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IGC Direction Statement
2020, A YEAR OF CHALLENGES AND OPPORTUNITIES

2020 was a year of challenges and accelerated change. The COVID-19 pandemic shaped the year in science, from campus shutdowns and moving all our meetings to the virtual world, to scientists being daily in the news, to the breathtaking speed of deployment of science that led to the new mRNA vaccines. As scientists and citizens, it is now time to reflect on the lessons learnt from this recent transformation of our lives and which future we wish to build for science and society.

As the pandemics unfurled, the Gulbenkian Foundation was one of the first foundations to react, acting within its fields of intervention. IGC played an important part in this effort and we are very proud of our achievements. In early March 2020, while closing the institute for 6 weeks for all non-urgent activities, several IGCers generously volunteered and/or redirected their work for a large COVID task force led by José-Lyn Demengeot and Carlos Penha Gonçalves (see timeline on pages 24 and 25). From developing and implementing diagnostic tests and virus sequencing, to studying virus evolution and our immune response to it, it became clear that an institution like the IGC, which focuses on fundamental basic research, has much to offer society not just through producing knowledge but also by helping to manage and solve immediate societal crises. In particular, the IGC’s collaborative spirit and diverse expertise in evolution, immunology, virology and its genomics facility were critical to help tackling this pandemic. As a result of these activities, IGC is responsible for more than 15% of all SARS-CoV-2 sequences in Portugal, has a large national cohort of people being followed to study the efficacy of vaccination, and implemented a screening strategy to identify infected people within the IGC using saliva. Our scientists were frequently interviewed by the media, organized and participated in webinars and other activities to fight the spread of misinformation, the other deadly “virus” that we are facing in this pandemic.

However, despite all these obstacles, we managed to make 2020 more than just “the year of the pandemic”. 2020 was also a year of achievements in our science, as well as adapting and rethinking on how we want to do science. It was a good year for scientific recognition and grants successes: Caren Norden and Luis Teixeira were elected EMBO members. M João Amorim, Raquel Oliveira, Ricardo Henriques and Elias Barriga were awarded ERC grants and Miguel Soares was awarded the first ERC-Oeiras award.

However, 2020 also bore some sad news for all at IGC as we lost our colleague Alekos (see page 58), a very creative and generous colleague and friend that contributed to the work of so many at the IGC. We are forever grateful to Alekos for his generosity and will always remember him for his passion and insightfulness when discussing science.

For keeping the IGC running against all odds, one of the biggest challenges was to move internal and external meetings to the virtual or semi-virtual world. We needed to ensure cohesiveness, keep the IGC spirit alive and prevent further delays in our science. From communication to funding, biosecurity and training, all units found new strategies to contribute to the well-being of IGCers and to ensure the continuation of our activities, on top of contributing to society.

Caren Norden, together with the training unit and the events team, organized a virtual SAB visit which was important for all members of IGC to keep the input of this important advisory body. They also organized the first ever virtual recruitment symposium that led to the recruitment of four new group leaders: Pablo Sartorí, Marco Fumasoni, Giulia Ghedini and Waldan Kwong. An experience that we might even, in amended form, carry into the future. We hosted EMBO virtual meetings, defended virtual PhD thesis exams, and engaged in hybrid PhD classes. This was not easy, but forced us to test new and more sustainable and creative ways of running events. This type of adaptation was already part of our mid-term strategy and the pandemic forced us to speed up its general implementation. We are now running hybrid events in our patio, from lab meetings to seminars, using new outdoor screens.

Another brighter side was that the pandemic accelerated many of our strategic goals defined in 2018. Those included networking with other international scientific organizations to accelerate discovery, as well as to better connect science with society towards science democratization. In 2020 we started to intensify our connection with EMBL and its large network of scientists and infrastructures, by starting a twinning networking grant headed by Luis Teixeira. We also signed a Memorandum of Understanding with EMBL towards strengthening our collaboration, a prospect we are very excited about. COVID-19 led us to establish new and strengthened already existing links with hospitals and industry. We also created a BSL3 facility to study pathogenic organisms such as SARS-CoV-2. Through the leadership of a consortia (Serology-4Covid) composed of 5 Institutes in the life sciences in the Lisbon area, IGC licensed its first diagnostic test to a company.

While COVID-19 highlighted the importance of communicating science to the lay public, it also exposed the long road ahead of us to make the benefits of science accessible to all. Science institutions, in collaboration with other societal stakeholders, have an important responsibility in promoting science democratization so that everyone can improve their health and well-being through science. In 2020, our projects to promote engagement with science sponsored by Gulbenkian, the Oeiras city council and MERCK family foundation engaged many pupils, teachers, citizens and scientists, including those from lower income countries. While the main mission of the IGC is without doubt its scientific one, which is understanding of the world within and around us, our societal mission has become even more relevant during this pandemic and will stay like this also beyond.
Organisation

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 respond 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.
Scientific Advisory Board

The Scientific Advisory Board comments and consults on 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 Jaechle
President
(Max Planck Institute, Göttingen, Germany)

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

Joe Bury
(VIB, Flanders, Belgium)

Leslie Vosshall
(Rockefeller University, New York, USA)

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

Nancy Moran
(University of Texas, Austin, USA)

Patrick Cramer
(Max Planck Institute)

Akiko Iwasaki
(Yale University, New Haven, USA)

Mónica Bettencourt-Dias
Scientific Director

Manuel Schmidt
Managing Director

Élio Sucena
Deputy Director for Science

Caren Norden
Deputy Director for Science
GULBENKIAN SCIENCE

ANNUAL REPORT 2020

IGC IN NUMBERS

PEOPLE
394
F:235 | M:156

RESEARCHERS
254
F:157 | M:97

GROUP LEADERS
29
F:12 | M:17

MASTER STUDENTS
28
F:6 | M:22

PhD STUDENTS
87
F:52 | M:35

POSTDOCS
101
F:66 | M:35

VISITORS
32
F:6 | M:22

CORE FACILITIES
10
SERVICES
12

COLLABORATIONS WITH OTHER INSTITUTIONS:
81 National
131 International

THESES IN 2020
12

PUBLICATIONS
131

PRIZES & HONOURS
24

SEMINARS & MEETINGS
58 National
188 International

TALKS ORGANIZED
246

NUMBER OF PROJECTS
158

Funding 2020
18,100 k€

52% / 48%

Core funding | External funding

EU funding
14

FCT funding
49%

International funding
18%

Other
18%

NEW PROJECTS IN 2020
37

NATIONALITIES
46

PORTUGUESE
71%

INTERNATIONAL
29%

IN THE LAST 7 YEARS
959

PUBLICATIONS
1,024

IN THE LAST 7 YEARS
131

PUBLICATIONS
928
**NEW CALL FOR GROUP LEADERS**


Series of concerts with science where also participated Louãres Choho & Bia Oliveira.

**IGC ORGANIZES THE FIRST CITIZEN ASSEMBLY WITH THE Oeiras City Council.**

**ANTONIO COUTINHO FELLOWSHIPS AWARDS CEREMONY**

**SARS-CoV-2 REACHED PORTUGAL AND LOCKDOWN STARTED**

**ELIAS BARRIGA AWARDED WITH A "LA CAIXA" FOUNDATION JUNIOR LEADER FELLOWSHIP**

**VIRTUAL SAB MEETING TOOK PLACE FOR THE FIRST TIME IN THIS FORMAT.**

**ISABEL GORDO AND KARINA XAVIER ELECTED AS NEW MEMBERS OF THE EUROPEAN ACADEMY OF MICROBIOLOGY.**

**IGC WINS ACCESS CULTURE AWARD FOR SCIENCE ALIVE EXHIBITION**

**IGC PROVIDES RESOURCES TO HOSPITALS DURING THE PANDEMIC.**

**SEROLOGY COVID CONSORTIUM LED BY IGC DEVELOPS SEROLOGICAL TRIAL FOR THE PORTUGUESE POPULATION.**

**HOW DO PLANTS GROW, NATURE CELL BIOLOGY PAPER FROM JORG BECKER REVEALS MORE INFORMATION ON THE CAPACITY OF PLANTS, IDENTIFIED AS "EPIGENETIC MEMORY".**

**IGC STARTS COVID-19 PREVALENCE STUDY IN HEALTHCARE PROFESSIONALS.**

**FIRST SARS-CoV-2 VIRUS SEQUENCED AT IGC.**

**NATIONAL SEROLOGICAL ROADMAP PROPOSED BY IGC.**

**EPILOGUE**
GROUP OF RESEARCHERS, FROM SIX COUNTRIES, INCLUDING LOUNÈS CHIKHI, IDENTIFIED A NEW POPULATION OF MOUSE LEMURS (MICROCEBUS) THAT INHABIT THE MADAGASCAR FORESTS.

VERA MARTINS, IDENTIFIED A GROUP OF CELLS THAT REGULATES THE DEVELOPMENT OF A PARTICULAR TYPE OF CELLS OF THE IMMUNE SYSTEM – THE T LYMPHOCYTES. STUDY PUBLISHED IN CELL REPORTS.

RESULTS OF THE SEROLOGICAL STUDY IN ALMEIRIM TO DETERMINE WHETHER THE POPULATION HAD BEEN EXPOSED TO THE SARS-COV-2 VIRUS.

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2020 and COVID-19 Efforts
ANNUAL REPORT 2020

2020 AND COVID-19 EFFORTS

An atypical year, completely dominated by science.

An invisible, silent element, moving at an unprecedented speed, with worldwide repercussions at the socio-economical, environmental, and public health levels, seemed like a foretold future.

It arrived in the end of 2019 and changed our lives forever.

A virus that managed to mobilize the whole scientific community, on an unprecedented demand.

The IGC participated in the negotiation of more than 70 agreements, among which were scientific and technological collaborations with hospitals (CHL, Hospital de São João, Hospital G. C. Malix, CHLU, among others) and companies.

The IGC released the virtual tour to take advantage of the science exposure and allow the society to get to know more about research and the scientific process behind fundamental research.

The first cases marked the Portuguese agenda. Lockdown was declared and IGC scientists assembled a volunteer COVID-19 task force led by Mónica Bernardino and Miguel Cunha-Correia. IGC scientists integrated laboratories of hospitals and ensured an increased testing capacity. IGC performed over diagnostic PCR 10,000 tests.

The first samples of the SARS-CoV-2 virus were sequenced at the IGC and over seven months more than 40 viruses analyzed. A process that was built with health authorities, optimizing the technological platforms and international cooperation.

The launch of the COVID-19 prevalence study in healthcare professionals, which aimed to know more about the SARS-CoV-2 virus.

The SARS-CoV-2 vaccine was authorized.

SeroLogic4 COVID was launched. The proposal, led by IGC, suggested a cycle coordination between public services and other partners, ensuring a robust response of the country to the pandemic.

The atypical year, completely dominated by science.
FIGHTING MICROBES WITH MICROBES

The findings published on *Nature Microbiology* revealed that the presence of the low abundant bacterium, member of the microbiota, *Klebsiella michiganensis* was sufficient to explain the resistance to invasion by other bacteria like *E. coli* or *Salmonella* because it can metabolize nutrients available in the intestine more efficiently, competing against potential invaders and preventing the entry of other bacteria that can harm the host.

The increasing consumption of antibiotics is a public health problem that can compromise the effectiveness of future treatments, highlighting the importance of the identification of bacteria and mechanisms that can minimize the negative effects associated with their consumption. Karina Xavier, leader of the IGC research group responsible for the study, reinforces that “in the future, what is desirable is that anytime we use antibiotics we also take complements that can restore the microbiota and potentiate the beneficial effects it entails. For that, the identification of super competitive bacteria like this one is essential”.

STUDY PROPOSES “MICROBIAL NOAH’S ARK” PILOT PROJECT

A new study finds that proposal to create a “microbial Noah’s ark” to protect the long-term health of humanity is feasible and should move forward into a pilot project phase, that would include installing infrastructure to store microbes in a site such as Norway or Switzerland and a collaboration for collecting samples all over the world. The Rutgers University’s initiative will give an important contribution to the health of future generations, safeguarding microbes’ diversity. Karina Xavier and Luís Teixeira, principal investigators at Instituto Gulbenkian de Ciência, integrate the scientific experts panel and will promote the collaboration with Portuguese-speaking countries in the sample collection process. Instituto Gulbenkian de Ciência will have a decisive role on two fronts: by contributing with the scientific knowledge production in this research area and by enhancing the networks developed over the years by IGC’s Science for Development Programme, an advanced training programme for researchers from Portuguese-Speaking Countries in Africa and Brazil.

HORMONE INVOLVED IN OBESITY IS A RISK FACTOR FOR SEPSIS

A group of scientists, led by Luís Moita, discovered that a hormone that has been pointed out as a treatment for obesity reduces the resistance to infection caused by bacteria and is a risk factor for sepsis. The work developed in collaboration with researchers from France, Germany and South Korea was published in the scientific journal *Proceedings of the National Academy of Sciences USA*.

Sepsis is a potentially fatal illness, that derives from a deregulated response of the organism to an infection, leading to organ malfunction. With the aim of expanding knowledge about this disease, researchers investigated whether the hormone known as *GDF15* (growth and differentiation factor 15) could play a role in sepsis. This hormone has the specificity of being widely studied by several laboratories and pharmaceuticals as a treatment for obesity. "We’ve discovered a critical effect of GDF15 on infection, which is relevant because this hormone increases in many common diseases, like obesity, pulmonary and cardiovascular diseases", explained Luís Moita. IGC researcher says that “they raise the possibility that the inhibition of GDF15’s action, perhaps using a blocking monoclonal antibody, could work as a new complementary therapy for sepsis, helping to control severe local infections and preventing it to become systemic and life-threatening”.

NEW DISCOVERIES ON LEUKEMIA

Researchers led by Vera Martins, identified a group of cells that regulates the development of a particular type of cells of the immune system – the T lymphocytes. The study published in Cell Reports demonstrates that the coordination of signals followed by cells in order to ensure the maintenance of a healthy organism. The cells identified in the study integrate information regarding the needs of more mature cells and define their own development accordingly: adjusting the speed of the production of T lymphocytes and purging the system of other less efficient cells, that tend to cause leukaemia.
**ANTIBIOTIC RESISTANCE AND THE NEED FOR SPECIALIZED TREATMENTS**

Study reveals that individual microbiota determines the maintenance of antibiotic-resistant bacteria in the gut. Researchers led by Isabel Gordo have found that the microbiota of each individual determines the maintenance of antibiotic-resistant bacteria in the gut, whereas in some individuals resistant bacteria are quickly eliminated, in others they are not. The study, published in Nature Ecology and Evolution, reinforces the need to implement more personalized therapies and offers new insights to the paradigm of the evolution of antibiotic resistance in the gut. Till now, much of what is known about this process relies on studies in artificial systems, that give an incomplete overview of the phenomenon’s complexity. In order to fill this gap, researchers used mice to observe that in the gut after the antibiotic intake, the competition for survival of resistant bacteria has different dynamics overtime, depending on the host. The same resistance has different interactions which determine which lead to resistant bacteria with low survival capacity in the absence of antibiotics in one individual and to bacteria with high survival capacity in another individual. The next steps of this research will be aimed at “finding the Achilles heel of resistant bacteria in the gut, a study we are carrying out in several levels,” said Isabel Gordo, “at least one of the hypothesis is showing great results: even when they colonize the gut in a less ideal condition we are being able to eliminate them faster!”

**GENETICS OR SOCIAL ENVIRONMENT: WHO WINS IN THE INFLUENCE OF BEHAVIOURS?**

Researchers discovered that the social environment in which the individual develops can revert genetic effects of its behaviour, something particularly important to take into account when experiments resort to genetically modified animals. The study published in Elife analysed behaviours associated with oxytocin, one of the known “happy hormones”, and showed that these can be reverted in the individual, with or without oxytocin, depending on the social group it interacts with. Researchers led by Rui Oliveira studied the role of oxytocin, an important molecule for the regulation of social bonding. Using the zebrafish (Danio rerio), they aimed at understanding how social genetic effects impact the interaction between the individual and the social environment or, in this case, the shoal. For that purpose, the team used two kinds of zebrafish: ones similar to the ones found in nature and others in which the oxytocin gene was removed, thus rendered no longer functional. The results show that both the social preference and social integration and influence change depending on whether the shoal has oxytocin or not. On the contrary, it’s the genetic features of the individual that determine the ability to create memories and therefore distinguish between different shoals. These results have a special relevance when experimental models are designed by editing genes.
New Research groups
Ricardo Henriques and Pablo Sartori come to strengthen the study in New Technologies in Cell Biology and Mathematics Applied to Biology at the IGC, in line with the new scientific strategy in progress.

Ricardo Henriques, with a background in physics, soon engaged with Biology. He arrived at the IGC, coming from University College London (UCL) with a portfolio of technological tools widely used by the world scientific community. Ricardo comes to lead the research group focused on the development of new technologies that make it possible to understand cell biology and biophysics.

Pablo Sartori studied Physics at the University of Granada and soon after moved to the IBM laboratory in New York where he took his first steps in biophysics. He studied at the Max Planck Institute for the Physics of Complex Systems (MPI-PKS) in Dresden, and, following his interest in discovering more about proteins, he joined Rockefeller University in NYC where he made his postdoc. In 2020, he arrived at the IGC to lead a new research group dedicated to the study of mathematical processes associated with biological phenomena.

GROUP NAME
OPTICAL CELL BIOLOGY

RESEARCH GROUP LEADER
Ricardo Henriques 

Research Interests: the Henriques group focuses on addressing biomedical questions by exploiting advancements we develop in optical microscopy. To do so, the research team creates open technology that pushes the boundaries of cellular imaging. All their research methods are transparent, reproducible and widely available to researchers. In biology, researchers tackle broad virology, host-pathogen interactions, immunology and cell signalling questions. Researchers do so by establishing new classes of fluorescent probes, high-speed cell-friendly super-resolution methods and computational modelling approaches that, although designed to answer questions of interest in the lab, have extensive cross-disciplinary applications.

HIGHLIGHTS IN 2020
Established the laboratory at IGC; awarded ERC Consolidator and EMBO Institution Grant.

GROUP NAME
LIVING PHYSICS

RESEARCH GROUP LEADER
Pablo Sartori

Research Interests: Functionality is at the core of our understanding of biological systems. In contrast, inert physical systems lack this sense of function. Accounting for biological function thus requires a new kind of the living physics research group explains biological phenomena by exploring new regimes of statistical physics, mechanics and thermodynamics.

These are some general questions that the research group addresses:

• How are functions embedded in biological matter? For instance, how do proteins find correct partners in the heterogeneous cellular environment?
• What determines the characteristics that organisms evolve? Why some organisms evolve sensory response, whereas others evolve stochastic response?
• What are the main constraints to biological functionality? The laws of thermodynamics, the genetic code, the finite size of the proteome?
Research groups

Research Groups

29 RESEARCH GROUPS
12 M 17 F

254 RESEARCHERS
157 M 97 F

COLLABORATIONS

NATIONAL 82
INTERNATIONAL 131

SABBATICALS

5

TALKS

NATIONAL 29
INTERNATIONAL 57
Research Interests: Understanding the mechanisms of vertebrate axial extension; understanding the mechanisms regulating the transition from head to trunk development in vertebrates; understanding the role of Tgfbr1 signalling in the activation of the trunk to tail transition in vertebrates; understanding the principles governing body plan diversity among vertebrates and understanding what controls whether the clausal mesoderm makes external genitalia or legs; and the mechanisms regulating anatomical diversity in this area.

/ HIGHLIGHTS IN 2020

Researchers from Moises Mallo’s lab have shown that Tgfbr1 signalling is essential to trigger tail bud formation by activating an incomplete epithelial to mesenchymal transition (EMT); Snai1 is essential to complete the incomplete EMT that generates the tail bud; Epha1 is a marker of neurodevelopmental progenitors entering mesodermal fates; Tgfbr1 signalling is essential to establish the balance between making legs or external genitalia from the clausal region and that the IX domain of Avx1 is essential to build the mouse femoral germtail tract.

LAB MEMBERS IN 2020

André Dias (IBB 2017), PhD Student
Anastasíia Lesovska (IBB 2017), PhD Student
Patrícia Duarte (IBB 2018), PhD Student
Trín Tekicka, Postdoc
Ana Casaca, Lab Manager

PUBLICATIONS


RUNNING GRANTS

2. PTDC/BIA-BID/30254/2017: Evaluating the switch in cellular competence during the head to trunk transition.
3. EMBIO workshop on Neurodevelopmental Progenitors in Development, Evolution and Regeneration, September 8-12, 2020, virtual from Lisbon (Portugal).
RESEARCH GROUPS

PLANT GENOMICS

Jörg Becker

Research Interests: The Plant Genomics group is interested in mechanisms controlling sexual reproduction and early embryogenesis. The research team is primarily studying these processes in two plant model species: the angiosperm Arabidopsis thaliana and the bryophyte Physcomitrium patens. A particular focus of their work lies on epigenetic mechanisms acting during male gametogenesis. In Arabidopsis, the development of the male gametophyte involves reprogramming events at both genetic and epigenetic level, leading to a very distinct transcriptome in male gametophytes, accompanied by alterations in their epigenetic landscape with far-reaching implications for transposon silencing and transgenerational inheritance. The research team is analyzing how these changes come about and what are their potential consequences after fertilization. Bryophytes were among the first colonizers of land. Based on the expectation that some key components have been evolutionarily conserved, irrespective of male gametes being free swimming in extant early land plants or being delivered passively within a pollen tube in angiosperms, the moss Physcomitrium patens serves as our model to study the evolution of epigenetic mechanisms governing male gametogenesis.

HIGHLIGHTS IN 2020

The research team established ANO1T, the scaffolding protein of the CCR4-NOT complex, as an important player during gametophyte development in Arabidopsis. Their study revealed that NOT1 is necessary for cell-type- and stage-specific transitions during gametophyte development and early embryogenesis (Peres et al., Plant Journal, 103: 1289–1303 (2020)). In addition, three collaborators have yielded the following results: (1) In collaboration with the Berger lab we have shown that targeted reprogramming of H3K27me3 resets epigenetic memory in Arabidopsis sperm cells, facilitating transcription of genes essential for gametophyte development and early embryogenesis (Peres et al., Plant Journal, 103: 1289–1303 (2020)). (2) The EVOREPRO database was published, and the analysis of this extensive RNA-Seq data set revealed conserved transcriptional programs underlying organogenesis and reproduction in land plants (Jörg et al., BioRxiv, https://doi.org/10.1101/2020.10.29.361501). (3) Researchers have characterized the bicentriole-mediated pathway for de novo centriole assembly during male gametogenesis in Physcomitrium patens, including its molecular conservation (Gomes Pereira et al., BioRxiv, https://doi.org/10.1101/2020.12.21.423647).

PARCÍCIA PEREIRA (FCUL), PhD student
ANTON KERMANOV (IBB 2017), PhD student
ARMIN HORN (PhD for Life IOTB NOW), PhD student
MÁRIO SANTOS, PhD holder, Lab manager, Lab Manager

PUBLICATIONS


RUNNING GRANTS

FCT Fundação para a Ciência e Tecnologia
María Carla

NEW GRANTS IN 2020

FCT Fundação para a Ciência e Tecnologia

GULBENKIAN SCIENCE

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CHROMOSOME DYNAMICS

RaqueL Oliveira

Research Interests: During cell division, the genetic information contained in the chromosomes needs to be equally distributed to the new cells that are formed. If the distribution of the genetic material is somehow impaired, cells may obtain an abnormal number of chromosomes or even break and lose significant parts of the genome. These abnormalities are usually associated with many health conditions, such as cancer development, genetic disorders and infertility. Raquel Oliveira’s lab investigates how chromosomes are assembled and how their morphology influences the fidelity of cell division.

HIGHLIGHTS IN 2020

The research team has recently obtained exciting preliminary results and optimized novel tools to study transcription dynamics during the cell cycle. This allowed them to broaden their research interests, aiming to uncover how transcription is shut-down upon mitotic entry. This new research line was awarded an ERC Consolidator grant - ChromoSilence - in 2020. In a fruitful collaboration with the Jansen lab (Oxford), the research team has also uncovered how the centromere, a chromosome region essential for correct cell division, is smaller and weaker in stem cells, when compared to differentiated cells (Milagre et al, Open Biology 2020). These findings open new insights on why stem cells are more prone to chromosome segregation errors, one of the major limitations for their use in regenerative medicine.

LAB MEMBERS IN 2020

SALMA RAHME, MSc
CATARINA CARMO (IBB 2017), PhD Student
MARGARIDA ARAOJE (IBB 2017), PhD Student
CAROLINA PEREIRA, PhD Student
JOÃO COELHO, PhD Student
SARA CARVALHAL, PhD Student
ARUNABHA BOSE, PhD Student
INÉS MILAGRE, PhD Student
ALEXANDRA TAVARES, Lab Manager
ANA BOAVIDA, Technician
PAULA GAUTIER, Technician

PUBLICATIONS


NEW GRANTS IN 2020

ERC Consolidator Grant - ChromoSilence
Quantitative Organismal Biology

Research Group Leader: Jorge Carneiro

Research Interests: Mechanisms of biological individualization: How do cells organize into organisms. Stochastic processes as the source of organismal somatic variation.

Lab Members in 2020:
José Faro (University of Vigo), Visitor
Alberto Darszon (UNAM, Mexico), Visitor
Eleonora Tulumblea (IBB 2015), PhD student

Publications:

PLANT STRESS SIGNALLING

Research Group Leader: Elena Baena Gonzalez

Research Interests: Plant carbon management; Mechanisms underlying carbon sensing and downstream signalling; Regulation of carbon signalling pathways by hormonal and other stress signals; Role of carbon signalling pathways in central metabolism; Role of carbon signalling pathways in stress responses and development.

/highlights in 2020/

The lab team efforts thus far focus on one carbon signalling pathway mediated by the SnRK1/AMPK protein kinase. Researchers main findings this year have been: a) Besides regulating growth in response to energy signals, as in animals, the plant SnRK1-TOR module evolved to sense the photomorphogenic ABA. This innovation enabled plants to modulate growth also in response to water availability b) The mode of regulation of the plant SnRK1/AMPK kinase is, contrary to its oncopathogenic counterparts, by release of repression rather than by direct activation, adding to the increasing list of plant signalling components that show this type of regulation. c) SnRK1 is part of the Suc-T6P system (analogous to the glucose-insulin system in mammals), required to maintain Suc homeostasis. SnRK1 influences the Suc-T6P relationship and modulates the flux of carbon to the TCA cycle (in preparation). d) Nuclear import through specific nuclear pore components is essential for the regulation of stress responses and growth by the plant SnRK1/ AMPK kinase (in preparation).

Lab Members in 2020:
Bruno Peixoto (Plants for Life 2016), PhD student
Filipe Lopes (Plants for Life 2017), PhD student
Mónica Costa (Plants for Life 2018), PhD student
Diana Reis (Plants for Life 2019), PhD student
Ana Confraria, Postdoc
Leonor Margarida, Postdoc
Borja Belda-Palazon, Postdoc
Liliana Ferreiro, Postdoc

Publications:

Running Grants:
Lisboa.01-0145-FEDER-031218, Molecular mechanisms of energy management in plants, PTDC/BIA-BID/33247/2017, The role of energy signalling in shoot branching (co-PI: PI: A. Confraria, IGC)
New Grants in 2020
1) PTDC/BIA-FBT/492/2020
2) FCT Fundação para a Ciência e Tecnologia

CELL BIOLOGY OF THE VIRAL INFECTION

Research Group Leader: Maria João Amorim

Research Interests: The Maria João Amorim’s lab study host pathogen interactions and how viruses organize and utilize the cellular structure to replicate efficiently. Researchers hypothesis that lipid biomolecular condensates are global organizers of viral reactions, subjected to tight control, flexible and dynamic, and thus prone to viral targeting. Their model viruses include A virus and SARS-CoV2.

/highlights in 2020/

Maria Joao Amorim strengthen her position in the virology field as a leader in phase separated organelles in virology. Attracted competitive funding - AS PI: ERC, CEC, 1FCT grant; as collaborator - 2 FCT grants, 1 ANI grant. Contributed to IGC reputation of excellence in student training as director of the IGC summer school - this year a virtual meeting with 90 students; Increased visibility of the IGC through outreach activities; Exploded the progression, developments and challenges of SARS-CoV-2 pandemics to the public.

Lab Members in 2020:
Catarina Candeias (Internationale 2019), Visitor
Diogo Atlhaye (interface 2019), Visitor
Mariana Marques (Universidade de Aveiro), Visitor
(PhD students in collaboration with other labs)
Mónica Medina (António Courahele Award 2000), MSc
Daniela Brás (Interface 2019), PhD
Nuno Santos (FCSID 2015), PhD
Temitope Etibor (IBB 2016), PhD
Christian Divou (IBB 2019), PhD
Silvia Vale-Costa, Postdoc
Filipe Ferreira, Postdoc
Marta Alemenque, Postdoc

Publications:

Running Grants:
FCT RESEARCH/COVID 19, ANI under INOV4COVID
New Gifts in 2020
European Research Council Consolidator FCT RESEARCH/COVID 19, ANI under INOV4COVID
Events: Organized
IGC Summer School - virtual hosted 90 participants

COVID-19 Highlights:
Approval of saliva testing in Portugal for screening; Demonstration that saliva may be used for screening children in schools; Demonstration that SARS-CoV-2 variants escape neutralizing immunity by natural infection and vaccination. Three articles of high impact.
GROUP NAME: EVOLUTION AND DEVELOPMENT

RESEARCH GROUP LEADER:
Élio Sucena

Research Interests: Evolution of the immune response in insects; The mechanistic basis of disease tolerance and resistance in Drosophila; The origins of transcriptional novelty.

HIGHLIGHTS IN 2020
Highlights in 2020: Researchers led by Élio have shown that ecdysone is involved in the regulation of AMP expression upon pupariation. This expression does not depend on the presence and sensing of microbiota via conventional immune signalling pathways. In addition, they could establish that different AMPs have been co-opted to distinct tissues encompassing both systemic and local immune responses. In parallel, the research team found that individuals that do not produce AMPs exhibit higher bacterial proliferation during metamorphosis. Together, these observations support that AMP production is part of the metamorphic developmental programme. Ultimately, the researchers aim at dissecting the gene regulatory network governing this mechanism at the onset of metamorphosis and test its correlation with the evolutionary emergence of holometabolism.

LAB MEMBERS IN 2020
David Duneau, Visitor
Diogo Roque, MSc
Catarina Nunes (IBB 2016), PhD Student
Tânia Paulo (IBB 2017), PhD Student
Priscilla Akayv (IBB 2019), PhD Student

STAFF INVOLVED IN COVID EFFORTS:
Tânia Paulo and Catarina Nunes

PUBLICATIONS

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant
Consolidator Grant

RESEARCH GROUP NAME: CELL BIOLOGY OF TISSUE MORPHOGENESIS

RESEARCH GROUP LEADER:
Caren Norden

Research Interests: Morphogeneis, cells and developmental biology, zebrafish, organoids, retina, quantitative imaging.

HIGHLIGHTS IN 2020
Managed to move the rest of the lab from Dresden to Lisbon during pandemic. Published an e-Life paper and a review in Development, become EMBO member.

LAB MEMBERS IN 2020
Elsa Nerli, MSc
Jenny Kretzschmar, MSc
Louise Dogher, MSc
Mariana Maia Gil (IBB 2019), PhD Student
Lucrezia Camilla Farma, PhD Student
Karen Grace Soans, PhD Student
Mauricio Rocha Martins, Postdoc
Ana Patricia Ramos, Postdoc
Tânia Ferreira, Lab manager

PUBLICATIONS

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant
Consolidator Grant

STAFF INVOLVED IN COVID EFFORTS:
Lucas Almeida, PhD Student
Beatriz Abreu, Lab manager

PUBLICATIONS

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant
Consolidator Grant

OUTCOMES
Measurement of the mutation rate of SARS-CoV-2, estimation of genetic constraints and adaptive mutation discovery. For the Vaccine Project: Pilot test completed, expecting the results of neutralizing capacity of the antibodies.

GROUP NAME: EVOLUTIONARY BIOLOGY

RESEARCH GROUP LEADER:
Isabel Gordo

Research Interests: Study the process of adaptation in the context of ecosystems, specifically the mammalian intestine, in health and in disease conditions. Test theoretical models of adaptive evolution against genotypic and phenotypic data obtained in experimentally adapted bacterial populations.

HIGHLIGHTS IN 2020
6 publications from the lab.

LAB MEMBERS IN 2020
Scott Miller, Visitor
Luís Cardoso (IBB 2016), PhD Student
Hugo Barreto (IBB 2017), PhD Student
Massimo Amicone (IBB 2018), PhD Student
Francisco Paupério (IBB 2020), PhD Student
Nelson Fradão, Postdoc
Paulo Durão, Postdoc
Roberto Balbontín, Postdoc
Anke Konrad, Postdoc
Anastasia Kothare, Postdoc
Francisco Correaque, Postdoc
Daniela Güleresi, Lab Manager
Beatriz Abreu, Technician

PUBLICATIONS

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant
Consolidator Grant

STAFF INVOLVED IN COVID EFFORTS:
Paulo Durão, Nelson Fradão

COVID-19 COLLABORATIONS
COVID19 Research, evolution
(May 2020)
COVID19 Research, evolution
(August 2020)

OUTCOMES
Measurement of the mutation rate of SARS-CoV-2, estimation of genetic constraints and adaptive mutation discovery. For the Vaccine Project: Pilot test completed, expecting the results of neutralizing capacity of the antibodies.
**LYMPHOCYTE DEVELOPMENT AND LEUKEMOGENESIS**

**GROUP NAME**

**RESEARCH GROUP LEADER**

Vera Martins

**Research Interests**

1. Cell competition in the thymus;
2. Thymus Autonomy;
3. T cell acute lymphoblastic leukemia (T-ALL)

/HIGHLIGHTS IN 2020/

Scientific findings published:
1. Ramos et al., Cell Reports;
2. Alves et al., EJI, Historical Article;
3. Graduation of H. Nadique MSc (20/20)

LAB MEMBERS IN 2020

Marta Nogueira, MSc
Sara Azenha, MSc
Rafael Paiva, PhD 2016
Camila Ramos, PhD 2017, PhD
Ricardo Paiva, Postdoc

PUBLICATIONS

3.ewnętrzowców, a także przeciwniczy w układzie komórek. Biorxiv (2020) doi:10.1101/2020.06.04.036656

/ COVID-19 HIGHLIGHTS/

Vera coordinated, with the help of I. Mesquita (ICVS), a short communication dedicated to the National effort on Covid, covering the role of the several Research Institutes in Portugal, on behalf of the Portuguese Society of Immunology (SPI) for the European Federation of Immunological Societies (EFIS) published on the Summer 2020 NewsFlash.

STAFF INVOLVED IN COVID-19 EFFORTS:

Rafael Paiva
Camila Ramos

// COVID-19 HIGHLIGHTS

a. Together with the M. Soares’ laboratory, working on a project to characterize the pathophysiology of COVID-19 in a mouse model of the disease.

b. Together with the M. Soares’ laboratory, working on a project to identify novel candidate treatment for COVID-19, using our previous discoveries in the pharmacological induction of disease tolerance to infection.

c. Together with I. Conoda’s laboratory, working on an innovative vaccine candidate against COVID-19.

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RESEARCH GROUPS

ANNUAL REPORT 2020

GROUP NAME: MATHEMATICAL MODELLING OF BIOLOGICAL PROCESSES

Erida Gjini

Research Interests: The research group lead by Erida studies host-pathogen interactions using mathematical frameworks for a deep mechanistic understanding. Their models seek to identify and quantify fundamental principles by which diversity affects health and disease in a range of microbial ecosystems. In two pioneering studies (1), researchers have discovered the link between colonialisation and co-colonisation processes and evolutionary dynamics in interacting multispecies communities. Applications involve multi- strain infectious disease epidemiology, antibiotic resistance, microbiota dynamic resistance, and the stress-gradient hypothesis.

/HIGHLIGHTS IN 2020

After a 5 year cycle of ICG, this was the research group transition year from ICG to a new institution. The main achievement was to complete their most important publications and prepare the move to Institute Superior Tecnico, at University of Lisbon. The 4th Master student graduated, and won a PhD scholarship in Utrecht, NL. The research group hosted 2 international visits at ICG in Feb. 2020, from France and USA. The lab published 9 papers, co-authored 2 more in collaboration within ICG, and had 2 more in review in Dec. 2020. The (Madec & Gjini, 2020) BMB paper was the most downloaded paper of the journal in 2019, and had 2 more in review in Dec. 2020. The (Madero & Gjini, 2020) BMJ paper was the most downloaded article of the journal in 2020, attracting genuine interest and high attention scores.

LAB MEMBERS IN 2020

Marco António Dias Louro, PhD
Ana-Harmina Gheniu, PhD
Júlio P. Paes
Ana Yansi Morales Arcos, Postdoc
Davide Cussoddu, Postdoc
André Amado, Postdoc
Luo Lianshun (Programmer), Other
Mark Schmitz (Data Manager), Other
Ínês Borges (Bachelor Student).

PUBLICATIONS


NEW GRANTS IN 2020

HIGHLIGHTS IN 2020

In collaboration with the Bettencourt-Dias lab, the research group developed a model to describe centriole number distributions in cancer cell populations under the influence of centriole overproduction and selection. Ercan-Herbst et al., PloS Comp Biol, in press. Moreover, analyzing the fitness effects of all possible single-codon mutations in a long stretch of the heat-shock protein Hsp90 in yeast, researchers discovered the locations of hotspots of beneficial and deleterious mutations, as well as environmentally sensitive regions of the protein (Cote-Hamarlof, Fragata et al., MBE, 2020).

LAB MEMBERS IN 2020

Mónica Bettencourt-Dias, PhD
Carla Lopes, PhD
Erika de Carvalho, PhD
Catarina Gaspar, PhD
Miguel Cavadas, PhD
Christian Diwo, PhD
Mário António Dias Louro, PhD
Marco António Dias Loura, PhD
Ana-Harmina Gheniu, PhD
Júlio P. Paes
Ana Yansi Morales Arcos, Postdoc
Davide Cussoddu, Postdoc
André Amado, Postdoc
Luo Lianshun (Programmer), Other
Mark Schmitz (Data Manager), Other
Ínês Borges (Bachelor Student).

PUBLICATIONS


NEW GRANTS IN 2020

HIGHLIGHTS IN 2020


LAB MEMBERS IN 2020

Ana Rita Marques, PhD Student
Sonia Pereira, PhD Student
Erika de Carvalho, PhD
Catarina Gaspar, PhD
Miguel Cavadas, PhD
Christian Diwo, PhD
Mário António Dias Louro, PhD
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Ana-Harmina Gheniu, PhD
Júlio P. Paes
Ana Yansi Morales Arcos, Postdoc
Davide Cussoddu, Postdoc
André Amado, Postdoc
Luo Lianshun (Programmer), Other
Mark Schmitz (Data Manager), Other
Ínês Borges (Bachelor Student).

PUBLICATIONS


NEW GRANTS IN 2020

HIGHLIGHTS IN 2020


Four of our postdocs were offered positions in other Universities / Institutes in Portugal and abroad.

LAB MEMBERS IN 2020

Catarina Peneda (GABBA 2016), PhD Student
Irina Fonseca PhD Student
Marco Louro (2017 IBB), PhD Student
Sonia Pereira (2014 IBB), PhD Student
Ana Rita Marques, PhD Student
Catarina Nobile, PostDoc
Carla Lopes, PostDoc
ANNUAL REPORT 2020

GROUP NAME
HOST-PATHOGEN CO-EVOLUTION

RESEARCH GROUP LEADER
Jonathan Howard

Research Interests: Toxoplasma, Mouse, Co-Evolution. The research group works, led by Jonathan Howard, focuses on mechanisms of resistance to the ubiquitous intracellular protozoan parasite, Toxo- plasma gondii, a malaria relative, which infects about 40% of the human race. They study immunity of mice against T. gondii because the primary hosts of the parasite, in which it makes gametes and does mosaics, is cats, so the T. gondii life cycle, and its abundance in our environment, is thus driven by an infectious cycle between cat and mouse. Mouse immunity against T. gondii is based on a mechanism absent in humans, inducible IL18R (IRG proteins) that cooperatively de- stry the vacuole in which the parasite lives. This mechanism has in turn been targeted by the parasite, via a family of kinases that inactivate IRG proteins. Both the IRG proteins and the kinases are massively polymorphic, consistent with a complex co-evolutionary dynamic. Our work stretches from ecological studies on wild mice to cell biological, biochemical and structural analyses.

STAFF INVOLVED IN COVID19 EFFORTS
Tânia Perestralo, Paulo Duarte

PUBLICATIONS

LAB MEMBERS IN 2020
Ana Lina Pereira Rodrigues, PhD
Martha Catalina Álvarez Meneses, PhD
Ana Claudia da Silva Campos, Lab Manager/Research Assistant

/ HIGHLIGHTS IN 2020
Claudia Campos was part of the Team of volunteers for Covid19 diagnoses at IGC

GROUP NAME
POPULATION AND CONSERVATION GENETICS (PCG)

RESEARCH GROUP LEADER
Lounès Chikhi

Research Interests: The PCG is interested in genetic and genomic diversity. More specifically we try to understand how the patterns of genetic diversity and differentiation observed today have been influenced by the recent evolutionary history of species. The patterns we observe today are the result of a complex history that includes demographic events such as population collapses, expansions, or admixture. This also includes spatial patterns whereby pop-ulations may go through periods of connectivity or disconnection, without mentioning selection acting in complex ways across pop-ulations and genomic regions.

/ HIGHLIGHTS IN 2020
Description of a new mouse lemur species (Microcebus jonahi) + Conservation genetics of wild (e.g. orang-utans, lemurs, rodents; African pri-mates; or dolphins) and domesticated species (e.g. cattle, sheep).

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant

NEW GRANTS IN 2020
European Proteomics Infrastructure Consortium

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
Fundo Azul
ERA-NET COFUND

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RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ERC European Research Council Grant

NEW GRANTS IN 2020
European Proteomics Infrastructure Consortium
COVID-19 RESEARCH: Disease tolerance to COVID-19 (Pending BSL3 facility Installation/Approval)

GROUP NAME
HOST MICROORGANISMS INTERACTIONS

GROUP LEADER
Luis Teixeira


/HIGHLIGHTS IN 2020
Received Training Grant from EU H2020 952537. SymbioNET - Genomics and Metabolomics in a Host-Microbe Symbiosis Network. Luis Teixeira, research group leader, was elected EMBIO member.

LAB MEMBERS IN 2020
Steve Perlman (Uva Victoria, Canada), Visitor
Ana Correia, PhD
Gonçalo Matos PhD
Miguel Landum PhD
Catarina Carmo, Postdoc
Sergio López Madrid PhD
Nelson Marins, Postdoc
Miguel Miskinyte, Postdoc
Teresa Malo, Research Technician
Rafael Coreiro, Research Technician
Pedro Marinho, Research Technician
Beatriz Reis, Research Technician
Rita Valente, Lab manager

PUBLICATIONS
1. Duarte, E. H., Carvalho, A., López-Madrigal, S., Costa, J., Duarte, E. H., Carvalho, A., López-Madrigal, S., Costa, J., Teixeira, L. 2020. Forward genetics in Wolbachia: Regulation of complex networks & systems, computational & systems biology, and functional intelligence. Ongoing research ranges from biomedicine & biomedical literature & social media monitoring to understanding redundancy, robustness, malfunction & control in complex biological networks, collective intelligence on the web & in social systems, and agent-based models of evolutionary systems. We are also committed to interdisciplinary research, teaching & graduate training. Also, during the pandemic, the PI presented a complex systems perspective of the ongoing pandemic to the general public by publishing several opinion articles in leading Portuguese newspapers.

GROUP NAME
COMPLEX ADAPTIVE SYSTEMS AND COMPUTATIONAL BIOLOGY

GROUP LEADER
Luis Rocha

Research interest: The group focuses on tackling multi-level complexity involved in human health, with projects organized in three main threads: complex networks & systems, computational & systems biology, and functional intelligence. Ongoing research ranges from biomedicine & biomedical literature & social media monitoring to understanding redundancy, robustness, malfunction & control in complex biological networks, collective intelligence on the web & in social systems, and agent-based models of evolutionary systems. We are also committed to interdisciplinary research, teaching & graduate training. Also, during the pandemic, the PI presented a complex systems perspective of the ongoing pandemic to the general public by publishing several opinion articles in leading Portuguese newspapers.

/HIGHLIGHTS IN 2020
Publication in high-impact publications (such as PNAS) of research threads matured in the group over several years. Furthermore, the PI accepted a named professorship at the State University of New York in recognition of important work in complex systems and artificial intelligence.

LAB MEMBERS IN 2020
Andrea Sofia Teixeira, PhD student
Rion Brattig Correia, Postdoc

PUBLICATIONS

GROUP NAME
INFLAMMATION LABORATORY

GROUP LEADER
Miguel Soares

Research Interest: To understand the biology of inflammation and immunity as it pertains to the maintenance of homeostasis. To identify and develop therapeutic strategies with an impact on human diseases associated with major morbidity and/or mortality.

/HIGHLIGHTS IN 2020
The research group findings suggest that the positive selection of GIGA1 loss-of-function mutations in the common ancestor of Old World primates was propelled by an overall enhancement in IgG effector function, providing resistance against infection by gut bacterial pathogens that would otherwise lead to the development of sepsis. This provided a survival advantage against infection by a broad range of pathogens, likely outweighing the trade-off imposed by the emergence of reproductive success and lower reproductive output, potentially explaining why loss of GIGA1 was a rare event, which occurred almost exclusively in Old World primates, including humans. bioRxiv 2020.07.10.186742.

The research group contributed to the finding by the laboratory of Luis Ferreira Morais, which identified and characterized a novel effect of Anfranchises that contributes to the reduction of inflammation and is independent of the activation of DNA damage responses. These findings may be relevant for the development of novel strategies targeting immune-mediated inflammatory diseases. bioRxiv 2020.04.27.065003.

The research team contributed to the finding by the laboratory of Shaden Kambara’s Lab, which identified and characterized how HD-1 induction through erythrophagocytosis is a universal mechanism that regulates skin inflammation following blood feeding by arthropods, thus promoting early-stage disease tolerance to vector-borne pathogens. (Cell Rep. 2020 27:334;108317).

In collaboration with Alain Le Moine and Stanislas Goriely the research group contributed to the finding by the laboratory of Luis Ferreira Morais, which identified and characterized a novel effect of Anfranchises that contributes to the reduction of inflammation and is independent of the activation of DNA damage responses. These findings may be relevant for the development of novel strategies targeting immune-mediated inflammatory diseases. (Acta Neuropathol. 2020 Oct;140(4):549-567).


RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia European Commission - Marie Skłodowska-Curie Actions

NEW GRANTS IN 2020
FCT Fundação para a Ciência e Tecnologia European Commission - Marie Skłodowska-Curie Actions

Covid19 Research:
Disease tolerance to COVID-19 (Pending BSL3 facility Installation/Approval)

NEW GRANTS IN 2020
FCT Fundação para a Ciência e Tecnologia European Commission - Marie Skłodowska-Curie Actions

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia European Commission - Marie Skłodowska-Curie Actions

NEW GRANTS IN 2020
FCT Fundação para a Ciência e Tecnologia European Commission - Marie Skłodowska-Curie Actions
ANNUAL REPORT 2020

RESEARCH GROUPS

GULBENKIAN SCIENCE

GROUP NAME: MECHANISMS OF MORPHOGENESIS

RESEARCH GROUP LEADER: Elias Barriga

Research interests: The research group studies the cellular, molecular, and biophysical mechanisms underlying collective cell migration (CCM) in embryogenesis and regeneration.

/HIGHLIGHTS IN 2020

The research group published 5 papers. The research group obtained 3 grants as principal investigator: ERC Starting Grant (1.8 Million EUR), La Caixa Junior Leader (300K EUR) and a EMBO Installation Grant (150K EUR). Furthermore, Elias Barriga, principal investigator, also obtained a Grant as collaborator from the BBSRC grant United Kingdom with Prof Guilianne Chorras. Two members of the team obtained Fellowships: Sofia Moreira, on FCT contract for 6 years and Fernando Ferreira, on EMBO long term fellowship.

LAB MEMBERS IN 2020

Inês Ferreira, MSc Student
Joana Saraiva, BSc PhD 2019, PhD Student
Sofia Moreira, Postdoc
Jaime Espina, Postdoc
Fernando Ferreira, Postdoc
Cristiano Marchant, Postdoc
João Mata, Lab manager

NEW GRANTS

ERC European Research Council Grant
La Caixa Junior Leader
EMBO Installation Grant

PUBLICATIONS

1. Dormia, The mechanical control of directed cell migration. FEBS Journal. DOI: 10.1111/febs.15662

COVID EFFORTS

The research group lab manager Joao Mata and the student Joana Saraiva helped at the beginning of the Covid testing initiative.

GROUP NAME: DISEASE GENETICS

RESEARCH GROUP LEADER: Carlos Penha-Gonçalves

Research Interests: Disease and organ dysfunction are in many cases controlled by genetic factors. Researchers from the lab are interested in uncovering how three factors work in specific cell types to drive organ inflammation trajectories and infectious disease outcomes. Under this theme they developed distinct projects working out protective roles of trophoblast cells in placental malaria, the action of brain endothelial cells in propagating inflammation in cerebral malaria and Kupffer cells responses to liver damage. To perform this research researchers have make use of multiple resources including human sample collections, mouse models of disease and optimized primary culture systems. This work is leading to ask how cell-type specific phenotypic adaptation triggered by inflammatory and infectious environments impacts in organ and systemic responses to subsequent challenges. The research team expect this research will contribute to bridge the fields of infectious diseases and metabolic disorders elucidating the role of tissue adaptation mechanisms in the protection of organ and systemic functions.

/HIGHLIGHTS IN 2020

The triggering receptor expressed on myeloid cells 2 (TREM-2) is an orphan immune receptor highly expressed in a particular liver-microvascular population in phenotypic transition to the mature macrophages that replenish the liver after severe injury. The lab work revealed that Trem-2 is an unexpected operator of a macrophage-endothelial cell crosstalk crucial in mounting swift regenerative reactions to hepatic tissue damage and liver fibrosis. Researchers from the lab propose that Trem-2 promotes the transition from pro-inflammatory to tissue repair phase by driving the acquisition of regenerative properties in the macrophages.

Brain microvascular endothelial cells (BMECs) comprise the first layer of the blood brain barrier (BBB). BMECs are seen in cerebral malaria (CM) pathogenesis only as targets of pro-inflammatory mediators and systemic functions. This work is leading to ask how cell-type specific phenotypic adaptation triggered by inflammatory and infectious environments impacts in organ and systemic responses to subsequent challenges. The research team expect this research will contribute to bridge the fields of infectious diseases and metabolic disorders elucidating the role of tissue adaptation mechanisms in the protection of organ and systemic functions. and developmental response to hypoxic implicated in vasculization and angiogenesis, regulation of energy metabolism and cell survival.

LAB MEMBERS IN 2020

Carolina Piedade (Jun 2020- Dec 2020), MSc
Abdul Shukri, PhD Student
Maria Teresa Pais, Postdoc
Inês Couto Calado, Postdoc
Nádia Duarte, Lab Manager

PUBLICATIONS


RUNNING GRANTS

FCF Fundação para a Ciência e Tecnologia
Network/Alliances | COVID-19 Host Genetics Initiative

COVID-19 HIGHLIGHTS

The unexpected COVID-19 pandemic outbreak early on March 2020 lead to a concerted effort from the research community aiming at support the health and hospital services and to develop accessible diagnostic tests and tools to evaluate the development of anti-SARS-COV2 immunity following infection. Researchers were very much involved in these COVID-19 oriented actions and in close collaboration with Joacine Demetropu have established several collaborations with national hospitals and city councils (Alemir and Osario) to bridge our scientific knowledge with the needs of the healthcare workers in the field and the community most prevalent questions. To better tackle this COVID-19 crisis, researchers from the lab have been involved in proposals to conduct epidemiological studies to monitor the pandemics in the country. In that context, in a collective effort at IGC, together with other institutions researchers performed serological surveys in hospitals and communities, to ascertain the level and progression of anti-SARS-COV2 antibody prevalence. Taking advantage of the anti-spike ELISA assay they have developed in the context of a national consortium “Sensilo- ry 4 CORVID” they started a number of studies on vaccine effectiveness. The lab still quantified the humoral immune response to the 1st and the 2nd dose of BNT162b2 mRNA COVID-19 (Pfizer/BioNTech, Comirnaty) in 1245 health care providers and 146 nursing home residents, together covering adult ages from 19 to 99 years. They observed inter-individual variation in the amplitude of the antibody response 3 weeks after administration of the 1st dose of the BNT162b2 after vaccine, that were negatively associated with age. After the 2nd vaccine dose robust IgG responses were achieved also in older individuals.

STAFF INVOVED

Nádia Duarte

RESEARCH COVID-19

Researchers put in place field studies to estimate the anti-SARS- CoV-2 seroprevalence in communities and in health workers. They are following the immune responses (antibodies) in vacci- nated specific groups including hospital health workers and elderly in nursing homes. Researchers from the lab collected COVID-19 patients samples aiming to identify host genetic factors that influence susceptibility to severe COVID-19 manifes- tations and to characterize the overwhellming inflammatory responses underlying severe and fatal COVID-19.

OUTCOMES

Institutional protocols of scientific collaboration were es- tablished with a number of hospitals (public and private) in areas of COVID19 research that also covering other possible research areas. Collaborations with IBE and technology transfer agreement with Meditar are leading to the pro- duction of an ELISA-based commercial assay for detection anti-spike SARS-COV2 antibodies.
RESEARCH GROUPS

GROUP NAME
INTEGRATIVE BEHAVIORAL BIOLOGY

RESEARCH GROUP LEADER
Rui Oliveira

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

/ HIGHLIGHTS IN 2020

In 2020 the Oliveira lab continued the work on the role of oxytocin in social cognition in zebrafish, as well as work on the role of the social environment on the development and evolution of social cognition and behavior. Main findings this last year include:
1. demonstrating an evolutionary conserved role of oxytocin in emotion recognition;
2. showing a G x E interaction in the role of oxytocin on the development of social behavior in zebrafish;
3. identifying the perceptual mechanisms of social affiliation in zebrafish. During this year 2 new FCT grants were funded, 8 papers were published in peer-reviewed journals, 1 MSc and 1 PhD thesis were completed.


LAB MEMBERS IN 2020
Bianca Fusani, (Researcher, PhD)
Gessica Pires, (Laborant, MSc)
Theo Reis, (Laborant), MSc
Gonçalo Malo, (Laborant, MSc)
Ibukun Akinrinade, (PhD-IB 2018), PhD
Claudia Gonçalves, (PCD 2016), PhD
Carlo Henriques (PhD-IB 2017), PhD
Felipe Espigares, (Postdoc)
Magda Teles, (Postdoc)
Ana Rita Nunes, (Postdoc)
Susana Varela, (Postdoc)
Victoria Alvarez, (Postdoc)
Kyrilaks Kareklas, (Postdoc)
Fred Mery, (sabbatical visitor, CNRS, Gif-sur-Yvette), Visitor

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
ISPA

PUBLICATIONS

GROUP NAME
VARIATION: DEVELOPMENT AND SELECTION

RESEARCH GROUP LEADER
Patricia Beldade

Research Interests: Eco-Evo-Devo research combines concepts and approaches from different disciplines (notably, evolutionary and developmental biology, as well as ecology) to explore the mechanisms that shape phenotypic variation and adaptation. Inter-individual variation is the raw material for natural selection, and a universal property of biological systems. Understanding the mechanisms that generate and shape this variation is a key challenge in biological research, and of obvious relevance also in biomedicine.

What are the gene types, specific genes, and gene regions that contribute to evolutionarily relevant variation? How do these genetic variants interact with environmental factors to regulate developmental trajectories and outcomes and account for phenotypic plasticity? For the dissection of variation in complex, diversity-, and ecologically-relevant phenotypes the lab uses two complementary models: Bicyclus anynana butterflies and Drosophila melanogaster flies.

LAB MEMBERS
Beatriz Gil Felipe, (PhD student)
Ana Teresa Eugénio, (PhD student)
Roberto Arboé, (Postdoc)

RUNNING GRANTS
FCT Fundação para a Ciência e Tecnologia
EU Seventh Research Framework Programme, Marie Curie

GROUP NAME
BACTERIAL SIGNALLING

RESEARCH GROUP LEADER
Karina Xavier

The research group focuses on deciphering the molecular basis of how bacterial communication regulates bacterial behaviours. Researchers use biochemical and genetic approaches to study the molecular mechanisms underlying quorum sensing signaling in multi-species bacterial consortia. They want to understand the role of quorum sensing in assembly, maintenance and recovery of bacterial consortia and the consequences of these processes in the beneficial and hostile interactions that these communities establish with their hosts.

The research group recent work shows how bacterial chemical interactions shape multi-species bacterial communities and highlights the importance of inter-species interactions in modulating metabolic networks in bacterial communities such as the gut microbiota. Their aim is to take advantage of our recent findings to manipulate inter-species interactions in the mammalian gut towards strategies that counter microbiota imbalances and ameliorate host pathology.

/ HIGHLIGHTS IN 2020

The research group recent work highlights the importance of inter-species interactions in modulating metabolic networks in bacterial communities such as the gut microbiota. Using a gnotobiotic mouse model researchers showed that the gut microbiota shapes the gut metabolic environment driving E. coli adaption to the mouse gut, rewiring E. coli’s metabolic versatility. (in Current Biology, Mar. 2020) They demonstrated the importance of microbiotal interactions in the assembly, maintenance and recovery of bacterial consortia. They want to understand the role of quorum sensing in the assembly, maintenance and recovery of bacterial consortia and the consequences of these processes in the beneficial and hostile interactions that these communities establish with their hosts.

They want to understand the role of quorum sensing in the assembly, maintenance and recovery of bacterial consortia and the consequences of these processes in the beneficial and hostile interactions that these communities establish with their hosts.

Karina Xavier invited Member of the Scientific Advisory Board of the Helmholtz Centre for Infection Research

PUBLICATIONS

HONOURS
Karina Xavier invited Member of the Scientific Advisory Board of the Helmholtz Centre for Infection Research

NEW GRANTS 2020
FCT Fundação para a Ciência e Tecnologia

NEW GRANTS 2020
FCT Fundação para a Ciência e Tecnologia

ANNUAL REPORT 2020
GULBENKIAN SCIENCE
Alekos Athanasiadis joined the IGC as a group leader in 2009. In 2018 he became co-director of the IGC PhD program. Previous to his time at the IGC, Alekos had done a masters and PhD in Molecular biology and Crystallography of restrictions enzymes at the IMBB in Crete, followed by a postdoctoral work at ICGEB, Trieste, Italy. He then moved to a research position at the MIT, with Prof Alexander Rich, where with a Human Frontiers research fellowship, he started to work on structural and computational studies of the RNA editing process and the responsible enzymes (ADARs) until 2008. In 2009 Alekos started his research group at the IGC as a Marie Curie Research Fellow. His research focused on understanding how post-transcriptional RNA modifications create and fine-tune a much larger repertoire of proteins originating from a small number of genes. He was 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. He was employing computational, molecular and structural biology tools, in particular to study the A to I RNA editing process which alters the sequence of thousands of human pre-mRNAs. This process has a prominent role in regulating innate immune responses to dsRNA.

Besides being an enthusiastic researcher that asked the most profound questions at seminars, Alekos was known for always having time to discuss and contribute to the work of all at the IGC, from student to PI. He helped many, many students and postdocs in the most diverse topics, from structure analysis, to protein purification, to the history of science.

The breadth of his knowledge of biology made his intellectual contributions particularly insightful and useful to us, his colleagues, from every discipline. He collaborated and co-authored papers with several research groups at the IGC but most of his human and scientific contributions will last in a not formally acknowledged manner in our memories and our hearts.

We will always remember Alekos enthusiastically discussing science with colleagues in the IGC patio.
**ANNUAL REPORT 2020**

**FACILITIES**

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**ELECTRON MICROSCOPY FACILITY**

**SERVICE HEAD**

ERIN TRANFIELD

**SERVICE DESCRIPTION**

- electron microscopy;
- technology development;
- teaching and training.

**HIGHLIGHTS IN 2020**

- hosting the COST Action Training School; leading a virtual international seminar series.

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**BIOINFORMATICS FACILITY**

**SERVICE HEAD**

JINGTAO LIU

**SERVICE DESCRIPTION**

We are working for supporting the research groups in IGC. We provide a broad range of bioinformatic services, a one-stop-service from experimental design to final publication. We are also interested in population genetics, evolutionary genetics, mammalian genomes, transcriptomes and genome assembly algorithms.

**HIGHLIGHTS IN 2020**

Received 34 requests from internal and external research groups in 2020. Tracking the evolution of COVID19 under the mass pandemic and make the data public available. Participated in several research projects on variant genome analysis, e.g. Smaigrad hujasiz, Acorns canina and anthomyxus taurus. Hosted several training projects for bioinformaticists and high school teachers (Curso Inversor Cârlio 2020 - Bioinformatico).

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**TRANSGENICS UNIT**

**SERVICE HEAD**

MOISES MALLO

**SERVICE DESCRIPTION**

The Transgenics Unit generates genetically modified mouse and Drosophila strains for research groups at the IGC. The research team works with mice includes:

- Production of transgenic mice by pronuclear DNA injection using both conventional expression constructs and BACs;
- Introduction of targeted modifications into endogenous genomic loci both following embryonic stem cell-mediated approaches and with the CRISPR/Cas9 technology.

The team work with Drosophila melanogaster includes:

- A microinjection service to generate transgenic or mutant flies, via p-element, OAC3, RNAi or CRISPR/Cas9 methods.

**HIGHLIGHTS IN 2020**

Mice transgenic analysis: 213 from 35 different constructs; Mouse transgenic founders: 24 from 8 different constructs, CRISPR/Cas9-mediated gene addition: 85 founders involving 15 different targetting; Drosophila transgenic lines generated: 48 through OAC3 insertion, from which 20 weeks for RNAi mediated inactivation, and 2 through random p-element insertion; Number of constructs built for Drosophila transgenesis: 22; Agreement signed with the Drosophila Genomics Resource Center (DGRC) to create an entire copy of the Gold Collection; clones of Drosophila and therefore be able to in 24-48h to the Portuguese fly research community.

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**FLOW CYTOMETRY AND ANTIBODIES**

**SERVICE HEAD**

MARTA MONTEIRO

**SERVICE DESCRIPTION**

The Flow Cytometry & Antibodies Facility offers flow cytometry and antibodies-related services and expertise to IGC researchers, as well as to outside groups and companies. The focus of our services is 1) To facilitate the access to state-of-the-art flow cytometry techniques and instrumentation; 2) To develop and implement new methods and solutions to support project development; 3) To offer scientific and technical support; 4) To provide easy access to monoclonal antibodies; 5) To promote advanced training and the best practices in Flow Cytometry. Instrumentation includes two multi-color high-speed cell sorters, three analyzers and a multiplex analyzer reader. Laboratory staff is well trained, and SOP are implemented to comply with the highest quality standards required to ensure reproducibility in science.

The need to find solutions to support research projects drives a continuous development of the facility, which aims to follow the advances in the flow cytometry field, collaborates with innovative projects, creates novel tools and methods to advance research, and implements strategies to improve the quality of the provided services.

**HIGHLIGHTS IN 2020**

In 2020, the Flow Cytometry Facility embraced a new challenge: the integration of the Antibodies Unit in its service and the transition to the Flow Cytometry & Antibodies Facility. With a larger team, we took the opportunity of improving our know-how and restructuring the portfolio of services to provide solutions better tailored to the research community needs. The Facility has also acquired a new cytometer - a full spectrum double Cytek Aura, equipped with four lasers and providing high sensitivity and opportunities to increase dimensionality. Finally, the facility launched the first Portuguese blog fully dedicated to Flow Cytometry: Go With The Flow (https://gowiththeflow.pt/blogpost/).

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**NEW EQUIPMENT**

- 4 LASER CYTEK Aura funded 40% by Lisbon Region Operational Program 2014-2020 European Structural Fund (FEDER) & 60% by Fundação Calouste Gulbenkian core funding.

**PUBLICATIONS**


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**NEW EQUIPMENT**

- 4 LASER CYTEK Aura funded 40% by Lisbon Region Operational Program 2014-2020 European Structural Fund (FEDER) & 60% by Fundação Calouste Gulbenkian core funding.

**PUBLICATIONS**

MODEL ORGANISM FACILITY

SERVICE HEAD
MANUEL REBELO

/ HIGHLIGHTS IN 2020
Organization of the V National Symposium of ORBEAs.

/ COVID-19 HIGHLIGHTS
The facility made available for COVID-19 activities at ISC an isolator to manipulate human samples in a safe way for the operator, and a H2O2 vaporizer to decontaminate the outside surface of the samples before manipulation.

TEAM MEMBERS
Sandra Cristóvão, BSc Holder
Ana Sofia Leocádio, BSc Holder
Ana Ribeiro, BSc Holder
Adérito Vieira, BSc Holder
Ana Raquel Machado, BSc Holder
Inês Matado, BSc Holder
Ana Laura Vinagre, BSc Holder
Joana Bom, Animal Care Staff Intern
Mário Rocha, Animal Care Staff
Lúcia Rego, Animal Care Staff
Mário Rocha, Animal Care Staff
Carina Santos, Animal Care Staff
Rodrigo M. Rodrigues, Animal Care Staff

HISTOPATHOLOGY FACILITY

SERVICE HEAD
PEDRO FAÍSCA

SERVICE DESCRIPTION
Histology services/ pathology assessment/ Quantitative pathology
(Stereology/Image Analysis)/ Immunohistochemistry

MAIN ACHIEVEMENTS IN 2020
Protocol developments:
Stereological quantification of murine intestinal tract Open swiss-roll technique/Stereological quantification of murine genitourinary Tract/ Techniques:
Resin embedding/ Immunohistochemistry service implementation

TEAM MEMBERS
Joana Rodrigues Lóios, Facility Manager, Technician
Andrea Mindouro, Technician
Mafalda Casanova, Junior Pathologist, Technician

NEW EQUIPMENT
Leica Automatic Microtome - IGC funding
Viasphere software for Stereology - IGC funding

PUBLICATIONS
Vera Nunes, MSc Holder
Liliana Vieira, MSc Holder
Ana Raquel Machado, BSc Holder
Sandra Crisóstomo, BSc Holder
Inês Matado, BSc Holder
Ana Laura Vinagre, BSc Holder
Joana Bom, Animal Care Staff Intern
Mário Rocha, Animal Care Staff
Carine Santos, Animal Care Staff;
Marco Rocha, Animal Care Staff
Mário Rocha, Animal Care Staff
Carina Santos, Animal Care Staff
Rodrigo M. Rodrigues, Animal Care Staff

/ COVID-19 HIGHLIGHTS
Stereological quantification of murine models of acute lung injury development for future murine covid models.

COVID-19 RESEARCH

COVID-19 COLLABORATIONS

PUBLICATIONS

ADVANCED IMAGING FACILITY

SERVICE HEAD
GABRIEL G. MARTINS

SERVICE DESCRIPTION
Imaging technology and biobeam data analysis; Mesocose and Nanoascape; Development and maintenance of optical systems

/ HIGHLIGHTS IN 2020
José Marques and Donald Fowler joined the team; installation of the Zeiss Z.1 light-sheet system; full implementation of AnyScans2 and Apo-tone systems; implementation of deep learning algorithms for image restoration and segmentation.

TEAM MEMBERS
Alexandre Lopes, MSc Holder
José Marques, MSc Holder
Mário Hanulová, PhD Holder
PhD - Head;
Donald Fowler, PhD Holder
PhD - Platform and Microscopy Assistant
Gabriel G. Martins, PhD Holder
PhD - Microscopy Assistant

NEW EQUIPMENT
Zeiss Z.1 Light-sheet (FCS)

PATTERNS AND PROTOYPES
New implementation of correlative Mesoscope

NETWORKS/ALLIANCES
FPRR - Portuguese Platform for Biobeamig and COOLie; EurlBiobeamig; NEUBIAS; Quareps-LiMI; COMULIS

PUBLICATIONS

COST action
QUANTITATIVE BIOLOGY & DIGITAL SCIENCE

SERVICE HEAD
TIAGO PAIXÃO

SERVICE DESCRIPTION
The unit provides data analysis, computational biology, mathematical modelling and experimental design services. Furthermore, the unit also provides support in the field of research data management.

/HIGHLIGHTS IN 2020

The unit started in February 2020. Since then, the unit has assisted more than 12 groups at IGC and was involved in more than 15 projects. The unit was heavily involved in the PhD program, providing most PhD modules with a quantitative perspective.

The unit is introducing computational notebooks and data management best practices to the scientific workflow of the institute and is helping coordinate the digital transition at the institute, starting with the transition to electronic lab books.

/Covid-19 Highlights

The team developed an app to assist with personal contact tracing (April 2020). We developed a framework to optimally estimate SARS-CoV2 antibodies prevalence (for serological population studies) that takes into account the uncertainties of the performance data of the test used. Also developed a model that integrates results from serological testing to provide improved classifier performance.

NEW GRANTS

FCT - High Performance computing grant
EMBO workshop grant (postponed to 2022)

NEW EQUIPMENT

Server providing computational services and data infrastructure for IGC.

GENOMIC UNIT

SERVICE HEAD
RICARDO LEITE

SERVICE DESCRIPTION
Technical platform

/HIGHLIGHTS IN 2020


TEAM MEMBERS

João Costa, Technician
João Sabral, Technician
Cathy Paulino, Technician
Susana Ladeiro, Technician
Maria Costa, Postdoc
Asunción Lago-Leñón, Visitor
(Univ. Baja California, México)

RUNNING GRANTS

GenomePT; ONEIDA; FCT-Covid

New Grants: Single Cell Hub: Tornar o invisível, visível, na saúde e na doença - Programa Operacional Regional de Lisboa sponsored by the European Structural fund FEDER

SOFTWARE DEVELOPED

D-Cellerate https://github.com/BioData-PT/D-cellerate;
Virtool - https://github.com/joaomatos02/Virtool;
Genoqual2 https://github.com/Genomic-Unit-IGC/genoqual

PUBLICATIONS

1. 10.1038/s41598-020-64774-y Catarina Churro; Ana P. Se- medo-Aguiar; Alexandra D. Silva; Jose B. Pereira-Leal; Ricardo B. Leite. “A novel cyanobacterial geosmin producer, revising GeoA dis- tribution and dispersion patterns in Bacteria”. Scientific Reports 10 1 (2020): https://doi.org/10.1038/s41598-020-64774-y


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

246 Talks
58 National
188 International

14 Events Organized
6 Conferences/Symposia
4 Workshops
4 Courses

Created in 2019, the Gulbenkian Collaborative Centre promotes the development of life sciences by enhancing interdisciplinary and collaborative research and by reducing inequality in the access to scientific knowledge. The Collaborative Centre administers a sabbatical programme and organizes lectures, courses, conferences and postgraduate training events. The Centre also created fellowships and prizes and coordinates the selection of the awardees.

In 2020, the Centre developed a sabbatical program, created and awarded prizes and scholarships and organised courses, workshops and other postgraduate training activities. In 2020 there were eight sabbatical visits to the IGC, each offering unique opportunities to establish synergies with external researchers. The Centre organised a virtual international conference sponsored by EMBO, one of the most prestigious scientific organisations in the world. Together with the Oeiras City Council, it launched the "Oeiras - ERC Frontier Research Incentive Awards" - an award that aims to attract and retain top scientists. Also in 2020, it held the second edition of the António Coutinho Scholarships, which aims to provide scientific training to citizens or descendants of Portuguese speaking African Countries, as well as increasing diversity in the scientific community.

INNOVATION AND TECH TRANSFER

120 Innovation Projects
70 Agreements
1 Lincensing Agreement

Innovation and tech transfer activities are part of the IGC strategy. The Innovation Unit is focused on the identification, protection and adequate exploration of ideas with added value that can dynamize relations with the regional, national and international industrial and business actors. In 2020 this structure followed, 120 innovation projects. This resulted in the establishment and negotiation of more than 70 agreements, including scientific and technological collaborations with hospitals and companies.

In close articulation with the Foundation legal office, it also conducted the negotiation and implementation of the first lincensing agreement of the FCG-IGC regarding the serological test developed within the scope of the Serology4COVID consortium, led by the FCG-IGC, to the pharmaceutical company Medinfar. This Unit maintains the management of this strategic partnership, as well as with other key partners such as CUF and Instituto Superior Técnico.

During a particularly critical year, this unit actively supported several proposals for public funding for translational research, contributing to the attraction of significant funds for the development of projects associated with COVID19.

The various activities promoted by the Innovation Unit increase the impact of the science produced at the IGC by bringing it closer to clinical practice, industrial fabric and society, with a direct result in the Institute’s international visibility and reputation.
Training @ IGC
UNDERGRADUATE SUMMER SCHOOL PROGRAMME

STUDENTS ADMITTED | 91

COORDINATORS:
Maria João Amorim, Luis Teixeira, Gabriel Martins

TRAINING UNIT MEMBERS:
Alexandra Castrano, Ana Aranda da Silva

PROGRAMME DESCRIPTION:
In 2014, the IGC and University of Oxford ran a Programme aiming to bring young science undergraduates to the IGC for a lab experience. This Programme has since then expanded to accommodate undergraduates studying in other universities in Europe and also from the Lisbon area, including Universidade Nova de Lisboa, Universidade de Aveiro, Sesc University, and University College London among others. Last year, because of the pandemic, the event was online with 91 participants from 8 different nationalities (Brazil, Cape Verde, Egypt, India, Portugal, Serbia, Slovenia, Spain, UK and USA). The Programme initiated on the 29th July with a week of classes, ending with a final discussion on SARS-COV-2 and Metabolism – defended on 17/01/2020

PhD PROGRAMME

PhD Thesis Defended 2020 | 7

STUDENTS ADMITTED | 16

COORDINATORS:
Jorge Carneiro, Élio Sucena and Alakso Asanathisadi

TRAINING UNIT MEMBERS:
Alexandra Castrano, Ana Aranda da Silva

PROGRAMME DESCRIPTION:
The IGC PhD programme offers to a selected group of students the opportunity 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 intense academic semester before choosing research groups to join and writing their theses projects. Candidates come from all over the globe, and diverse academic backgrounds. This year the programme initiated on the 29th July with a week of classes, ending with a final discussion on SARS-COV-2 possibilities of training at IGC. The Programme had great positive feedback from the students and we already had enquiries from several national and international students about the next edition.

/ HIGHLIGHTS IN 2020

The move to an online format allowed us to reach 91 participants in the programme.

MODULES/COURSES HELD

Participating Groups in 2020:
Cell Cycle Regulation Lab, Chromosome Dynamics Lab, Mechanisms of Morphogenesis Lab, Host-Microorganisms Interactions Lab, Evolutionary Biology Lab, Population and Conservation genetics Lab, Plant Stress Signalling Lab, Cell Biology of Viral Infection Lab, Plant Molecular Biology Lab, Optical Cell Biology, Light Microscopy Facility, Electron Microscopy Facility, Flow Cytometry Facility, Public Engagement Unit, Technical Scientific Support Unit, Quantitative Organismal Biology Unit.

List of IGC Participants:

/ PhD Thesis Defended 2020

1) Maria Inês Machado Malo (IBB2014) - Determining the role of Sympathetic Nervous System activity in the control of Body-Weight and Metabolism – defended on 07/06/2020
2) Fika Kotsa Santos Rodrigues (PGC2020) - Seasonal plasticity in insect models: effects of variable temperatures on developmental outcome – defended on 19/10/2020
3) Eleonara Tulumello (IBB2015) - Robust tolerance out of variable regulatory T cells. Lessons from mathematical modelling – defended on 10/07/2020
4) Boulou Dorcas Fatukiri Akimade (IBB2015) - Chytridiumic modulatior of social information use in threat perception – defended on 07/06/2020
5) Luís Manuel Figueres Lira Vitorino Coimbra Cardoso (IBB2015) - The role of the gut microbiota in the subsistence of antibiotic resistance – defended on 06/03/2020
6) Henrique Guerra Gonçalves Calçado (IBB2015) - Organellar homeostasis in yeast: The role of mitochondrial function and metabolism – defended on 17/01/2020
7) Ana Rita Almeida de Oliveira (IBB2015) - Interspecies interactions in recovery of gut microbiota functions – defended on 13/01/2020

/ STUDENTS ADMITTED

IBB2019:
Carina Galhão (PT), Christian Diwo (DE), Francisco Pasquarelli (PT), Joana Sarraiva (PT), Katia Jesus (PT), Lucrezia Ferone (PT), Mariana Gil (PT), Priscilla Akyaw (GH) and Ramana Yalvez (CR)

IBB2020:
Ana Lisa Mendes (PT), Camila Moraes (PT), Catarina Pedro (PT), Maria Monteys (IT), Mariana Nastarino (PT), Ravi Vishvakarma (IN), Victor Mello (BR)

/ MODULINES/COURSES HELD

IBB2020:
Alcance Mendes (PT), Camila Moraes (PT), Catarina Pedro (PT), Maria Monteys (IT), Mariana Nastarino (PT), Ravi Vishvakarma (IN), Victor Mello (BR)

Plant Biology (06-10/01/2020)
Organiser: Ilana Blanc, Jorg Becker and Paul Duque
Faculty: Ilana Blanc, Jorg Becker and Paul Duque, IGC, Andreas Walter, Johanna Maria-Vilmar and Lise Hoveland; University of Cologne

Hypthesis Driven Research (15-24/01/2020)
Organiser: Isabel Gordo and Tiago Paixão
Faculty: Isabel Gordo and Tiago Paixão, IGG, Daniel Geitche, Austrian Academy of Sciences in Vienna

History of Biological Concepts (07/11/2020)
Organiser: Élio Sucena
Faculty: Ana Simões, Centro Internazionale di Storia delle Scienze, Istituto di Scienze della vita, University of Bologna, Sara Janes, Department of Biochemistry, University of Oxford, Thiago Cardoso, FURG, Fundação Champalimaud, IGG, and Jorge Carneiro, IGC

Statistics and Quantitative Biology (14-18, 23-25/09/2020)
Organiser: Jorge Carneiro and Tiago Paixão
Faculty: Jorge Carneiro and Tiago Paixão, IGC

Structural and Molecular Biology (21-23/09/2020)
Organisers: Bruno Correia
Faculty: Bruno Correia, EPFL, Switzerland, Tiago Caetano, ITQB, Eric Weihof, BNRC, Strasbourg, France
### TRAINING PROGRAMME IN BIOINFORMATICS (GTPB)

**HEAD:** PEDRO L. FERNANDES

**SERVICE EXTERNAL USERS**

**National | International | 2**

**SERVICE DESCRIPTION:**

The Gulbenkian Training Programme in Bioinformatics (GTPB) is dedicated to the provision of an environment that optimally delivers skills to researchers and students, since 1999. In 2020, the ability to run training courses in GTPB’s Bioinformatics Training Room due to the pandemic situation has shifted our focus to the consolidation of the training methods and the development of materials. It was still possible to run an applied Bioinformatics course before the lockdown.

### HIGHLIGHTS IN 2020

- PSLS20 Practical Statistics for the Life Sciences (Jan 20-24 2021) with Liene Clement and Jensen Gibs, both from the University of Ghent, BE was fully attended (20 participants).

**TEAM MEMBERS**

Miguel Cardoso internship with BioData.pt, Technician

**COLLABORATIONS**

BioData.pt, Network/Alliances: ELIXIR, GOBLET

**EVENTS ORGANIZED**

- Training Course PSLS20 training course (Jan 20-24 2020)
  - 20 participants
- ELIXIR Train-the-Trainer (October 6-9 2020)
  - 17 participants, online

**EVENTS ORGANIZED**

- Train-the-Trainer course for service unit or core facility technicians @IGC
- Feb 6th 2020 (17 participants from IGC)

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**TRAINING PROGRAMME IN BIOINFORMATICS (GTPB)**

**STUDENTS ADMITTED | 2 MODULES/COURSES HELD | 14**

**COORDINATORS:**

Isabel Gordo

**TRAINING UNIT MEMBERS:**

Alexandra Castrino
Ana Aranda da Silva

**PROGRAMME DESCRIPTION:**

The Postdoctoral Programme Bioinformatics by Numbers is a multidisciplinary Programme for PhD-holders from Exact Sciences & Engineering facing a lack of knowledge in fundamental questions. Selected postdoctoral researchers are offered advanced courses, starting in September 2020, 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.

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**POSTDOCTORAL PROGRAMME BIOLOGY BY NUMBERS**

**STUDENTS ADMITTED | 2 MODULES/COURSES HELD | 14**

**COORDINATORS:**

Isabel Gordo

**TRAINING UNIT MEMBERS:**

Alexandra Castrino
Ana Aranda da Silva

**PROGRAMME DESCRIPTION:**

The Postdoctoral Programme Biology by Numbers is a multidisciplinary Programme for PhD-holders from Exact Sciences & Engineering facing with little knowledge on great curiosity for fundamental biological questions. Selected postdoctoral researchers are offered advanced courses, starting in September 2020, 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.

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**/ Main achievements in 2020**

Cécil Carrere gained a position with CNRS, Institut Denis Poisson Université d’Orléans.
RESEARCH STRUCTURES

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

**EXECUTIVE DIRECTOR:**
Ana Portugal Melo (IGC)

**TECH & ALLIANCE COORDINATOR:**
Gabriel Martins (IGC)

**BIODATA.PT**

Is the Portuguese Infrastructure for Biological Data, operating the Portuguese node of ELWIR - 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-ordinated by the IGC and INESC-ID, it is a Consortium of 12 Portuguese organizations, from Braga to Algarve.

**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 amassed 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 the creation of highly qualified human resources in Portugal.

**CONGENTO**

**CONSORTIUM OF GENETICALLY TRACTABLE 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 Gnotobiosis, Continuous education and certification in animal research and technology.

**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, oncology, pharmacology, 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.

**EXECUTIVE DIRECTOR:**
Ricardo Leite (IGC)

**STEERING COMMITTEE:**
Joselyne Demengeot (IGC)

**CONGENTO COORDINATOR:**
Ana Portugal Melo (IGC)

**CONGENTO STEERING COMMITTEE:**
Joselyne Demengeot (IGC)

**CONGENTO Executive Director:**
Helder da Silva (Biocantabria)

**CONGENTO Funding Co-ordinator:**
Marielle Senecoff (Biocantabria)

The IGC is part of COLife, an alliance of six research institutes in life sciences located in Lisbon and Oeiras: CEDOC-NMS, Fundação Champalimaud, IBET, INM, ICTS NOVA and IGC, with a mission to promote and strengthen research in life sciences, training, innovation and connection with society, in the region of Oeiras and Lisbon.

**COLife**

**MAIN GOALS:**
- Enhancing the national and international visibility of the six research institutes of this alliance.
- COLife will be contributing to the dissemination of scientific knowledge not only to the scientific community, but also to funding agencies, industry, as well as the civil society.

**COLife COORDINATOR:**
Mariana Silva

**COLife WEBSITE:**
https://colife.eu/en/

In 2020, during the beginning of the pandemic and one year after the first COLife meeting at the Calouste Gulbenkian Foundation, in Lisbon, the alliance website was launched with the goal of sharing credible information initially about the COVID-19 pandemic (and long term about the research and technology happening at COLife institutes). Aim to share information in a dynamic, useful and accessible way for both scientists and the general public. At the beginning of the pandemic, a COLife social media campaign was launched to provide reliable and accessible scientific information and tools on how to cope with the pandemic situation. COLife organized a number of scientific webinars and launched the COLife community webinar series, that aims in bringing the COLife community together and in presenting the facilities, how-how and services existent at each institute. COLife also organized a number of scientific webinars and launched the COLife community webinar series, that aims in bringing the COLife community together and in presenting the facilities, know-how and services existent at each institute. COLife launched their own social media networks (Facebook, Twitter and Instagram) and created a Slack communication workspace that facilitates communication among the six different institutes: colife-pt.slack.com.
Bringing Science to Society

35 PRESS RELEASES
2020

902 NEWS ON MEDIA
(+39%/2019)

LinkedIn:
+94% followers (22198)

Twitter:
+30% followers (8052)

Facebook:
+8% followers (42086)

Instagram:
started in 2020 (989)

WEBSITE
+400.000 page views

9 EDITORIAL ILLUSTRATIONS

6 PUBLISHED IN MEDIA

2 JOURNAL COVERS

10 COVID INFOGRAPHICS
PUBLIC ENGAGEMENT

The public engagement unit goal is to bring ordinary citizens closer to science through innovative approaches, and to promote a more critical, collaborative and participatory society through science. IGC promotes science communication activities aimed at diverse audiences and stakeholders, that include educational initiatives with schools and public events. The public engagement programme at the IGC was adjusted to cope with the COVID-19 pandemic restrictions. Hence, face-to-face activities were replaced by digital initiatives. Our educational activities reached 23 teachers and 583 students, and we produced 9 multimedia resources that received more than 14500 views. During 2020 we organized 11 digital events, reaching over 72500 people. Within these events we highlight the IGC Virtual Open Day that offered visitors a virtual tour of the IGC, using 360° video technology, with science riddles to unravel.

The online conference cycle Variable new world explored the connection between science and society as a fundamental tool to overcome the COVID19 crisis and to build a new reality. A new video series entitled “Cientistas em casa” (scientists at home) was created to encourage children to do science hands-on activities at home; one of the episodes addressed how to wash hands.

PRIZES
- Prémio Acesso Cultura – Linguagem Clara 2020, awarded by Acesso Cultura

EVENTS ORGANIZED 2020
- COULife webinars: Sharing information together (series of 4 webinars, organized together with COULife partners. Target audience: general public)
- Variable New World (cycle of 3 online conferences; organized together with Cielo Program. Target audience: general public)

Courses
- Inspira Ciência – Bioinformática (target audience: high school biology teachers)

Public Events
- Music and Science at the Gulbenkian Foundation; IGC Virtual Open Day; European Researchers Night (participation in this event)

HIGHLIGHTS IN 2020

New “Lab in a Box” Online Platform (website)
Development, production and distribution of the new “Lab in a Box - Oeiras” kits

1st “Lab in a Box” accredited Teacher Training Workshops for Oeiras’ primary school teachers (Estudo da Meio)
1st “Lab in a Box” accredited Teacher Training Workshops for Oeiras’ middle school teachers (Natural Sciences)
Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.

MARIE CURIE