit also produced 366 transgenic mice or embryos from 23 different DNA constructs and 8 lines from one BAC construct and injected one mutant ES cell line that gave chimeras with germ line transmission.

The Transgenics team also re-started the transgenic services in *Drosophila*: completed 47 services, production of 32 P-element/Phi31 transgenic lines and 15 RNAi lines.

Started projects using CRISPR/Cas9-mediated gene edition in *Drosophila* embryos.

FACILITY MEMBERS IN 2019

**Ana Nóvoa**

Research Technician (mouse microinjection)

**Leonardo Gaston Gilgur**

Research Associate (*Drosophila* microinjection) / Started March.

## Advanced Imaging

HEAD

**Gabriel G. Martins**

The Advanced Imaging facility stands as provides access and support to high-end light microscopy to the scientific community. They stand as a national and international reference, with flagship techniques such as super-resolution, high-throughput wide-field, multiphoton, light-sheet microscopy, optical tomography and macro bioluminescence. Some of these techniques are unique in the country and were developed in-house. This facility also organize personalized training sessions and internal workshops on light microscopy, equipment setup, experimental design and image processing & analysis.

### / Highlights

The Advanced Imaging facility has organized three internal workshops and co-organized four international schools on image analysis. Furthermore, they have co-organized the IGC Summer School and participated in the national MICRODIA2019 open days, where they hosted multiple visits from the public or schools.

FACILITY MEMBERS IN 2019

**Maria Hanulova**

PhD, microscopy assistant / Started in April

**Alexandre Lopes**

MsC, OPenT/OpenSpin developer and microscopy assistant / Started in May

**Nuno P. Martins**

MsC, microscopy assistant / Left in September

## Histopathology Unit

HEAD

**Pedro Faísca**

The unit has two major roles: to provide high quality preparations for microscopy and to give pathology support to the IGC scientific community and external research centers. The services provided include all the necessary steps of histological sample preparation, processing and analysis, together with providing training in several techniques.

### / Highlights

The Histopathology Unit has also developed sectioning devices for the systematic uniform random sampling in Stereology and implemented several stereological probes in the Facility. The unit also hosted two external students doing a Summer School and had a master thesis defense of a histopathology facility internship student.

FACILITY MEMBERS IN 2019

**Joana Rodrigues Lóios**

Facility Manager / Histology Technician

**Andreia Mindouro**

Histology Technician / Started in July

## Genomics

HEAD

**Ricardo Leite**

Offers a comprehensive portfolio of NGS solutions from short reads to long reads and from bulk samples to single cell level analysis. Equipped with the Illumina platforms NextSeq 500 and MiSeq, a 10X Genomics Chromium, Oxford Nanopore Minlon. Genomics provides a complete service from advice on experimental design, over sample processing to data delivery.

### / Highlights

The team processed 3304 samples for re-sequencing, 2940 samples for 16S metagenomics, 394 samples for RNA-Seq.

FACILITY MEMBERS IN 2019

**Jörg Becker**

Head / Left in May 2019

**Ricardo Leite**

Head / Started in June 2019

**Carla Rodrigues**

Technician Left in July 2019

**Cathy Paulino**

Technician / Started in October 2019

## Flow Cytometry

HEAD

**Marta Monteiro**

Service with state-of-the-art flow cytometry techniques and instrumentation, develop and implement new methods and solutions to support project development, offers scientific and technical support, promotes advanced training and the best practices in Flow Cytometry.

### / Highlights

The FLxFlow network became part of COLife, officializing the initiative of co-operation between the flow cytometry core facilities of the four major biomedical institutions in the Lisbon area.

FACILITY MEMBERS IN 2019

**Mariana Fernandes**

Flow Cytometry Research Support Specialist | Left in October

**Inês Almeida**

Flow Cytometry Research Support Specialist | Left in March

**Ana Teresa Branco**

Flow Cytometry Research Support Specialist | Started in May

**Denise Brito**

Flow Cytometry Research Support Specialist | Started in September

## Electron Microscopy

HEAD

**Erin Tranfield**

Equipped with two transmission electron microscopes able to perform 2D and 3D imaging, the EM helps national and international scientists to apply a wide variety of electron microscopy approaches. From simple negative staining experiments to more complex experiments like high pressure freezing and freeze substitution of very delicate samples, the facility offers users multiple approaches for sample preparation, allowing experiments to be tailored to exactly the question under investigation. They also offer the option for new users to be trained on all aspects of electron microscopy.

### / Highlights

Erin, the facility head, was elected President of SPMicros (Portuguese Microscopy Society) for 2020 and 2021.

FACILITY MEMBERS IN 2019

**Ana Laura Sousa**

Technician

**Sara Bonucci**

Technician | Left July 2019

## Antibody Service

HEAD

**Jocelyne Demengeot**

The facility provides support to researchers wishing to produce, purify and label monoclonal antibodies (mAbs). It also maintains a collections of hybridomas, purified antibodies, and coupled antibodies for IGC researchers. Services include all the steps in quality control of hybridomas and in vitro purified antibodies and other techniques.

FACILITY MEMBERS IN 2019

**Ana Regalado**  
Lab Manager and Technician

## Model Organism Facility

HEAD

**Manuel Rebelo**

The Model Organism Facility provides infrastructure and services for model organism based research at the IGC, including Mouse, Aquatic (zebrafish and frog), Fly, and Plant Facilities. This facility seeks to integrate management of the different model facilities, namely by sharing technological development and good practices among different animal and plant models. The staff guarantee: husbandry procedures; general maintenance of facilities and equipment; advanced services, such as Rederivation, Cryopreservation or Gnotobiology; production of germ-free animals; assistance to researchers; colony maintenance; animal importation and exportation; organisation of Laboratory Animal Science (LAS) Courses; and support on legal issues.

### / Highlights

This unit has integrated the Plant Facility in the Core Animal House structures and implemented an Animal Welfare Office. Furthermore, this unit organized of the 1st Course on Mouse Assisted Reproductive Techniques in Portugal.

FACILITY MEMBERS IN 2019

**Joana Bom**  
Manager of the Mouse Facility (IGC)

**Ana Cristina Borges**  
Manager of the Aquatic Facility (IGC)

**Liliana Vieira**  
Manager of the Fly Facility (IGC)

**Vera Nunes**  
Manager of the Plant Facility (IGC)

**Sandra Crisóstomo**  
Technician (IGC)

**Maysa Franco**  
Technician (IGC)

**Ana Sofia Leocádio**  
Technician (IGC)

**Carina Monteiro**  
Technician (IGC)

**Marília Pereira**  
Technician (IGC)

**Pedro Pinto**  
Technician (IGC)

**Ana Ribeiro**  
Technician (H2020-INFRADEV)

**Inês Santos**  
Technician (IGC)

**Liliana Vale**  
Technician (IGC)

**Adérito Vieira**  
Technician (IGC)

**Ana Raquel Machado**  
Technician (IGC) / Started in May

**Carla Almada**  
Animal Care Staff (IGC).

**Cláudia Gafaniz**  
Animal Care Staff (IGC)

**João Lopes**  
Animal Care Staff (IGC)

**Lévi Pires**  
Animal Care Staff (IGC)

**Marco Rocha**  
Animal Care Staff (IGC)

**Mário Rocha**  
Animal Care Staff (IGC)

**Carine Santos**  
Animal Care Staff (IGC)

**Rodrigo Pires**  
Animal Care Staff (IGC) / Started in April

**Rute Marques**  
Animal Welfare Officer / Started in January





## SERVICES

# 13

NUMBER  
OF SERVICES

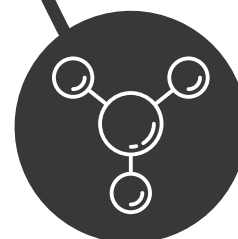
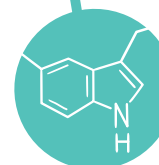
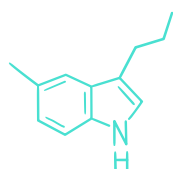
The 13 services available at the IGC guarantee the support to all research activities. From administrative support to project management, the services teams work daily and close with all the research groups and facilities heads with one main focus: to promote the excellent science produced at the IGC.

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STAFF

Leading innovation actions, funding support, events organization or managing projects, the different teams gather more than 50 people dedicated to accomplish the strategy designed by the Board.

- Administrative Unit
- Biosafety
- Events & Welcome team
- Human Resources
- Informatics
- Innovation
- Institutional Communication
- Maintenance
- Procurement
- Project Management & Accounting
- Public Engagement
- Research Funding Affairs
- Technico-Scientific Support







## RESEARCH STRUCTURES

Four research structures of the IGC are included in the National Roadmap of Research Infrastructures.

### BIODATA.PT

Is the Portuguese Infrastructure for Biological Data, operating the Portuguese node of ELIXIR - European Distributed Infrastructure for Biological Data. It supports the research strategy and programs of the national scientific system through a distributed computing infrastructure and a network of bioinformatics and data management experts, promoting scientific research in the agri-food and forestry, sea and health sectors. Co-coordinated by the IGC and INESC-ID, it is a Consortium of 12 Portuguese organizations, from Braga to Algarve.

### PPBI PORTUGUESE PLATFORM OF BIOIMAGE

The Portuguese Platform of Bioimage is a common functional platform dedicated to promoting the technical integration and centralized management of shared resources in bioimaging. Organized as a consortium of top research universities and institutes in Portugal, the PPBI services focus on advanced microscopy and processing/analysis of images in the life-sciences, from cell & developmental biology, neurosciences, oncobiology, immunology, infection, and regenerative medicine. Currently, PPBI consists of 16 Nodes distributed by 3 regional poles (DOURO & MINHO, MONDEGO & BEIRAS, TEJO & ALGARVE), comprising more than 100 high-end equipment resources supported by Ph.D. experts in bioimaging. Access to PPBI resources and services is open to all scientific community, as well as industry.



## **GENOMEPT NATIONAL FACILITY FOR GENOME SEQUENCING AND ANALYSIS**

A distributed genome sequencing and analysis infrastructure integrated in the Portuguese Roadmap of Research Infrastructures. It congregates over 50 researchers and technical personnel and amasses important bioinformatics expertise into a single genomics consortium. GenomePT provides sequencing and bioinformatics services for genome projects coordinated by national and international partners, including the national health service, food, pharma, biotech, paper, wine and fishing industries. The main mission is to build the research capacity and align research strategy with Regional and National development priorities to make tangible contributions to regional development, the national economy and fixation of highly qualified human resources in Portugal.

## **CONGENTO CONSORTIUM OF GENETICALLY TRAC- TABLE ORGANISMS**

Portuguese Research Infrastructure for technology development across animal models, providing state-of-the art services, such as Maintenance and hosting of genetically modified lines; Generation of new genetic lines and technologies; Assisted Reproduction Services; Generation of germ-free mice and Gnotobiology; Continuous education and certification in animal research and technology.

# Graduate Education and Training

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## TRAINING PROGRAMME

The IGC offers outstanding training opportunities for scientists at all career stages to develop themselves and their research. An International and multidisciplinary approach that reflects a community of different professional backgrounds, nationalities and age groups. Academic and scientific training is provided with total access to the latest technological and knowledge advances.

From Masters to Postdoctoral Training Programmes, at the IGC scientists are motivated to boost their career perspectives and are encouraged to become successful independent researchers.

**3** / PHD PROGRAMS

**1** / ADVANCE TRAINING PROGRAM

**1** / UNDERGRADUATE PROGRAM

**30** / COURSES

**4** / WORKSHOPS

**102** / PARTICIPANTS  
(67 NATIONAL AND 35 INTERNATIONAL)

## Undergraduate Summer School Programme

### SCIENTIFIC COORDINATION

**MARIA JOÃO AMORIM,  
LUÍS TEIXEIRA  
& GABRIEL MARTINS**

### TRAINING OFFICER

**ANA ARANDA DA SILVA**

In 2014, the IGC and University of Oxford ran a programme aiming to bring young science undergraduates to the IGC for a lab experience.

Since then, this programme has expanded to accommodate undergraduates studying in diverse universities in Europe and also from the Lisbon area, including Universidade Nova de Lisboa, Universität Karlsruhe, Pierre and Marie Curie University, Poznan University of Life Science, University of Belgrade, University College London among many others. In 2019, 12 students were selected to work in the labs of 9 different IGC researchers. The programme started in July with a week of classes, followed by lab work and a final project presentation. The programme had great positive feedback from all the students.

### HOSTING GROUPS

**/ Maria João Amorim**  
Cell biology of viral infection

**/ Mónica Bettencourt-Dias**  
Cell Cycle Regulation

**/ Claudia Bank**  
Evolutionary Dynamics

**/ Pedro Faísca**  
Histopathology

**/ Isabel Gordo**  
Evolutionary Biology

**/ Vera Martins**  
Lymphocyte Development  
and Leukemogenesis

**/ Raquel Oliveira**  
Chromosome Dynamics

**/ Luís Teixeira**  
Host-Microorganism Interactions

**/ Erin Tranfield**  
Electron Microscopy

## PhD Programme in Integrative Biology and Biomedicine

### SCIENTIFIC COORDINATION

**ÉLIO SUCENA  
& ALEKOS ATHANASIADIS**

### TRAINING OFFICER

**ANA ARANDA DA SILVA**

The IGC PhD Programme offers the opportunity, to a selected group of students, to learn biology from a combination of resident Institute researchers and invited faculty from many of the world's most prestigious scientific institutions. Students benefit from an intensive academic semester before choosing research groups to join, and writing their thesis projects. Candidates hail from all over the globe, and diverse academic backgrounds.

The 2019 class maintains its international collaboration with the University of Cologne, and the Max Planck Institute for Plant Breeding Research, as well as local partnerships with the Champalimaud Research (Champalimaud Foundation) and the Instituto de Tecnologia Química e Biológica (ITQB-UNL). Students also benefit from many educational courses and workshops throughout their PhD, including our popular bioinformatics training programme, weekly seminars and an annual retreat. Graduate students drive social life at the Institute, organising cultural events all year round.

The IBB programme is supported by the Fundação para Ciência e a Tecnologia and the Calouste Gulbenkian Foundation and its students are awarded their degrees from the Universidade Nova de Lisboa.



## PhD Program Biology at the Host Microbe Interface

### SCIENTIFIC COORDINATION

**ADRIANO HENRIQUES** (ITQB)  
DIRECTOR

**MIGUEL SOARES** (IGC)  
**MARIA MOTA** (IMM)  
VICE DIRECTORS

### TRAINING OFFICER

#### ANA ARANDA DA SILVA

The Biology at the Host Microbe Interface (INTERFACE) PhD program was created on the premise that understanding the general principles guiding host-microbe interactions is a major scientific endeavor per se with a potential global translational impact on therapeutic intervention against infectious as well as non-communicable diseases. The INTERFACE PhD program aims at fulfilling a current gap of knowledge at the interface of these multidisciplinary scientific areas.

The INTERFACE program brings together three internationally renowned institutions in the Lisbon area, with strong proficiency in the field of host-microbe interactions: Instituto de Tecnologia Química e Biológica (ITQB NOVA), Instituto Gulbenkian de Ciência (IGC) and Instituto de Medicina Molecular (iMM).

ITQB/IGC/iMM provide the Interface program with a rich and exciting training and research environment that can be easily adjusted to specific expectations and needs. The Interface students are exposed to a culture of rigor, excellence, innovation and cutting-edge performance at the research, training and administrative levels, that characterizes the three Institutions.

The program has close ties with biopharmaceutical companies and also with the European Centers for Disease Control and Prevention, which adds to the pool of training opportunities for students.

## Postdoctoral Programme Biology by Numbers

### SCIENTIFIC COORDINATION

**ISABEL GORDO**

### TRAINING OFFICER

#### ANA ARANDA DA SILVA

The Postdoctoral Programme Biology by Numbers is a crossdisciplinary programme for PhD holders from Exact Sciences & Engineering with little knowledge and/great curiosity for fundamental biological questions.

Selected Postdoctoral researchers are offered advanced courses, starting in September 2019, covering both basic concepts and cutting-edge research in modern biology. Module topics range from structural and molecular biology to evolution and ecology and are taught by IGC faculty and invited lecturers from top universities and research institutes all over the world.

At the end of the proposed classes, postdoctoral researchers will develop a research proposal with the support of their chosen IGC principal investigators in order to apply for extramural fellowships.

## Gulbenkian Training Programme in Bioinformatics

### SCIENTIFIC COORDINATION

**PEDRO L. FERNANDES**

The GTPB runs face-to-face Bioinformatics Training Courses regularly at the Instituto Gulbenkian de Ciência since 1999. Up to now, more than 5400 course participants have acquired practical skills that they can use with a high degree of independence.

The Programme consists of a series of short, intensive hands-on courses delivered and fully documented in English. The design of the courses is based on sets of carefully chosen exercises, flanked by short lectures and participative interaction sessions. The training methodology is based on active learning principles. A set of courses addresses recognised needs in a stable manner, whereas new themes are introduced each year to allow for novel areas where Bioinformatics is making new impacts.

The active learning methods maximise participant engagement with group work and instant feedback. The participants are led to a continuous self-assessment that gauges the accumulation of skills and the degree of confidence in using them without help. The questionnaires at the end of each course are used to plan future editions and to evaluate participant satisfaction.

# Bringing Science to Society

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#### MEDIA

**349 / 16**  
IGC in the news / Press Releases

#### LINKEDIN

**11.546** <sup>32%</sup>

#### TWITTER

**6.094** <sup>32%</sup>

#### FACEBOOK

**36.657** <sup>2%</sup>

## Bringing science to society

63

## CITIZEN SCIENCE PROGRAMME

In April 2019, the IGC, ITQB NOVA and Oeiras City Hall initiated a new citizen science programme, that aims at establishing science as a tool that citizens can use in the construction of a healthy and sustainable future.

This programme, funded by Oeiras City Hall, will promote an open dialogue between citizens, scientists and politicians, through citizen fora and other initiatives. It will also foster an active citizenship, through the development of citizen science projects that engage citizens in the discovery of science. In the first months, new partnerships with diverse stakeholders including the educational start-up, INOVlabs, and the public schools of Oeiras were established. In 2019, further external funding was pursued with the application to a national grant and to two grants from European programmes.



## SCIENCE EDUCATION PROJECTS

**602** / Students involved

**17** / Schools

**56** / Researchers & Science communicators involved

## EVENTS 2019

**8** / Events

**1710** / People Reached

**70** / Researchers Involved

### SCIENTISTS GO TO SCHOOLS

300 students across 13 schools.

### SCHOOL VISITS TO THE IGC

72 students from High schools visited the IGC.

### JOB SHADOWING SCIENTIST FOR A DAY

54 students, from 13 municipalities, enrolled in this programme during Easter, Summer and Christmas school break.

### LAB CHAT

Paula Duque talked with 26 students from a school from Vila Flor that participated in this programme.

### SCIENCE FAIRS AT SCHOOLS

IGC scientists and science communicators took a live exhibition of butterflies to the science fair and engaged the students in a game, entitled "Camouflage", to explore concepts of genetics and adaptation to the environment. The Science Fair was organised by the Parents Association of the Joaquim de Barros Primary school in Paço d'Arcos.

### MICROSCOPY DAY - MICRODIA

23 May

### FASCINATION OF PLANTS DAY

17 May

### INTERNATIONAL MICROORGANISM DAY

17 September

### SCIENCE AT OEIRAS CAPITAL DO NATAL

14 and 15 December

### IGC AT NOS ALIVE MUSIC FESTIVAL

11-13 July

"Science Alive" stand, a live installation made out of the model plants used at the IGC that were cultivated in petri dishes: *Arabidopsis thaliana* and *Physcomitrella*. The installation was the trigger to a series of hands-on activities and conversations that explored how fundamental research can impact on societal problems. Every year, the partnership between IGC and Everything is New, awards two NOS Alive – IGC Research Fellowships to young Portuguese graduates who wish to start a scientific career. Twenty Graduates students have already benefited from the NOS Alive – IGC Research Fellowships.



## INTERNATIONAL DAY OF IMMUNOLOGY

29 April

Students interacted with scientists in lectures, hands-on activities and visits to the IGC laboratories. In the evening, citizens participated in a broad discussion over research in immunology, an event that gathered scientists from IGC, CEDOC and IMM at the Palace of Marquis of Pombal.

## "BRAIN - WIDER THAN THE SKY" EXHIBITION

1 and 2 June - 120 people

Satellite events to the exhibition organized in the Gulbenkian Garden: 4 science stories, written and read by IGC scientists and a Speakers' Corner hosting IGC scientists that talked about obesity, cerebral malaria and the social brain.

## IGC AT THE EUROPEAN RESEARCHERS NIGHT

27 September - 250 visitors

The "Tower of Knowledge" was a game the public was invited to play: to alert on the importance of fundamental research in a developed society.

# ART & SCIENCE PROJECTS

## ARTIST IN RESIDENCE: ALAA ABI HAIDAR

From December 2018 to May 2019, the IGC hosted ALAgrApHY, artistic name of Alaa Abi-Haidarn. ALAgrApHY explored artificial intelligence-generated art to create "Collective Brain X", a piece shown at the "Brain - wider than the sky" exhibition at the Calouste Gulbenkian Foundation. The artist also created "Histology of histologies algorithmic art", a triptic that shows a progressive reassembly of a histological image. In addition, ALAgrApHY produced a short film entitled "A short walk between Self and Non-self: AI, Art and Science at IGC". This film was selected to the BIO·FICTION Science Art Film Festival.

# PROGRAMMES WITH TEACHERS

## LAB IN A BOX PROJECT

"Lab in a Box" is an educational project that promotes the appropriation of scientific methods and "hands-on" experimental learning as tools for development of critical thinking in school children, with the long-term aim of building a more informed and participative society. The kit was put together by volunteer IGC scientists with the purpose of making experimental biology, ecology and physics classes more readily available to 7<sup>th</sup> through 12<sup>th</sup> students in African Portuguese-Speaking countries (PALOP). First implemented in 2016, with a series of teachers training courses in Cape Verde, in 2019, a teachers' training course was held in Mindelo, Cape Verde, reaching about 30 Physics-Chemistry teachers. This course was taught by partner scientists from the Instituto Superior Técnico (IST) and the IGC.

Moreover, the "Lab in a Box" (LiB) project was galvanized in early 2019 by having secured funding from both the Oeiras City Hall and from the Merck Family Foundation, and by the recruitment of a small, full-time team of IGC scientists and science communicators. This team is newly developing and adapting the project to suit the needs of primary school children from the 4<sup>th</sup> through the 6<sup>th</sup> grade in the Oeiras municipality, while also expanding the project to two new PALOP countries: Angola and São Tomé e Príncipe. More than a box of materials and protocols, the current instalment of the "Lab in a Box" project aims to actively engage teachers in the co-creation of the LiB experimental science tools, and is heavily invested in providing constant support and follow-up with teachers that undergo the Lab in a Box training.

## WORKSHOP FOR TEACHERS: "INSPIRAR CIÊNCIA 2019 - GENETICS"

15 teachers in 2019

A 4-day practical workshop for high-school biology teachers focused on the most recent research and experimental protocols. This year edition focused on Genetics and combined informal lectures, laboratory sessions and group work to produce lesson plans.

## COLLABORATION IN SCHOOL PROJECTS

5 biology teachers requested *Drosophila melanogaster* and food to implement genetics experiments in the classroom.

## COORDINATION

/ Ana Morais

## EDITORS

/ Joana Carvalho


/ Joana Saraiva

/ Alexandra Caetano

## LAYOUT AND DESIGN

SMASH CREATIVE AGENCY

[www.smash.pt](http://www.smash.pt)

 Twitter - @IGCiencia

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 LinkedIn - Instituto Gulbenkian de Ciencia

All the information available on the report was shared by the Researchers, facilities and services heads who we are thankful for the help.

The Instituto Gulbenkian de Ciência (IGC) Annual Report is available to download from the IGC website at:

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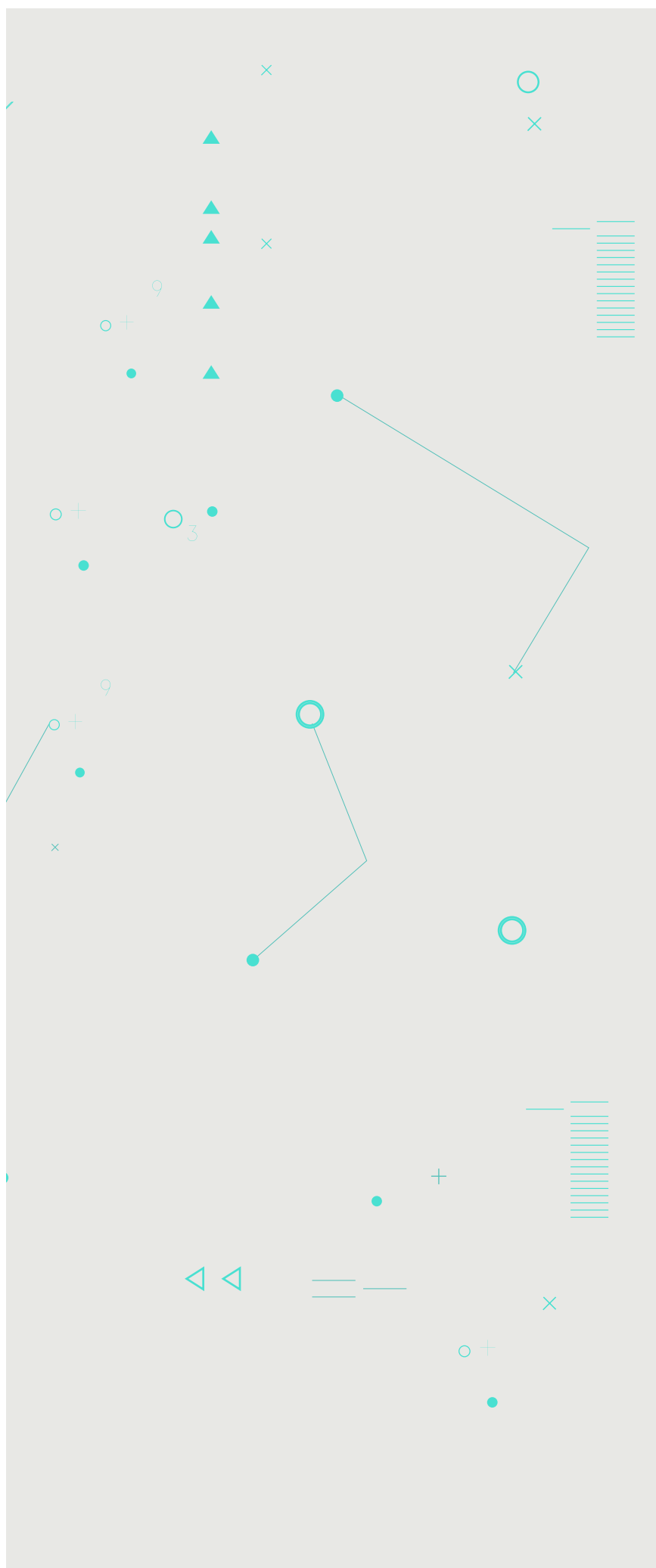
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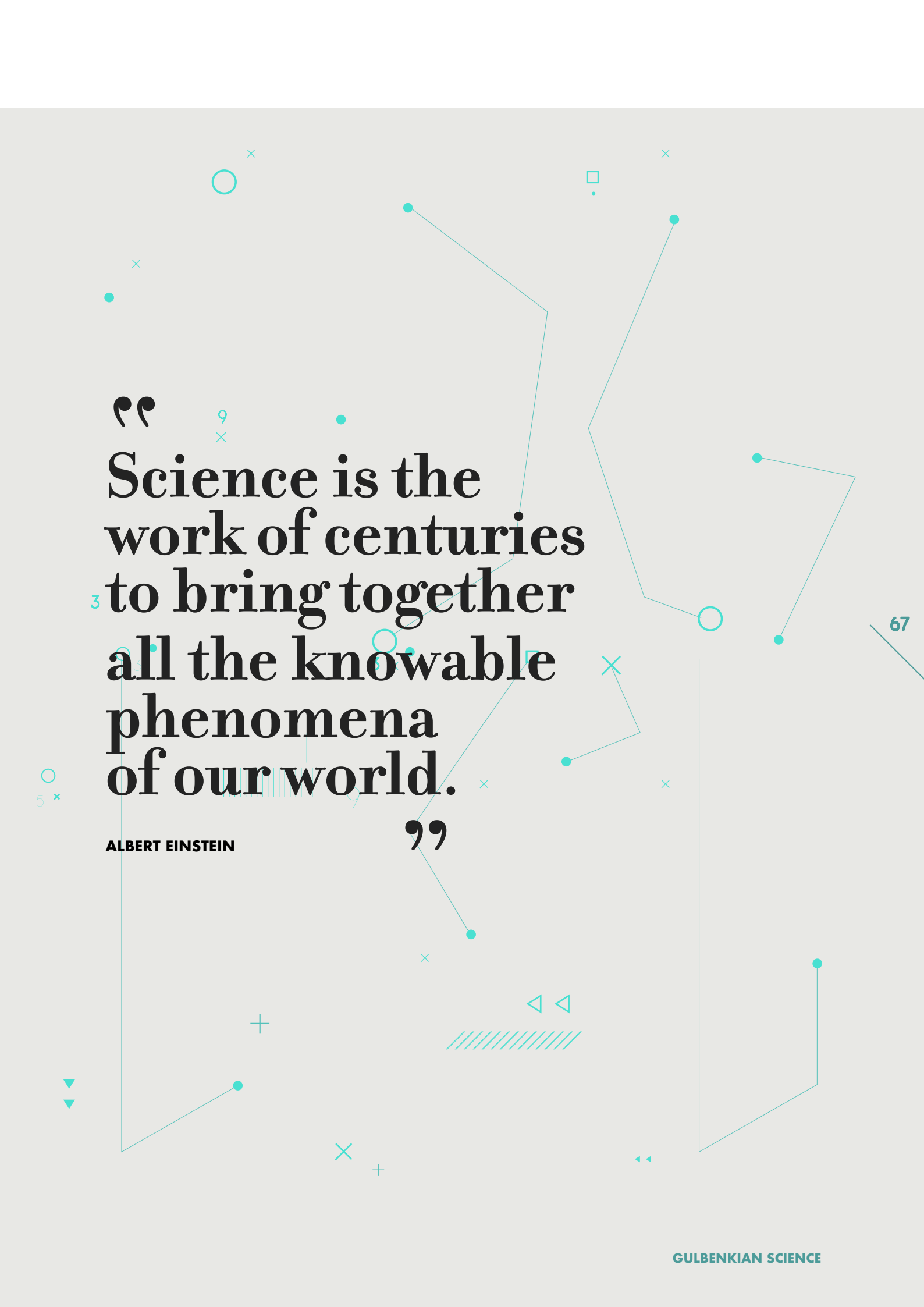
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“  
Science is the  
work of centuries  
to bring together  
all the knowable  
phenomena  
of our world.”

ALBERT EINSTEIN



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