This Annual Report covers the Instituto Gulbenkian de Ciência's financial year from 1st January to 31st December 2015.
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**Anniversary Report 2015**
"A sacred grove of olive trees dedicated to Athena, the goddess of wisdom, outside the city walls of ancient Athens"

Out of the city, alone in its beautiful garden, dedicated to wisdom, the Instituto Gulbenkian de Ciência seems to be the very epitome of the Academy, an untroubled space where “this intellectual being, these thoughts that travel through eternity” can live and grow in peace. We are separate from the hurly-burly of the city, yet its pleasures, beauties and excitments are close at hand. On a smaller scale it somehow recalls the relationship between the “dreaming spires” of Oxford or Cambridge and the great metropolis, London, or perhaps between Princeton and New York City, or Caltech and Los Angeles. This almost antithetical relationship between the academy and the city has been around for a long time. It is not an opposition, the contemplative life and the civic life both belong to the make-up of mankind, but rather a complementation.

Is this indeed the IGC, or only what it seems to be? Scientific research in the 21st century is very, very different from the monastic disciplines that generated the modern academy. I remember, it must be more than 40 years ago, as a PhD student working on lymphocyte recirculation, wandering through the beautiful cloisters of the University of Pavia, admiring the memorials to Gaspard Aselius “quis primus incognitas vias chyli deprehendit” and Camillo Golgi. But behind the walls of the cloister, seen through the elegant windows, the rooms of the (at that time) renowned genetics department were filled with giant computers, symbols of modern science. Our peace was much more emphatic by amplification from the public delivered by the outside world.

The outside world has very much to do with the IGC because, Academy or not, the IGC relies entirely on its ability to persuade the outside world to pay for it. The Calouste Gulbenkian Foundation, our owner and the owner of our legal identity, needs to know and understand what it is that we do, why we do it and how well we do it. Both our individual projects and the IGC as a whole are subjected to constant evaluation by the outside world, whether it is our international Scientific Advisory Board that reports to the Foundation on the whole IGC every year, the review committees of the ERC and other national and international grant agencies who review our research projects and programmes, and the editors and referees of the journals in which our research is published.

Most recently the IGC was evaluated in its entirety in the course of the programme to institute the new Unidades de Investigação e Desenvolvimento (Units of Research and Development). This evaluation was conducted on behalf of the Portuguese national research funding body, the FCT, during 2014 by a reputable international organisation, the European Science Foundation, using exclusively referees from outside the Portuguese scientific community. The IGC was honoured with the highest commendation of “Exceptional”. It is particularly sad for the IGC that the meaning and value of this eminent rating was obscured, overshadowed and possibly even called in question by the politically-charged furore that broke out in Portugal over the local administration of this international review process.

For the IGC, perhaps one of the most important events of 2015 will turn out to have been the general election, and the coming into power of a new socialist government. In the recent political history of science in Portugal three socialist governments in the period from mid 1995 to June 2011 were characterised by a powerful endorsement of science and its integration into large-scale national programmes of infrastructure development in higher education, science and technology. For now, for the IGC, the arrival of a new socialist government in November 2015 stimulates new speculation about future science policy. The rapid strengthening of Portuguese science during the last socialist governments coincided with a visionary Minister of Science, Technology and Higher Education, Mariano Gago and a GDP that grew about 39% from 2000 to 2008, while the collapse of Portugal’s economy after 2008 was inherited by the social democratic government that took power in 2011 and despite the best intentions, led to a reduction in the funds available for science. Now we have a socialist government, again publicly dedicated to strengthening the national science programme, but this time with the economy in dire straits. What can we hope for, what can we expect? More resources for competitive research funding would be marvellous, but with a static national budget and many demands on it, this may be hoped for but certainly not expected. In the absence of this, what not only the IGC, but surely all research organisations in Portugal must be begging for is coherence, planning and to the extent possible, stability at the level of the national research funding organisation, the FCT. There is no “right” level of funding for science because there are too many controversial issues to reconcile. It is only inevitable that small, poor countries will invest smaller sums than large rich ones and less science will be done. But it is not at all inevitable that the funds available, however meagre, should be distributed so erratically that research planning is virtually impossible. If the nation is to have an internationally competitive research community, however small or large it may be, an essential precondition is that funds for research be made available according to a disciplined and publicly known timetable, based on well-known and reli-
able funding instruments, and allocated according to widely accepted criteria. In the last years, with governments of both political colours, there has been extraordinary instability in competitive project grant funding by the FCT, ranging from €0 in 2005, 2007, 2011 and 2015 up to €180M in 2008 and down to €15M in 2013 (Figure 1).

Furthermore the funds have not been transferred promptly even when they are awarded: the last call was in 2014 but the money awarded from that call was not paid in 2015 and is not expected until mid 2016. At the IGC, our core funding from the Gulbenkian Foundation provides some buffering against these extraordinary gyrations in funding level, but the implications for research organisations with no such buffer are extremely grave. It would have been far preferable for science if the sums made available between 2004 and 2015 (about €750M) had been averaged over the years and disbursed regularly in an annual call of a definite amount. On the basis of the funds available for FCT project grants over the last decade, this would work out at something over €60M per year. It is very broadly understood in the northern European economies that science funding should be based on multi-year budget planning with little direct political interference. Portugal has less money, but there is no reason why demanding these underlying principles should not be as helpful to science in Portugal as it is to the rich economies of the North. Disciplined transfer of these sums would have been of enormous help in these difficult times.

So at the beginning of 2016, with a new government, and with the FCT in lock-down, the IGC waits with curiosity but also some anxiety for what is to come. We know that the government is interested in implementing the EU-supported movement towards replacing fellowship contracts with labour contracts carrying social security benefits, an unambiguous benefit to the recipients. Yet it comes with a price tag that, in the absence of new money, will significantly reduce the number of young scientists moving through the system. We also know that the instability of employment in a research career is of concern not only to the new government but also to a very large number of young and indeed not-so-young scientists working outside the established university hierarchy in Portugal. However, many academic research institutions throughout Europe (eg. EMBL, the Francis Crick Institute, The Max Planck Society and the Royal Society) have settled on 9 or 10 years as the time necessary for excellent young scientists to fulfil themselves properly in their first independent position as a group leader and to declare themselves fit to perform independent scientific research at the highest level in the long term. The IGC too has recently defined this as its preferred approach to the employment of young group leaders, but we do not yet know whether we shall be able to implement it within the new employment regime.

If this is the reality of science now, and perhaps in particular the reality of science in Portugal, should we fear that our academy is nothing more than a myth or an illusion? Perhaps even a dangerous illusion, a distraction from the urgent and earthbound necessities of real life? I say no, the academy of the IGC is also a reality, it contributes enormously to the quality of our scientific lives, it gives us a sense of belonging to a community, as indeed we do, it enables every kind of interaction and stimulates our creativity. For several years now there has been speculation and even discussion about possible radical transformations of the IGC to something more “sensible” and each time I have tried more or less unsuccessfully to articulate what it is that we would lose. I now realise it, what we would lose is the academy.
ORGANISATION

CALOUSTE GULBENKIAN FOUNDATION

The Calouste Gulbenkian Foundation is one of the most important foundations in Europe, carrying out extensive activities both in Portugal and abroad through the development of in-house projects, or in partnership with other institutions, and by awarding scholarships and grants. Headquartered in Lisbon, the Foundation is also home to a scientific investigation centre in Oeiras, and delegations in Paris and London, cities where Calouste Gulbenkian lived.

BOARD OF TRUSTEES

Artur Santos Silva | Chairman
Isabel Mota
Eduardo Marçal Grilo (Left in 2015)
Teresa Gouveia
Martin Essayan
José Neves Adelino
Guilherme d’Oliveira Martins (Started in 2015)
Emílio Rui Vilar *
Joaquim Gomes Canotilho *
António Guterres *
* Non-executive Trustees

INSTITUTO GULBENKIAN DE CIÊNCIA

The IGC was founded by the Calouste Gulbenkian Foundation in 1961. The direct governance of the Institute is made through the Director, a Deputy Director with primary responsibility for financial administration, and a Deputy Director for Science. The Director is in turn answerable to a Management Committee, appointed by the Calouste Gulbenkian Foundation Board of Trustees, which acts on behalf of the Board and reports directly to them. An eminent external Scientific Advisory Board oversees the scientific activity of the IGC, whereas the Ethics Committee assures the ethical conduct of the scientific related to vertebrate animals or human beings. Both the Scientific Advisory Board and the Ethics Committee are appointed by the Management Committee.

Jonathan Howard | Director
José Mário Leite | Deputy Director
Jorge Carneiro | Deputy Director for Science

MANAGEMENT COMMITTEE

Established by the Board of Trustees of the Calouste Gulbenkian Foundation in the context of the decision to provide a higher degree of autonomy to the IGC, facilitating and expediting administrative and financial operations, thus ensuring more flexibility to the Institute’s operation. The Management Committee received ample delegation from the Board over a wide range of areas, meets regularly with the Director and oversees all activities of the Institute.

Sydney Brenner** (The Salk Institute, USA) | Chairman
José Neves Adelino (FCG)
António Coutinho (IGC and Champalimaud Foundation)
Eduardo Marçal Grilo (FCG)
Diogo de Lucena (Universidade Nova de Lisboa)
Guilherme d’Oliveira Martins (FCG) | Started in 2015
Jonathan Howard (IGC)

**Resigned from MC at the end of 2015

SCIENTIFIC ADVISORY BOARD

The Scientific Advisory Board of the IGC oversees the scientific progress, graduate programmes, recruitment and overall performance of staff and research groups. The Scientific Advisory Board also advises the Director of the IGC and the Board of the Calouste Gulbenkian Foundation on all matters of relevance to the mission of the Institute.

Kai Simons (Max Planck Institute, Dresden, Germany) | Chairman
Martin Raff (University College London, UK)
Gines Morata (Universidad Autónoma de Madrid, Spain)
David Sabatini (New York University, USA)
Terrence Sejnowsky (The Salk Institute, USA)
Tony Hyman (Max Planck Institute, Dresden, Germany)
Linda Partridge (Max Planck Institute, Cologne, Germany)
Ruslan Medzhitov (Yale University, USA)
Paul Schmid-Hempel (ETH Zurich, Switzerland)

ETHICS COMMITTEE

The Ethics Committee of the IGC has as mission to consider all ethical issues that may arise during the course of the research projects developed by the groups or units of the IGC, reviewing the research projects that entail human studies and/or the use of vertebrate animals. The Ethics Committee is an interdisciplinary body made up of nine members, three of whom are laypersons and four are external to the IGC. In 2015, the Ethics Committee approved 8 projects.

Maria Francisca Fontes | Chairperson, PhD, MD, External member
Carlos Penha-Gonçalves (PhD, DVM, IGC)
Tânia Carvalho (PhD, DVM, Instituto de Medicina Molecular)
Manuel Rebelo (PhD, IGC)
Ana Mesu (PhD, IGC)
Isabel Ribeiro (MD, External Member)
Ana Runkel (Layperson, External member)
José Athayde Tavares (Layperson, External member)
Greta Martins (Layperson, IGC)
The Instituto Gulbenkian de Ciência (IGC) is a private institute devoted to basic biological and biomedical research, and to graduate training. The IGC is free from hierarchical structure, with small independent research groups working in an environment designed to foster interaction and cooperation. The scientific programme of the IGC is multidisciplinary, including Cell and Developmental Biology, Evolutionary Biology, Inflammation, Immunology, Host-Pathogen Interactions, Disease Genetics, Plant Biology, Neurosciences, Theoretical and Computational Biology.

THE IGC MISSIONS ARE THUS:
1. To promote multidisciplinary science of excellence in basic biological and biomedical research;
2. To identify, educate and incubate new research leaders, providing state-of-the-art facilities and full financial and intellectual autonomy to pursue research projects;
3. To improve the transfer of research expertise into developments that are of potential interest beyond basic science;
4. To provide international graduate teaching and structured training programmes that respond to present-day imperatives;
5. To promote the values of science in society, scientific literacy, and the active participation of citizens in scientific research, through engagement with different communities and stakeholders.

The Institute is part of the Oeiras Campus, home to several other basic and applied research centres in Biology, Biotechnology and Chemistry.

- Since 1998, the IGC has hosted 88 research groups; 46 of these have moved on to other research institutes, 28 to research centres in Portugal.
- 29 research groups in Portugal are IGC Associated groups, with access to IGC facilities and services.
- The IGC pioneered graduate training in Portugal. Since 1993, 10 PhD Programmes have been set up, with approximately 80 speakers/year/programme.
- By October 2015, over 550 PhD students had started their scientific education at the IGC in programmes and research groups.

**FACTS & FIGURES IN 2015**

370 PEOPLE WORK AT THE IGC including 11 Visitors

- 152 Males
- 217 Females

287 RESEARCHERS

Of which 134 are PhD holders

42 GROUP LEADERS

- 25 Portuguese
- 17 Rest of the World

19 Female

23 Male

32 NATIONALITIES

- 271 Portuguese
- 99 Rest of the world

79 Postdocs

81 PhD Students

35 Research Groups/Technicians

26 Masters Students

17 Trainees

5  BOOK CHAPTERS

187 PEER-REVIEWED PUBLICATIONS FROM ASSOCIATED GROUPS

730 PEER-REVIEWED PUBLICATIONS FROM IN-HOUSE GROUPS

917 TOTAL

In the last 5 years

- Albania 1
- Argentina 1
- Belgium 1
- Brazil 5
- Canada 2
- Cape Verde 6
- China 1
- Colombia 2
- France 11
- Germany 9
- Greece 2
- Hungary 1
- India 5
- Ireland 2
- Italy 6
- Japan 4
- Montenegro 1
- Nepal 2
- Netherlands 2
- Nigeria 1
- Poland 7
- Portugal 271
- Serbia 2
- Spain 11
- Sweden 1
- Switzerland 1
- Tanzania 1
- Tunisia 1
- Turkey 2
- United Kingdom (UK) 5
- United States (USA) 2
- Uruguay 1

10 CORE FACILITIES

45 Core Facility Staff, of which 14 are PhD holders (includes 5 Heads that are also Group Leaders)

9 SERVICE UNITS

43 Service Units staff, of which 9 are PhD holders

**SCIENTIFIC COMMUNICATION**

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### Competitive Awards Secured by IGC Researchers

**PRIZES AND HONOURS**
- 2 ERC Consolidator Grants
- 2 FCT Investigators
- 1 Pfizer Prize for Basic Science
- 1 PluS Genetics Research Prize
- 1 Laço Breast Cancer Grant
- 1 Pulufo Valente Science Award
- 1 Grande Oficial da Ordem Militar de Santiago da Espada
- 1 Liga Portuguesa Contra o Cancro/Pfizer Research Award
- 2 ERC Grants
- 2 European ERA-NET
- 1 March of Dimes Research Grant
- 1 FCT – Harvard Medical School
- 1 EMBO Member nomination
- 1 March of Dimes Research Grant
- 1 FCT-FACC
- 1 FACC-internationalization travel grant
- 1 EMBO Practical Course/workshops
- 1 EEFIS Short-term fellowship
- 1 Tebu-Bio’s Researchers Travel Grant

**NEW INSTITUTIONAL GRANTS**
- 1 Unidade de Investigação FCT
- 1 POBI Lisboa/QREN Portugal

**NEW RESEARCH GRANTS STARTED IN 2015**
- 1 European Commission - Horizon 2020
- 1 ERC Grants
- 1 Pfizer Prize for Basic Science
- 1 EU grant
- 1 EMBL Installation Grant
- 1 Pfizer Investigator-Initiated Research Project
- 1 Melo e Castro SCL Award
- 1 BIAL Bursary Programme
- 1 Laço Breast Cancer Grant
- 1 FCT Investigator-Initiated Research Project

**OTHER FUNDING, INCLUDING BILATERAL COLLABORATION, TRAVEL GRANTS AND CONFERENCE ORGANISATION**
- 1 Programme Pessoa Bilateral Cooperation Portugal/France
- 1 EMBO Practical Course/workshops
- 1 European Summer School - Volkswagen Foundation
- 1 FCT-FACC
- 1 FACC-internationalization travel grant
- 1 EMBO Practical Course/workshops
- 1 EFIS Short-term fellowship
- 1 Tebu-Bio’s Researchers Travel Grant
- 1 Bolsa SPP/Menarini
- 1 SPI Travel Award
- 1 Youth Travel Fund
- 1 Christian Boulin Fellowship
- 1 International Society for Evolution Medicine and Public Health Travel award

### Research Grants Breakdown by Funding Source

**2011-2015**

- **FCT (PORTUGAL)**
  - 161
  - 14%
- **EUROPEAN COMMISSION**
  - 13%
- **PUBLIC**
  - 7%
- **PRIVATE**
  - 14%
- **PUBLIC-PRIVATE PARTNERSHIP**
  - 0%\n
**In the last 5 years**

- **FCT (PORTUGAL)**
  - 121
  - 13%
- **EUROPEAN COMMISSION**
  - 0%
- **PUBLIC**
  - 0%
- **PRIVATE**
  - 0%
- **PUBLIC-PRIVATE PARTNERSHIP**
  - 0%

**Source:** IGC Research Funding Affairs
BUDGET OVERVIEW
2015

TOTAL BUDGET
17.2M €

BREAKDOWN OF IGC EXPENDITURE

43% INTERNAL FUNDING
Calouste Gulbenkian Foundation

57% EXTERNAL FUNDING

PERSONNEL
staff and researchers
19%

FELLOWSHIPS
28%

OPERATIONS
facility costs, others
32%

INFRASTRUCTURE
building maintenance, refurbishments
12%

EQUIPMENT
9%
IGC launched a new educational resource
“My genes: should or should I not know who I am” is a video that explores concepts related to heredity, questioning the social and ethical implications of accessing genomic information.

Call for the 2016 PhD Programme IBB
The IGC PhD Programme in Integrative Biology and Biomedicine (IBB) recruited 10 students for the 2016 class.

Florence Janody awarded with Laço Breast Cancer Grant 2015
Florence Janody will study the alterations of the cell skeleton in the transition from normal to cancer cells.

Nobel Prize, Christiane Nüsslein-Volhard at the IGC
In the scope of the IBB Course on Developmental Biology, Christiane Nüsslein-Volhard visited the IGC.

Louis Moita awarded with an European Research Council (ERC) Consolidator Grant
Moita’s research on sepsis was awarded with 2 million Euros.

Workshop “Mouse microbiota: genotype-phenotype control and technological challenges”
Over 50 scientists from all over the world discussed recent findings addressing the interaction of microbiota and mouse genotypes.

Workshop “Mouse microbiota: genotype-phenotype control and technological challenges”
About 50 scientists gathered at the IGC to discuss the behavioural neuro mapping of fish.

António Coutinho awarded with the “Grande Oficial da Ordem Militar de Sant’Iago da Espada”
The President of the Portuguese Republic recognized the member of the IGC Management Committee and former IGC Director, António Coutinho, for his work on science and education.

Placental malaria research funded by March of Dimes Foundation
Carlos Penha Gonçalves will study factors and mechanisms involved in placental malaria. This was the first time that this American organisation funded research from a Portuguese Institution.

President of the Howard Hughes Medical Institute visited the IGC
Robert Tjian visited the IGC as one of the three Portuguese institutions with affiliated HHMI Early Scientists: Miguel Godinho Ferreira and Karina Xavier.

Mónica Bettencourt Dias elected European Molecular Biology Organisation (EMBO) Member
Mónica Bettencourt Dias was recognized by the merit and excellence of the work developed in recent years.
European and US consortium coordinated by IGC
The consortium, coordinated by Jörg Becker, received 2.6 million Euros to study the evolution of sexual reproduction in plants.

Workshop Inspirar Ciência: a Matemática para a Vida
In this course, 25 Mathematics high school teachers learnt how to apply mathematical concepts to the analysis of biological systems.

IGC at NOS Alice Music Festival
IGC scientists took science to this music festival, whose promoter, Everything is New, also funds two fellowships every year for young scientists at IGC.

European Summer School “Host-microbe symbioses – old friends and foes”
This Summer School, organised by Karina Xavier and Luis Teixeira, had 30 European PhD students.

EMBO Practical Course “Measuring intra-species diversity using high-throughput sequencing”
Thirty scientists from all over the world attended this EMBO practical course on new sequencing techniques, organised by Daniel Sobral.

IGC scientists attracted national funding
In a competitive call for projects from Fundação para a Ciência e a Tecnologia with 13% national success rate, 21 out of 30 IGC groups secured funding.

Call for the 2016 PGCD
Applications to the 2016 edition of the Graduate Programme Science for Development (PGCD) were opened.

Symposium “Super-Resolution Microscopy in Infection and Immunity”
Over 65 scientists gathered at the IGC to discuss Super-Resolution Microscopy, in a symposium co-organised by Nuno Moreno.

IGC research won the PLOS Genetics Research Prize 2015
A research paper from Isabel Gordo, Karina Xavier and Jocelyne Demengeot's laboratories was recognised as the best article published in the journal PLOS Genetics in 2014.

IGC PhD student received 2015 Fellowship Liga Portuguesa Contra o Cancro/Pfizer
Sandra Tavares was awarded to study the role of the cytoskeleton in the early phases of breast cancer.

IGC Scientists awarded with the 2015 Pfizer Award in Basic Research
The work developed by Miguel Soares laboratory on how gut bacteria are protective against malaria was selected by SCML and the Pfizer Laboratories.

Mónica Bettencourt Dias awarded with an European Research Council (ERC) Consolidator Grant
Bettencourt Dias’ research on the biogenesis of centrioles was awarded with 2 million Euros.

First scientific meeting of African and Timorese Graduate Students in Portugal
Students developing PhD theses in different research fields gathered at the IGC, in an event organised by Joana Gonçalves Sá, Director of PGCD.
42 GROUPS
287 RESEARCHERS
69 FUNDED RUNNING PROJECTS
152 PUBLICATIONS
MEMBRANE TRAFFIC

GROUP LEADER
Adrain, Colin

RESEARCH INTERESTS
We are interested in how secretory trafficking coordinates cellular signalling during normal physiology, and its contribution to inflammatory disease and cancer. 60% of all current drugs target membrane proteins, illustrating the medical importance of this pathway. However the complex biogenesis and trafficking of many signalling proteins is poorly understood, providing an incentive to understand the secretory pathway better. In eukaryotes, one third of translated proteins are secretory proteins. These fold in the endoplasmic reticulum (ER) and traffic to the plasma membrane, where signalling occurs. Until recently, it was believed that secretory trafficking was accomplished by a default mechanism called ‘bulk flow’ whereby newly synthesized proteins are packaged into trafficking vesicles at the rate that they are produced. However, it is now clear that trafficking, especially of membrane proteins, is controlled by additional influences, including trafficking partners, post-translational modifications, or regulation of protein stability.

PROJECTS RUNNING IN 2015
• How membrane trafficking regulates signalling controlled by metalloproteases
• Role of quality control in the secretory pathway in vivo in mice, during development and disease
• Genetic screens to identify novel trafficking factors

MAIN ACHIEVEMENTS IN 2015
HOW MEMBRANE TRAFFICKING REGULATES SIGNALLING CONTROLLED BY METALLOPROTEASES
This project builds on my observation that ER-localized membrane proteins called iRhomms are essential for activation of ADAM17, a membrane-tethered metalloprotease, required for the proteolytic release of membrane-tethered signalling molecules including TNF (tumour necrosis factor) and ligands of the EGFR (epidermal growth factor receptor). We now focus on understanding how iRhom itself is regulated by inflammatory and growth-promoting stimuli; hence how these signals activate ADAM17. The major achievements have been the isolation and characterization of iRhom regulatory proteins from immunoprecipitation/mass spectrometry experiments.

This revealed several iRhom interactors that we are studying in cellular/biochemical experiments, including kinases and a cytoskeletal protein associated with the endocytic pathway. We are currently deciphering the effect of these interactors on iRhom (hence, ADAM17) control of growth factor signalling, in cells in which the candidate has been ablated using CRISPR. A second focus is to understand how upstream signals from inflammatory pathways control iRhom behaviour, via triggering post-translational modifications within the iRhom N-terminus. We are delineating how these pathways influence iRhom.

ROLE OF QUALITY CONTROL IN THE SECRETORY PATHWAY IN VIVO, DURING DEVELOPMENT AND DISEASE
The goal is to define the role of quality control in the endoplasmic reticulum at the organismal level, during physiology and disease. We have generated mice null in genes implicated (from biochemical studies) in the control of degradation of misfolded proteins in the ER. We have successfully targeted four candidate genes. For one project, we have confirmed ablation of protein expression, and are characterizing the mutant animals. For the others, we have confirmed targeting and are homozygous the mutants. During this year, we will characterize the mutant mice in disease models, in conjunction with the histopathology facility. We will also assess serum metabolites, to investigate the role of these genes in metabolic regulation.

GENETIC SCREENS TO IDENTIFY NOVEL TRAFFICKING FACTORS
The rationale is to perform genetic screens in mammalian cells to identify novel factors responsible for the trafficking of biologically important molecules, including ADAM metalloproteases, to the cell surface. Our approach exploits mutagenesis of a population of mammalian cells with a CRISPR library, then selecting cells with abnormally low cell surface levels of the protein of interest. Candidates were identified by comparing the parental versus selected populations, in deep sequencing experiments. We have identified several candidate trafficking factors and we are currently dissecting how these control metalloprotease trafficking.

Funding
FP7-Marie Curie Actions, European Commission
Worldwide Cancer Research

Collaborators
Christopher Gemen (University of Vienna, Austria)
Paul Lehner (University of Cambridge, UK)
Seamus Martin (Trinity College, Ireland)
Kvido Strisovsky (Institute of Organic Chemistry & Biochemistry, Czech Republic)

Outreach
IGC stand at NOS Alive’15 - speed dating, Alges, July.
IGC stand at GreenFest - speed dating, Estoril, October.
Hands-on activities for primary school students, Azeitão, December.
Our research focuses on the biophysical and genetic bases of pattern formation and morphogenesis. How is gene expression regulation coordinated in space and time during embryo development? How are sharp responses in gene regulation triggered by shallow concentration differences of the signalling molecules? How are gene expression patterns reliably shaped in the presence of molecular fluctuations, genetic variability and environmental perturbations?

We address these questions using a multilevel modelling approach, capturing key quantitative aspects of the interplay between the biophysical mechanisms underlying cell and tissue morphogenesis and the regulation of gene expression. Our theoretical models are developed in close relation with experimental data and are mainly used to formulate organised hypotheses and make testable predictions.

As the models’ validation is strongly dependent on quantifying and estimating the biological parameters involved, we also work on the development of quantitative image analysis methods, databases and parameter optimisation algorithms.

**QUANTIFYING NATURAL COLOUR PATTERNS**

In many organisms, relevant phenotypes are described by their specific colour patterns, and these can vary with the genetic background, age or environmental factors.

How can these phenotypes be described by numbers? Can we disentangle different traits from these complex patterns and evaluate them independently? Despite the widespread use of natural colour patterns to characterise phenotypes, there are surprisingly few robust and reproducible methods to quantitatively classify this type of data.

We are developing image analysis methods, together with dedicated (or adapted) image acquisition systems and databases. Our colour and shape analysis algorithms enable the quantitative characterization of phenotypes, according to their morphometric parameters and pigmentation (or gene expression) patterns. These methods are applied to different image types and model systems, from butterfly wings to fly and lizard pigmentation patterns.

**SOFTWARE DEVELOPMENT**

**MathColor**

MathColor is a set of Wolfram Mathematica interactive applications implementing novel methods for the quantitative analysis of colour patterns in natural colour images.

**WingPatterns**

The WingPatterns knowledge base combines in the same platform the experimental image collections (with the respective associated metadata) and the quantitative analysis results of the gene expression patterns in larvae and pupae, adult pigmentation, vein patterning and wing shape, among other morphometric traits. Associated with the database, we are developing automated image analysis algorithms and data-mining techniques.

wингpatterns.igc.gulbenkian.pt
Influenza A virus is a major human pathogen that causes yearly epidemics and occasional pandemic outbreaks. Despite a tight surveillance and a yearly vaccination scheme, the pathogen is responsible for high mortality, morbidity and economic damage. The elucidation of cellular pathways used by the virus, can contribute to identify novel therapeutic targets. The cell biology of viral infection lab is interested in identifying and characterizing host factors and pathways necessary for viral infection. In particular we focus on the host processes involved in influenza A virus assembly, for which host vesicular trafficking contributes. In this sense, our primary interest is to understand the regulatory mechanisms governing host trafficking and how these are subverted by infection to assist viral infection, modulate immune response to influenza A virus infection and the role of ADP ribosylation factor 15 in influenza A virus infection.

**MAIN ACHIEVEMENTS IN 2015**

The lab focuses in three main themes related to influenza A virus host interactions, and in all of which we made considerable progress:

**ASSEMBLY OF INFLUENZA A SEGMENTED GENOME**

One of the most intriguing aspects in the lifecycle of influenza A virus is the selective packaging of its 8-segment genomic core (vRNPs) in a virion. We set out to characterize the involvement of the recycling endosome in the process, substantiated by the formation of vRNPs that we are dissecting. Our working hypothesis is that vRNPs attach to mitochondria, leading to its fragmentation, and concomitant transport to sites of assembly, for energy supply.

**CHARACTERIZATION OF MITOCHONDRIA ALTERATIONS IN INFECTION**

It has been reported that influenza A virus infection leads to mitochondria fragmentation. Our preliminary data showed a positive correlation between mitochondria fragmentation and vRNPs that we are dissecting. Our working hypothesis is that vRNPs attach to mitochondria, leading to its fragmentation, and concomitant transport to sites of assembly, for energy supply.

**POSTER PRESENTATION AT THE IGC WORKSHOP ON VIRAL INFECTION AND IMMUNITY**

Dr. Alenquer presented the lab’s work on the role of Rab11 in innate immunity and its involvement in the egress of influenza A virus. The poster presented the main findings of the lab’s work on the role of Rab11 in the egress of influenza A virus, showing that Rab11 regulates the recycling of viral proteins to the plasma membrane, facilitating the release of viral particles. The poster also highlighted the lab’s ongoing work on the characterization of the mitochondrial alterations induced by influenza A virus infection, showing a positive correlation between mitochondria fragmentation and viral RNA hotspots.

**PUBLICATIONS**


**OUTREACH**

The lab participated in several outreach activities, including public talks, workshops, and school visits, to share their research on influenza A virus and its impact on human health. The lab's research on the role of Rab11 in influenza A virus infection was highlighted in a public talk titled “Influencing the immune response to influenza A virus infection,” presented at the 10th International Conference on Viral Infections and Immunity, held in Lisbon, Portugal. The lab’s research on mitochondrial alterations induced by influenza A virus infection was highlighted in a public talk titled “Mitochondrial alterations during influenza A virus infection,” presented at the 8th International Conference on Viral Infections and Immunity, held in Madrid, Spain.
PROTEIN NUCLEIC ACIDS INTERACTIONS

GROUP LEADER
Athanasiadis, Alekos

RESEARCH INTERESTS

Sequence is not fate. Proteins demonstrate an impressive ability not only to recognize and bind to particular pieces of nucleic acids code but also to alter its information content by catalyzing reactions that rearrange its sequence or specifically change one nucleotide for another. Organisms have found in such mechanisms the means for creating sequence diversity as it is gloriously exemplified in the diversification of immunoglobulin genes. The recent realisation that multi-cellular organisms achieve phenotypic complexity without a parallel increase in number of genes has highlighted the importance of posttranscriptional RNA modifications in creating and fine-tuning a much larger repertoire of proteins originating from a small number of genes. I am interested in the study of the molecular mechanisms involved in such diversification of RNA and DNA sequence as well as understanding the consequences of such processes for molecular evolution dynamics. In this direction I am employing the tools of computational, molecular and structural biology in the study of RNA and DNA editing. My work presently focuses on the A to I RNA editing process which alters the sequence of thousands of human pre-mRNAs (Athanasiadis et al., 2004), while it also plays a role in a newly discovered and as yet uncharacterized interferon response antiviral pathway.

PROJECTS RUNNING IN 2015

- Recognition of nucleic acids by the innate immune system
- Structural studies of A to I RNA editing

MAIN ACHIEVEMENTS IN 2015

In vertebrate species the innate immune system down-regulates protein translation in response to viral infection through the action of the dsRNA-activated protein kinase PKR. Not surprisingly viruses have evolved proteins that inhibit such host responses. Pox viruses encode for that purpose E3L, a potent inhibitor of PKR and interferon response. In some teleost species another protein kinase, PKZ, plays a similar role but instead of dsRNA binding domains, PKZ has Zα domains. Zα domains recognize the left-handed helical DNA conformation known as Z-DNA. Not surprisingly viruses have evolved protein kinase PKZ. Not surprisingly viruses have evolved proteins that inhibit such host responses. Pox viruses encode for that purpose E3L, a potent inhibitor of PKR and interferon response. In some teleost species another protein kinase, PKZ, plays a similar role but instead of dsRNA binding domains, PKZ has Zα domains. Zα domains recognize the left-handed helical DNA conformation known as Z-DNA.

Now we completed the crystal structure of ORF112-Zα in complex with an 18 bp CpG DNA repeat, at 1.5 Å. We demonstrated that the bound DNA is in the left-handed conformation and we identified key protein nucleic-acids interactions accounting for the specificity of ORF112. In collaboration with the Veterinary Medicine lab of Alain Vanderplasschen at the University of Liege, we demonstrated that ORF112 protein localises in stress granules of CyHV-3 infected fish cells suggesting a not only structural but also functional behaviour similar to that of host Zα domains. We further designed mutants of ORF112 that abolish DNA binding. Virus with the equivalent mutations resulted in loss of pathogenicity in fish. In the future mutant virus may serve as a live vaccine.

A repetitive CpG DNA bound by the Zα domain of the Cyprinid Herpes virus protein ORF112. Like the Pox viral inhibitor of interferon response E3L, ORF112 induces the left-handed helical DNA conformation known as Z-DNA.

PUBLICATIONS

PLANT STRESS SIGNALLING

GROUP LEADER
Baena-González, Elena

RESEARCH INTERESTS
Mounting evidence suggests that in plants, environmental information is partly conveyed through sugar signals. Accordingly, sugars have been linked to stress responses, to the regulation of growth and to specific developmental transitions such as germination and flowering. How the plant nutrient status is integrated with other signals into adequate growth and developmental decisions is poorly understood, but one central component in this process is the SNF1-related Protein Kinase1 (SnRK1). SnRK1 is an evolutionary conserved protein kinase complex that regulates energy homeostasis in plants. In doing so, it promotes developmental transitions such as germination and development; it has a central role in how SnRK1 interacts with the ABA pathway, also central to stress responses and development; iv) what are the cellular processes under SnRK1 control?

PROJECTS RUNNING IN 2015
- Regulation of SnRK1 signalling by SUMOylation
- Cross-talk between the SnRK1 and ABA signalling pathways
- Downstream effectors of SnRK1 signalling
- Screening for mutants altered in energy signalling

MAIN ACHIEVEMENTS IN 2015
We have found that sustained SnRK1 activation triggers its SUMOylation through the SIZ1 E2 SUMO ligase and its subsequent degradation via the proteasome. This establishes a negative feedback loop between SnRK1 activity and its SUMOylation that prevents a detrimental over activation of the pathway. Our follow-up work suggests that SUMOylation may have additional roles in SnRK1 complex formation, favouring the assembly of specific subunit combinations over others. We are currently investigating the functional relevance of this as well as its connection with the previously observed effect on SnRK1 complex stability.

Our previous work showed that SnRK1 is negatively regulated by the same PPK2 phosphatases that repress ABA signalling, a central phytohormone that controls numerous stress and developmental responses. This provided for the first time a molecular connection between SnRK1 and ABA signalling but was not sufficient to explain why manipulation of the SnRK1 pathway results in ABA-related phenotypes. Our work during this year has revealed additional levels of crosstalk between the two pathways, both at the level of the kinases and their surrogate transcription factors.

We have previously shown that part of the transcriptional programme driven by SnRK1 is mediated by miRNAs and by the C81-class of bZIP transcription factors, but the mechanistic details of this remained poorly understood. During this year our collaboration with the group of Markus Teige in Vienna has provided insight into how SnRK1 controls bZIP function. Upon activation during stress SnRK1 phosphorylates the C-class bZIP63, thereby changing its dimerization properties and favouring the formation of specific heterodimers with S1-class bZIPs.

Finally, our mutant screen using a transgenic reporter line for the SnRK1 pathway has resulted into the identification of numerous mutants with altered regulation of SnRK1 signalling. Eight of these mutants have now been selected for mapping using next generation sequencing.


Identification of mutants with altered SnRK1/energy signalling. Identification of mutants with altered SnRK1/energy signalling. The DIN6::LUC reporter is strongly induced in the original reporter line (“WT”) under extended night conditions, but this induction is lost in mutants M1 and M2. On the other hand, mutants M3, M4, and M5 express the DIN6::LUC reporter under normal control conditions and the induction in response to an extended night is aberrantly high. The reduced growth phenotype of plants with deficient induction is similar to that reported for plants with transient systemic SnRK1 silencing.


Our group is interested in sexual reproduction and early embryogenesis, with a particular focus on (epi)genetic mechanisms acting during male gametogenesis. We and others have shown that male gametes in the plant and animal kingdom carry complex sets of RNA molecules, including not only mRNAs but also small RNAs. Epigenetic reprogramming during male gametogenesis seems to be partially responsible for these distinct transcriptomes. Using the angiosperm Arabidopsis thaliana and the bryophyte Physcomitrella patens as our primary experimental models we are addressing the following specific questions:

1. How has (epigenetic) reprogramming during gametogenesis evolved in the plant lineage? Are we employing male gametogenesis in the extant moss Physcomitrella as a test case?
2. Do sperm and vegetative nucleus communicate via mRNA transport? This question is being addressed using Arabidopsis pollen.
3. What is the role of the CCR4-NOT1 complex during pollen development in Arabidopsis?
4. Are plant tetraspanin signalling complexes important for gamete cellular interactions and double fertilization?

**PROJECTS RUNNING IN 2015**

- Evolution of sexual reproduction in plants
- mRNA transport and non-cell-autonomous activity in the male germ unit
- Tetraspanin signalling complexes and their role during gamete cellular interactions and double fertilization

**MAIN ACHIEVEMENTS IN 2015**

In 2015, we have finalized our Physcomitrella patens transcriptome atlas covering 14 stages of the life cycle of the moss, including 3 stages of male gametogenesis. The majority of this data set is easily accessible through the Physcomitrella eFP browser at the Bio-Analytical Resource for Plant Biology. Based on our detailed time-course of sporophyte developmental progression we identified a comprehensive set of sperm-specific transcription factors. We found that many of these genes have homologs in angiosperms that function in developmental processes such as flowering and shoot branching. Deletion of the PpTCP5 transcription factor resulted in development of supernumerary sporangia attached to a single seta, suggesting that it negatively regulates branching in the moss sporophyte. Given that TCT genes repress branching in angiosperms, we suggest that this activity is ancient. During spermatogenesis a complex transcriptome was observed, characterized by a high number of enriched and preferentially expressed genes. A phylostratigraphic analysis showed that in anthozooids those transcripts correspond to evolutionarily younger genes, and therefore might act as a source of evolutionary gene innovation. These studies will be continued within the scope of the ERA-CAPS funded project EVOREPRO, which started in July 2015. Here our focus will be on epigenetic mechanisms during male gametogenesis in Physcomitrella. In our search for tetraspanin signalling complexes with potential importance for gamete cellular interactions and double fertilization we identified several potential tetraspanin-interacting binding partners (TBPs). The double mutant of two functionally redundant TBPs (tbp8/9) expressed in sperm cells (SC), showed an altered SC-SC membrane interface and SC connection to the pollen vegetative nucleus. Despite no apparent change in the expression of known sperm adhesion (GEX2) and fusion (GCS1) factors, tbp8/9 presents severe fertility defects, caused by predominant single fertilization events. These results support that TBPs8/9 is part of a sperm cell-specific TET signalling complex involved in the regulation of intercellular connections within the male gametophyte and with essential functions in plant gamete fusion.

**PUBLICATIONS**


VARIATION: DEVELOPMENT AND SELECTION

GROUP LEADER
Beldade, Patricia

RESEARCH INTERESTS
My research in evolutionary developmental biology is focused on the mechanistic basis of phenotypic variation and adaptation. Heritable phenotypic variation is the raw material for natural selection, and a universal property of biological systems. Understanding the mechanisms that generate this variation is a key challenge in biological research. What are the gene types, specific genes, and gene regions that contribute to evolutionarily relevant variation? How do they interact with environmental factors to regulate developmental trajectories and outcomes and account for environmental dependence of organismal development: 1) differences in height and slope of thermal reaction norms for body pigmentation between ca. 200 D. melanogaster genotypes, 2) similar effects of developmental temperature and immune challenge on ecdysone levels known to affect wing pattern development in B. anynana, 3) differences in response to juvenile hormone manipulations between body part, caste and species of ants, 4) differences between closely related species of Drosophila in how they respond to macronutrient variation in larval diet. Finally, the lab also completed the work in an FCT-funded project exploring the genetic basis of variation in butterfly wing patterns (work of MSc candidate Andreeia Teixeira) and adult performance of D. melanogaster (work of PhD candidate Elvira Lafuente). We characterized differences between wing pattern mutants in sequence and expression of candidate genes identified by genetic mapping, and started to explore methods of gene editing to study the function of those candidate genes.

MAIN ACHIEVEMENTS IN 2015
Our group’s Eco-Evo-Devo research combines concepts and approaches from different disciplines to characterize genetic and environmental factors (and corresponding mechanisms) that account for intra-specific variation and inter-species divergence in adaptive traits. During 2015, we used different insect models to explore the genetic and environmental factors that account for phenotypic variation and diversity. The bulk of the lab’s work focused on the role of the external environment in the generation of novel genetic variants (through the mobilization of transposable elements, TEs) and of novel phenotypic variants (through developmental plasticity). The work of PhD candidate Marta Marialva and MSc candidate Ana Eugénio explored the effect of an external abiotic factor (temperature) and internal biotic factor (Wolbachia endosymbiont) factors in TE dynamics during Drosophila melanogaster oogenesis and found complex patterns of response that depended on host genotype and TE identity. We also had various projects addressing the impact of the environment on adult phenotype: thermal plasticity in D. melanogaster body pigmentation (work of PhD candidate Elvira Lafuente and of student volunteer Jessica King), effect of immune challenge on wing patterns of Bicyclus anynana butterflies (work of PhD candidate Maria Adelina Jerónimo which will be followed by PhD candidate Yara Rodrigues), and nutritional plasticity in body architecture in different ant species (work of MSc candidate Andreeia Teixeira) and adult performance of Drosophila species (work of PhD candidate Nuno Soares). These projects characterized different aspects of the genetic and physiological factors that underpin the environmental dependency of organismal development: 1) differences in height and slope of thermal reaction norms for body pigmentation between ca. 200 D. melanogaster genotypes, 2) similar effects of developmental temperature and immune challenge on ecdysone levels known to affect wing pattern development in B. anynana, 3) differences in response to juvenile hormone manipulations between body part, caste and species of ants, 4) differences between closely related species of Drosophila in how they respond to macronutrient variation in larval diet. Finally, the lab also completed the work in an FCT-funded project exploring the genetic basis of variation in butterfly wing patterns (work of MSc candidate Carolina Silva and lab manager Pedro Castanheira). We characterized differences between wing pattern mutants in sequence and expression of candidate genes identified by genetic mapping, and started to explore methods of gene editing to study the function of those candidate genes.

GROUP OVERVIEW
GROUP LEADER
Email pbeldade@igc.gulbenkian.pt
PhD in Evolution and Development
Leiden University, The Netherlands, 2002
Group Leader at IGC since 2009
Previous positions
Associate Professor, Institute of Biology, Leiden University, The Netherlands
External Website
http://www.beldade.nl/

GROUP MEMBERS
Maria Adelina Jerónimo, External PhD student | Left in November
Elvira Lafuente, PhD student, PIBS 2013
Marta Marialva, PhD student, PIBS 2011
Yara Rodrigues, PhD student, PGCD 2015 | Started in September
Nuno Soares, PhD student, PIBS 2013
Ana Eugénio, Masters student
Carolina Silva, Masters student
Andreeia Teixeira, Masters student | Left in November
Jessica King, Undergraduate student | Left in August
Pedro Castanheira, Technician

Funding
Fundação para a Ciência e a Tecnologia

Collaborators
Filipa Alves (IGC, Portugal)
Manuel Marques Pita (IGC, Portugal)
Arnaud Martin (University of California at Berkeley, USA)
Christen Mirth (IGC, Portugal)
Susanne Sænæs (Natural History Museum of Paris, France)

Outreach
Public talk for general public, Lisbon, April.
Media appearance in newspapers, January, April.
CELL CYCLE REGULATION

GROUP LEADER
Bettencourt-Dias, Mónica

RESEARCH INTERESTS
Our research focuses on cell cycle progression and the cytoskeleton in normal development and disease. We are particularly interested in the role played by microtubule organising structures, such as the centrosome, cilias and flagella. The centrosome is the major microtubule organising in animal cells, and is very often abnormal in cancer. Cilia and flagella are cellular projections, which are indispensable in a variety of cellular and developmental processes including cell motility, propagation of morphogenic signals and sensory reception. Despite their importance, we know very little about centrosome and cilias biogenesis or how they may go awry in human disease. Our laboratory uses an integrated approach to study those questions: we combine studies in model organisms with studies in human cells, bioinformatics and mathematical modelling to have an integrated view of this process. The fruit fly is an excellent organism to address those questions, since it combines possibilities of screening multiple genes with the ability to perform in-depth regulation studies in the whole organism. As the regulatory mechanisms of the cell cycle and cytoskeleton have been highly conserved throughout evolution, we can extrapolate our findings to humans to test their relevance for human disease. An understanding of the pathways involved in cell cycle and cytoskeleton can generate diagnostic and prognostic markers and hopefully provide novel therapeutic targets in human disease.

PROJECTS RUNNING IN 2015

- Centriole elimination in oogenesis
- Centrosome Evolution
- Centrosome Number Control in Space and Time
- Centrosome Structure
- Centrosome changes in Cancer
- Cilia, their diversity and maintenance

MAIN ACHIEVEMENTS IN 2015

CENTROSOME BIOGENESIS AND STABILITY

Focusing on PLK4 regulation in space and time our group has identified mechanisms by which centrosomes form always at the same place (PLK4 trans-autophosphorylation plays a critical role) and always at the same time (regulated by CDK1 activity). We have been characterizing new microtubule regulators that regulate centrosome elongation and biogenesis. We have discovered that centrioles are not intrinsically stable but need to be stabilized by their matrix. In doing so we have discovered a mechanism by which centrosomes are inactivated and eliminated in oogenesis. We were able to prevent centrosome loss and show that that leads to problems in embryogenesis after fertilization.

CENTROSOMES IN CANCER

We have found that centrosome amplification and their clustering in mitosis is a hallmark of cancer. Using Barrett’s esophagus as a model system we show that centrosome amplification occurs early during tumorigenesis in dysplasia and is dependent on p53 inactivation.

CENTROSOMES IN EVOLUTION

We have discovered and are characterizing parallels between S. pombe and centrosome assembly that raise new questions regarding their evolution.

CILIA STRUCTURE AND MAINTENANCE

We have shown that cilias within an organism, such as Drosophila, are much more diverse than previously thought and that diversity in basal body and transition zone structure is critical to create diversity in function. We have also uncovered that cilias in Drosophila need to be actively maintained for their correct function.

PUBLICATIONS


Cells of multicellular organisms cooperate to ensure body development and maintenance throughout life. They do this in a collective distributed manner, without any master or plan. The Quantitative Organism Biology group studies the multilevel mechanisms that give rise to properties of the whole organism, in search for general principles of biological organisation and, eventually, the design of artificial systems.

One of our main research interests is the immune system, in which cells collectively ensure body housekeeping and homeostasis, avoid autoimmune diseases, and fight cancer and infections. We also investigate the morphodynamics of cells and tissues during fertilisation and embryonic development of metazoans.

Our approach is two fold: on the one hand, we create mathematical models of specific exemplary systems aiming to uncover basic principles, and on the other hand, we develop the quantitative methods required to assess the properties and predictions of these models.

RESEARCH INTERESTS

• Morphodynamic modelling and imaging of sperm chemotaxis in three dimensions
• Regulation of the biosynthesis single product in the cell: from VDJ recombination to centrosome synthesis
• Interplay between immune tolerance and disease tolerance in the vertebrate immune system

PROJECTS RUNNING IN 2015

A model of membrane potential and ion flux dynamics, featuring the sperm-specific channel Catsper, explains the pH changes and the temporal organisation and envelop of the spike-trains of cytosolic calcium elicited in sea urchin spermatozoa by sperm activation peptides.

A model of polo-like kinase 4 activation, a rate limiting kinase involved in centriole biosynthesis, suggests that supерnumerary centrioles can be avoided by concentrating this kinase at the centrosome thus reducing its cytosolic levels below a critical threshold.

A model of the recombination of antigen receptors and its control indicates that allelic exclusion, the quasi-absence of lymphocytes with two functional receptor genes, may be a functionless side-product of reducing the risk of collateral Rag-mediated genome damage.

PUBLICATIONS


MAIN ACHIEVEMENTS IN 2015

QUANTITATIVE ORGANISM BIOLOGY

GROUP LEADER

Carneiro, Jorge

GROUP MEMBERS

Tiago Macêdo, PhD student, PGCB 2008
Delphine Pessoa, PhD student, IBB 2013
Pedro Silva, External PhD student
Eleonora Tulunello, PhD student, IBB 2015
Daniel Espinosa, Visiting PhD student

Collaborators

Mónica Bettencourt-Dias (IGC Portugal)
Gabriel Corkidi (Instituto de Biotecnología, UNAM, Mexico)
Alberto Darszon (Instituto de Biotecnología, UNAM, Mexico)
Jocelyne Demengeot (IGC Portugal)
Adan Guerrero (Instituto de Biotecnología, UNAM, Mexico)

Outreach

Workshop Inspirar Ciência 2015 - Theoretical and practical teaching of high school teachers, IGC, September.
In this context we use cancer stem cell models of hijacked during tumorigenesis. We identified the zinc-finger factor Myt1 as a direct target of Ascl1 at the onset of neuronal differentiation. We found Myt1 functions as a transcriptional repressor genome-wide, acting at multiple levels to antagonize the inhibitory activity of notch signalling. It targets both Notch pathway components and many of its downstream targets, including known regulators of the neural stem cell programme, such as Sox2, Olig1 or Id3. Our results reveal an intricate gene regulatory network centred on Myt1, through which Ascl1 efficiently suppresses notch signalling cell-autonomously, thereby coupling neuronal differentiation with repression of the progenitor programme.

Glioblastoma Multiform, the most frequent and aggressive of brain tumours. In our research we use a multidisciplinary approach, combining mouse genetics, genomics and stem cell biology techniques.

Projects running in 2015
- Transcriptional control of vertebrate neurogenesis by the proneural and notch pathways
- Mitotic inheritance of the neural stem/progenitor cell network
- The transcriptional network of the zinc-finger factor Zeb1 and its function in the embryonic nervous system and glioma development

Main achievements in 2015
We used a cellular model of neurogenesis to investigate how Ascl1 interacts with the chromatin landscape to regulate gene expression when promoting neuronal differentiation. We found that Ascl1 binding occurs mostly at distal enhancers and is associated with activation of gene transcription. Surprisingly, the accessibility of Ascl1 to its binding sites in neural stem/progenitor cells remains largely unchanged throughout their differentiation, as Ascl1 targets both regions of readily accessible
NETWORK MODELLING

GROUP LEADER
Chaouiya, Claudine

RESEARCH INTERESTS
Thanks to great technological advances, regulatory networks are being uncovered that control cellular processes. Complementary to experimental approaches, mathematical models allow to get further insights into the functioning of these complex networks and to formulate hypotheses, e.g. identify proper strategies to enforce or prevent certain properties. In this context, considering the dimensions and complexity of the networks at stake, we mainly rely on the logical framework, which can uncover the key characteristics of the dynamics of such large networks, as demonstrated by a growing number of published models. Our activity is mainly organised along three lines:

- Methodological developments to enhance the analysis of large interaction networks (properties in terms of attractors, reachability, etc.);
- Implementation of new methods in the form of software tools;
- Development of models to tackle specific biological questions, in close collaboration with experimentalists.

MAIN ACHIEVEMENTS IN 2015
We contributed to two modelling studies that have been recently published, which both show the versatility of logical models. The first aimed to assess patterns of frequent genetic alterations, co-exclusivities or co-occurrences, observed in bladder cancer. To do so, interactions between these genes were organised into an influence network based on literature analysis. Because the sole network topology cannot explain all patterns, a logical model was built, accounting for the dynamics of associated pathways. This model shed light on aberrant activation of some pathways and provided predictions about contexts in which combined alterations would benefit tumorigenesis [Remy et al., Cancer Res. 75(19): 4042-52, 2015].

The second model focuses on the cellular network regulating the differentiation of T-helper cells. Our model-checking tools to analyze reachability properties allowed uncovering observed polarization of naïve cells as well as substantial plasticity of Th subtypes depending on the signalling environment [Abou-Jaoudé et al., 2015].

We also advanced on some methodological aspects. In particular, to better assess the complexity of choosing regulatory functions as well as the impact of this choice on model dynamics, we have fully characterized the Boolean functions compatible with a regulatory structure (i.e. complying with the sign and functionality of each regulatory interaction). We have further devised an efficient SAT-based approach to identify all the stable states of logical models defined as model compositions over 2D grids of cells.

PUBLICATIONS


SOFTWARE DEVELOPMENT
GInSim
GInSim supports the definition and analysis of logical models of regulatory/signalling networks. This software is in constant development, implementing most of our methodological advances.
http://ginsim.org

EpiLog
EpiLog supports the extension of the logical modelling approach to multi-cellular systems represented as grids of communicating cells. We have recently refactored the code, the graphical interface has been improved and novel updating schemes have been implemented to overcome the unrealistic synchronous behaviours of cellular automata.
http://epilog-tool.org/
We are interested in how adaptation to stressful environments is affected by interactions between organisms. For this purpose we use a multilevel approach that ranges from genes to ecosystems in the context of experimental evolution with *C. elegans* and different bacteria. The focus is on intra-population mechanisms, by which negative feedbacks can lead to the maintenance of genetic variability, or on interactions between species, where strong selective pressures occur between predators and prey or host and parasites. In this context we want to broadly know:

1. If adaptation to a new environment is affected primarily by the type (host/parasite, host/commensal, predator/prey, etc) or by the strength of interactions;
2. If the strength and type of interactions between organisms can change due to co-evolution during adaptation.

This year, we developed an efficient sequencing-based method to detect changes in frequencies of wild-type *C. elegans* isolates. With this, we show that frequency-dependent fitness effects are prevalent in competitions in the lab, which reveals possible evolutionary consequences of heterogeneity in *C. elegans* behaviour. The next stage of this research will test the adequacy of the worm model to mimic the eco-evolutionary consequences of resource heterogeneity in nature.

**Main Achievements in 2015**

Despite large fitness differences between *C. elegans* isolates, frequency-dependent effects prevent absolute loss of genetic diversity thus keeping the adaptive potential of populations.

**Research Interests**

- Diversity and frequency-dependent selection in *Caenorhabditis elegans*
- The genetic basis of consumer/resource interactions and the evolution of aging
- Host-microbe interactions and the evolution of aging

**Projects Running in 2015**

- Diversity and frequency-dependent selection in *Caenorhabditis elegans*
- The genetic basis of consumer/resource interactions and the evolution of aging
- Host-microbe interactions and the evolution of aging

Despite large fitness differences between *C. elegans* isolates, frequency-dependent effects prevent absolute loss of genetic diversity thus keeping the adaptive potential of populations.
POPULATION AND CONSERVATION GENETICS

GROUP LEADER
Chikhi, Lounès

RESEARCH INTERESTS

Genetic and genomic data are influenced by the demographic events that have shaped the history of populations. Such events include population collapses, expansions, or admixture processes. Our group is interested in developing new and using/testing existing methods to improve our understanding of these events and of the recent evolutionary history of species. We also, and crucially, want to understand the limits of genetic or genomic data as inferential tools. Applications go from human evolution (e.g. the Neolithic transition in Europe) to conservation genetics of wild (e.g. orang-utans, lemurs, dolphins) and domesticated species (e.g. cattle, sheep).

Work currently done at the Population and Conservation Genetics (PCG) group involves field work in Madagascar, Guiné-Bissau and Portugal, and the genetic typing of endangered species (lemurs, endemic and invasive rodents, red colobus, bottlenose dolphins) data analysis and simulation. We are also moving towards the use of genomic data (RAD-seq). We collaborate with the laboratoire Évolution & Diversité Biologique, in Toulouse, where Lounès Chikhi is a Senior researcher (Directeur de Recherche) and with colleagues from various institutions, including several in Portugal, the UK (Reading University), France (Institut de Mathématiques de Toulouse), Madagascar (Univ. Mahajanga, Antananarivo, Antsirana), or Malaysia (Danau Girang Field Station).

PROJECTS RUNNING IN 2015

• A vertebrate’s eye view on habitat loss and fragmentation across time and space in Madagascar
• Assessing the molecular, toxicological and ecological status of the bottlenose dolphin from the Sado estuary (Portugal), a highly-human-impacted environment

MAIN ACHIEVEMENTS IN 2015

With Bárbara Parreira we showed that social groups can maintain high levels of genetic and genotypic diversity. Social groups are common among primates and vertebrates. Population geneticists tend to either ignore them (focusing at the level of the population) or to consider them as small “populations”. If they behaved as small populations they should be subject to significant genetic drift and lose diversity rapidly. This is not what we find. We use simulations and find that social groups maintain high levels of genotypic (i.e. individual) and genetic (i.e. at the level of the group) diversity.

With Olivier Mazet, a mathematician from the Institut de Mathématiques de Toulouse, IMT, and Willy Rodriguez, the PhD student that we co-supervise, we showed that it is possible to use genetic data from a single individual to do model selection in population genetics. Population geneticists typically use genetic data from populations to identify which among several alternative models best explains the observed patterns of genetic diversity and differentiation. Here we showed that we can do that with genomic data from a single individual.

In the same study (with Olivier Mazet and Willy Rodriguez) we also showed that if a population or species is structured (organised in a set of S subpopulations) we can estimate the number of subpopulations, $S$, simply by analysing the genetic data from one individual sampled in any of these populations.

With two additional colleagues (Simona Grusea from the IMT and Simon Boitard from the INRA Toulouse) we also showed that genomic data from a single individual can be wrongly used to identify changes in population size that may never have taken place. This study was published online in Dec. 2015, but will only appear in the Feb. Issue of Heredity.

Propithecus perrieri is one of the rarest primates in the world. It is has been classified as one of the 25 most endangered primates by the IUCN on various occasions. We have carried out the most thorough study of genetic diversity and differentiation of the species. We found that the species is indeed genetically less variable than sister species. This genetic study together with previous work on population size estimates published in 2013 led us to contribute to the IUCN book on the 25 Most endangered primates of the world.

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PUBLICATIONS


Outreach

Public talk for University students at Aula Aberta, FCUL, Lisbon, March.

Public talk for University students at Darwin’s Legacy Tea Party, FCUL, Lisbon, April.

Public talk for general public at Fête de Lutte Ouvrière, France, May.


Public talk for general public at Jornada de Reflexão: O que é o Homem? FCSH, Lisbon, October.

Public talk for University students at NEBFCUL conferences, FCUL, Lisbon, November.
**LYMPOCYTE PHYSIOLOGY**

**GROUP LEADER**

Demengeot, Jocelyne

**RESEARCH INTERESTS**

We are concerned with those properties of the immune system that guarantee tissue integrity as well as tolerance to commensals and food antigens while maintaining the ability to mount efficient responses to infectious agents and some tumours. We approach the cellular and molecular bases of immune regulation through the analysis of various mouse models, notably of spontaneous or induced autoimmune and immuno-pathological inflammation. Keeping in mind that the vertebrate immune system relies on the production of a very large diversity of lymphocytes and tissues in autoimmune cardiomypathies and set assays to identify the precursors of Treg cells and tissues in autoimmune cardiomyopathy. We evidenced that the adaptive immune system results in the production of a very large diversity of lymphocytes and tissues in autoimmune cardiomypathies and set assays to identify the precursors of Treg cells and tissues in autoimmune cardiomyopathy.

**PROJECTS RUNNING IN 2015**

- Reciprocal interactions between the adaptive immune system and bacterial opportunists
- Genetic and environmental factors in the targeting of organ-specific autoimmunity
- Clinical relevance of therapeutic Ab immunogenicity
- Off-targets of the lymphocyte recombinase RAG

**MAIN ACHIEVEMENTS IN 2015**

We evidenced that the adaptive immune system reduces the pace and increases the predictability of E. coli adaptation to the mouse gut. We developed experimental algorithms to dissociate the role of lymphocytes and tissues in autoimmune cardiomyopathies and set assays to identify the precursors of Treg impairing tumour immunosurveillance. We revealed physiological conditions under which tolerogenic peptide therapies worsen autoimmune disease outcome. We evidenced that the RAG recombinases exert a selective pressure for genome evolution, demonstrating that the TCRbeta locus undergoes intense illegitimate recombination and produced the Recombination Classifier software. Finally, we initiated the systematic monitoring of all patients under anti-TNF inhibitors in a single centre (IIGO).


**PUBLICATIONS**


**SOFTWARE DEVELOPMENT**

REC, a RAG recombinase target Classifier

New bioinformatics tool to map potential recombinase (RAG) targets in all jawed vertebrates. This is the product of a collaboration with the Computational Genomics’ group. [http://www.evocell.org/cgl/resources]

**FUNDING**

FIP7 programme, European Commission Fundação para a Ciência e a Tecnologia

**COLLABORATORS**

Paula Breia (Hospital Garcia de Orta, Portugal)
Michel Cogné (Centre National de la Recherche Scientifique, Limoges University, France)
Decio Eizirik (University Libre Brussels, Belgium)
Stefan Frantz (Universitätsklinikum Halle, Germany)
Isabel Gordo, José Pereira Leal, Vasco Barreto, Alekos Athasianadis, Jorge Carneiro, Miguel Soares (IGC, Portugal)
Luís Graca (IMM, Portugal)
Jorge Kollas (Institute of Immunology, Greece)
Mark Peakman (King’s College London School of Medicine, UK)
Salvatore Spicuglia (Technological Advances for Genomics and Clinics, France)

**OUTREACH**

IGC stand at NOS Alive’15 - speed dating, Algés, July.

Media appearance in newspapers and other channels, November, December.
OBESITY

GROUP LEADER
Domingos, Ana

RESEARCH INTERESTS
Organisms evolved biological mechanisms that maintain an individual’s body weight within a narrow range of variation. For that purpose, different organs such as brain, fat, liver, bone, pancreas, and even the immune system, integrate nutrient-related and hormonal signals to control weight homeostasis. Our laboratory is interested in the function of the nervous system in weight control, aiming at identifying neurons that play a fundamental role in eating behaviour and metabolism. We rely on newly developed targeted mouse strains that enable the application of state-of-the-art neuro-genetic techniques: we use optogenetics to establish the role of molecularly identified populations of neurons, and Translational Ribosome Affinity Purification – TRAP – to identify molecular targets with neuromodulatory activity enriched in those key neurons. We believe that our experimental approach will pave the way for the identification of novel molecular targets with potential in the treatment of obesity.

PROJECTS RUNNING IN 2015

• Sympathetic of the Neuro-Adipose Connection – new mechanisms for new anti-obesity therapiies

MAIN ACHIEVEMENTS IN 2015

Neuro-adipose connections are first visualized in vivo with two-photon microscopy, in a transgenic mouse expressing red fluorescent protein (dtTomato) in sympathetic neurons. (Cell, 2015).

Optogenetic activation of these neurons drives lipolysis and concordant fat reduction. (Cell, 2015).

Optical projection tomography (OPT) coupled to tissue clearing reveals the hidden anatomy of the adipose organ. (Cell, 2015).

PUBLICATIONS


GROUP LEADER
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PhD in Neurobiology
The Rockefeller University, USA, 2005

Group Leader at IGC since 2013

Previous positions
Research associate, The Rockefeller University, USA
Postdoctoral associate, The Rockefeller University, USA

External Website
http://domingoslabobesity.weebly.com

GROUP MEMBERS

Andrea Barateiro, Postdoc
Elsa Seixas, Postdoc
Maria Inês Mahi, PhD student, IBB

Roksana Maria Pirzgalska, External PhD student
Mafalda Pereira, Masters student

Nadiya Kubasova, Research Technician
Imogen Morris, Trainee | Started in May

Funding
European Molecular Biology Organisation / Fundação para a Ciência e a Tecnologia

Collaborators
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Denis Burdakov (Medical Research Council, MRC HILL, UK)
Marcelo Dietrich (Yale University, USA)
Chris Glass (UCSD, USA)
Dan Litman (NYU, USA)
Henning Voss (Weill Cornell Medical College, USA)
Allison Xu (UCSF, USA)
Manuel Zimmer (Institute of Molecular Pathology, Austria)

Outreach
Media appearance in newspapers, TV, and other channels, January, March, August, September.

IGC stand at NOS Alive’15 - speed dating, Algés, July.
whole transcriptome analysis using next generation sequencing. In 2015, we also reported the functional characterization of a novel Arabidopsis membrane transporter of the Major Facilitator Superfamily (MFS), Zinc-Induced Facilitator-Like 2 (ZIFL2) is a plasma membrane root transporter that modulates plant potassium and caesium homeostasis. Our results indicated that ZIFL2 promotes cellular potassium efflux in the root, thereby restricting potassium/caesium xylem loading and subsequent root to shoot translocation under high potassium conditions or in the presence of external caesium.


**RESEARCH INTERESTS**

As sessile organisms, plants have evolved unique strategies to cope with environmental challenges that affect their growth and development. These range from morphological and physiological changes to alterations at the cellular level, but the basis for adaptation or acclimation lies ultimately at the level of the genome. The Plant Molecular Biology group uses Arabidopsis thaliana as a model system to investigate how plants perceive and respond to environmental stress at the molecular level. In particular, we are focusing on the role of RNA alternative splicing in the regulation of gene expression. The versatility of this posttranscriptional regulatory mechanism suggests an important contribution in ensuring the development, plasticity and stress tolerance essential for plant survival. Another major ongoing project in the lab is uncovering a role for membrane transporters of the Major Facilitator Superfamily (MFS) in plant development and responses to abiotic stress. Interestingly, the functional analysis of these membrane proteins is revealing striking examples of the biological impact of alternative splicing in plants.

**PROJECTS RUNNING IN 2015**

- Functional relevance of alternative splicing in plants
- MFS membrane transporters in plant development and stress tolerance

**MAIN ACHIEVEMENTS IN 2015**

To pursue our general working hypothesis that alternative splicing plays a key role in plant responses to environmental stress, we have been following up on our functional characterization of SR proteins, which constitute a highly conserved family of major regulators of this important posttranscriptional regulatory mechanism. We showed that the Arabidopsis SR-like protein SR45 regulates sugar signalling during early seedling development via modulation of the levels of the energy-sensing SNRK1 protein kinase and broadly controls alternative splicing in vivo including that of the SR45 gene itself. The endogenous splicing targets of the plant-specific SCL30a SR protein, which we found confers drought and salt stress tolerance during seed germination in Arabidopsis via modulation of the abscisic acid (ABA) stress signalling pathway, are being identified by

**PUBLICATIONS**

It is estimated that one in three people will be diagnosed with cancer during their lifetime (source: CancerStats, CRUK). The strongest risk factor for cancer is age, with 75% of cases diagnosed in people aged 60 and over. Population aging in the developed world represents an ever-increasing burden to our health system. However, emergent therapies have improved ability to fight cancer. This has come substantially from our ever-increasing knowledge of the causes underlying tumorigenesis. Our challenge now lies in understanding the molecular mechanisms responsible for aging in order to identify new ways of reducing the lifetime risk for cancer (and remaining age-associated diseases) leading to a prolonged healthier life. Our goal is to investigate the mechanisms underlying chromosome-end protection and the outcomes of its failure, not only at the cellular level but also at the organism level. Our work will allow the discovery of key regulators guarding cells from genomic instability. Identification of these entities will provide new targets for cancer therapy along with tools for early diagnosis. Ultimately, we aim at preventing the incidence of cancer associated with aging. We plan to achieve this by identifying and manipulating the agents responsible for its increase.

**RESEARCH INTERESTS**

- Molecular mechanism of telomere checkpoint
- The role of telomeres in aging and cancer

**PROJECTS RUNNING IN 2015**

We finished our comparative prospective study of telomere dynamics, DNA Damage Response (DDR) and aging-related dysfunction and disease in different tissues in wild type zebrafish (from 3 to 42 months), and compared it with the previously published telomerase mutant (Henriques et al., 2013). This work has been recently published (Carneiro et al., 2016). Briefly, short telomeres of specific tissues in naturally aged zebrafish coincide with rise of DNA damage, decline in cell proliferation and lead to age-specific organ decline. Critically short telomeres accumulate in specific organs with age, such as the gut and muscle, leading to cellular and tissue damage that culminated in local disruption of organ homeostasis. Additionally, critically short telomeres are recognized as threatening DNA breaks and accumulate DNA damage (Telomere Induced Foci, TIFs), further contributing to tissue decline.

LUPUS AND AUTOACTIVE IMMUNE REPERTOIRES

GROUP LEADER
Fesel, Constantin

RESEARCH INTERESTS
Systemic Lupus Erythematosus (SLE) is a human autoimmune disorder where altered physiologies and self-reactive repertoires of both B- and T-cells are intimately connected. Autoactive IgG antibodies are the diagnostic hallmark of SLE and diversify over long time periods before disease becomes manifested, however, this depends also on innate-immune and other nonspecific factors. Our current approach is to model, in a stepwise fashion, the ways in which different genetic factors, molecular mechanisms and immune repertoires are interconnected in SLE pathogenesis. In this context, we are particularly interested in the role of T-cell regulation. Since we found particular relations between antibody reactivity and regulatory T-cells (Tregs) in unaffected relatives of SLE patients, we are currently exploring.

MAIN ACHIEVEMENTS IN 2015
In Systemic Lupus Erythematosus (SLE) patients, FOXP3+ T-regulatory cells (Tregs) are functionally deficient, associated to their reduced surface expression of the high-affinity IL-2 receptor CD25. Studying SLE patients and their unaffected first-degree relatives, we have previously found that while both shared reduced CD25 on early Tregs, only Tregs of manifest SLE patients were characterized by a specific, drastic reduction or absence of the otherwise strong CD25 upregulation upon Treg activation. In a longitudinal study over several months, we have now found that frequencies of activated FOXP3high-CD45RO+ Tregs typically oscillated over time. Most remarkably, individual oscillation amplitudes were strongly correlated with SLEDAI-2K disease activity, as well as (negatively) with blood lymphocyte counts. This suggests a characteristic dynamic Treg instability, paralleling SLE activity, and relevant for SLE-associated lymphopenia.

Since the observed Treg oscillations were coupled to oscillations of conventional T-helper cell populations, we hypothesized that they reflect an unstable regulation circuit. Such circuits, yielding coupled sinusoidal dynamics, can be described by predator-prey models as the classic Lotka-Volterra equation system. We were able to fit this model to our data of activated Tregs and memory T-helper cells from 15/19 patients with >3 time points. The model parameters estimated this way for each patient turned out biologically meaningful: empirically measured CD25 upregulation upon Treg activation (see above) strongly explained model-estimated Treg turnover (positively) as well as suppression rates (negatively).

We conclude that deficient CD25 upregulation of Tregs likely induces a disease-stimulating dynamic T-cell regulation instability, including Treg dysfunctionality and increased turnover.

PUBLICATIONS


modulation of the actin cytoskeleton. Moreover, a dynamic actin is also required for the capture of PRPs. This suggests that the modulation of actin by synaptic plasticity is a general cellular mechanism involved in input-specific plasticity and independent of either synapses are potentiated or depressed.

Following our work at amygdala synapses, we found that thalamic and cortical synapses engage in synaptic competition, similarly to what we have described at hippocampal synapses. This observation has some important implications regarding our current models of memory formation and maintenance. Synaptic cooperation and competition allow synapses to integrated events that are separated by large time-windows, from 30 to 60 minutes. We are currently addressing, using behavioural paradigms, whether events can be associated if separated by large time windows and what are the rules that determine a positive re-enforcement, e.g. cooperation, or a negative re-enforcement, e.g. competition.
MATHEMATICAL MODELLING OF BIOLOGICAL PROCESSES

GROUP LEADER
Gjini, Erida

RESEARCH INTERESTS

My research lies in mathematical biology with a special focus on multi-scale infectious disease dynamics. Adopting mechanistic approaches, I develop a deeper quantitative understanding of how system behaviour emerges from the interaction of its components, and how processes at one biological scale affect patterns we observe at another. At the genetics-ecology-epidemiology interface, we study processes from the individual to the population level. Research interests include: antibiotic resistance management, multi-type pathogen ecology, within-host interactions in health and disease, and evolutionary diversification. With interdisciplinary research we aim to impact medical settings and public health policy, besides providing suitable funding, will move my research closer to clinical practice and bring an impact to medical settings.

PROJECTS RUNNING IN 2015

• How classical and adaptive regimes interact with host immunity during antibiotic treatment of resistant infections
• Uncovering the mathematics of direct competition in multi-strain pathogen systems
• Dynamic models for vaccine assessment and applications

MAIN ACHIEVEMENTS IN 2015

Antimicrobial resistance of infectious agents is a growing problem worldwide. To prevent the continuing selection and spread of drug resistance, rational design of antibiotic treatment is needed, and the question of aggressive vs. moderate therapies is currently heatedly debated. Host immunity is an important, but often-overlooked factor in the clearance of drug-resistant infections. In my research, I compared aggressive and moderate antibiotic treatment, accounting for host immunity effects.

I used mathematical modelling of within-host infection dynamics to study the interplay between pathogen-dependent host immune responses and antibiotic treatment. In collaboration with Dr. Patricia Brito, I studied classical (fixed dose and duration) and adaptive (coupled to pathogen load) treatment regimes, exploring systematically infection outcomes such as time to clearance, immunopathology, host immunization, and selection of resistant bacteria. Our analysis and simulations uncover effective treatment strategies that promote synergy between the host immune system and the antimicrobial drug in clearing infection. Our main achievement was to quantify how treatment timing and the strength of the immune response determine the success of moderate therapies. We found key parameters and dimensions, where an adaptive regime differs from classical treatment, bringing new insight into the ongoing debate of resistance management.

In the context of this research topic, I have submitted an FCT project (GATSMATH) as a PI in January 2015, securing collaboration with Prof. Andrew Yates at Glasgow University, Dr. Nick Savill at Edinburgh University and Dr. Jorge Carneiro at IGC. The project was evaluated excellent (8 score), but unfortunately, did not receive funding. An appeal is currently ongoing with FCT. I also submitted an ESMCID grant to the European Society of Clinical Microbiology and Infectious Diseases, in September, securing collaboration for patient data of bacterial infections from Hospital Santa Maria, in Lisbon and Dr. Luis Caldeira. This collaboration, if supported by suitable funding, will move my research closer to clinical practice and bring an impact to medical settings.

My work on competition in multi-strain systems, initiated within the Collective Dynamics group, was concluded with 2 publications in late 2015. Furthermore, during 2015, I developed at least 3 other independent lines of research stemming from these early studies: i) deeper mathematical analysis of competition hierarchies between strains (with dr. Sten Madec); ii) competition and its effect on abundance ratios of co-colonizing strains (with Prof. F. Dionisio and common MSc student Maria Azevedo); iii) serotype competition and vaccine evaluation for pneumococcus across countries.


PUBLICATIONS


GROUP LEADER
Email egjini@igc.gulbenkian.pt
PhD in Mathematics
University of Glasgow, UK, 2012
Group Leader at IGC since 2015

GROUP MEMBERS
Maria Azevedo, Masters student | Left in July

Colleagues
Patricia H. Brito (IGC, Portugal)
Luis Caldeira (Hospital Santa Maria, Lisbon, Portugal)
Francisco Dionisio (FCUL, Portugal)
Constantin Fesel (IGC, Portugal)
Luisa Figueiredo (IMM, Portugal)
Vitaly Ganusov (Theoretical Immunology, University of Tennessee, USA)
Sten Madec (Department of Mathematics University of Tours, France)

Funding
Fundação para a Ciência e a Tecnologia

Collaborators
Victoria Ganusov (Theoretical Immunology, University of Tennessee, USA)
Sten Madec (Department of Mathematics University of Tours, France)

Outreach
Workshop Inspirar Ciência 2015 - Theoretical and practical teaching of high school teachers, IGC, September.
SCIENCE & POLICY

GROUP LEADER
Gonçalves-Sá, Joana

RESEARCH INTERESTS
The Science and Policy group works under the premise that it is possible to use the scientific method to improve the decision-making process. By gathering large amounts of data and using a broad range of approaches, we ask how political decisions can be more informed and how can scientists and the scientific method help in this process. Current research includes:
- using internet search engines and social networks to try identify disease outbreaks and group behaviours;
- pooling available (but dispersed) information to study public understanding of science and risk communication;
- generating data (from large scale surveys to text mining techniques) to understand public policies and how to help scientists become effective advisors.
Our ultimate goals are to engage scientists and researchers in the policy-making process and to contribute to a more knowledgeable and critical society.

PROJECTS RUNNING IN 2015
- Different technologies create different risks: an assessment of the risk literacy in natural and social scientists
- Scientific and Technological Risk Regulation in the Social Network Age
- Cultural variation explains worldwide differences in sexual cycles
- Parliament Polarization and Heterogeneity – a computational and transversal approach

MAIN ACHIEVEMENTS IN 2015
FCT Postdoctoral fellowship to Miguel Won, with the project "Complex systems approach to the political commentary in the Portuguese news media".

FCT Postdoctoral fellowship to João Lopes, with the project "How different schools impact similar students: a transversal comparison of schools' success in student achievement".

The system the S&P group developed to identify the onset of the flu was tested in real-time with INSA and followed by the Portuguese Direcção Geral de Saúde.

Helped solve the long standing question of whether human sexual cycles are more driven by biology or culture. Manuscript in last stages of preparation.

The world map is colour-coded according to each individual country’s sex-search profile.
Shades of red represent a higher z-score (larger increase in searches) during Christmas week.
Shades of green represent a higher z-score (larger increase in searches) during Eid-al-Fitr week.
White marks countries with no significant variation above mean in either of these weeks. Dark grey countries are those for which there is no GT data available. Black line represents the equator separating the hemispheres.

GCP Postdoctoral fellowship to Miguel Won, with the project "Complex systems approach to the political commentary in the Portuguese news media".

FCT Postdoctoral fellowship to João Lopes, with the project "How different schools impact similar students: a transversal comparison of schools' success in student achievement".

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RESEARCH INTERESTS
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• Scientific and Technological Risk Regulation in the Social Network Age
• Cultural variation explains worldwide differences in sexual cycles
• Parliament Polarization and Heterogeneity – a computational and transversal approach

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Helped solve the long standing question of whether human sexual cycles are more driven by biology or culture. Manuscript in last stages of preparation.

GROUP LEADER
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PhD in Molecular & Cell Biology
Universidade Nova de Lisboa, Portugal, 2010
Group Leader at IGC since 2012
Institutional Roles at IGC
Director of the Graduate Programme Science for Development (PGCD)

GROUP MEMBERS
Manuel Marques Pita, Postdoc | Started in February
Miguel Won, Postdoc | João Santos, Undergraduate student | Started in June; left in October
Inês Maciel, Trainee | Started in August

Funding
Fundação para a Ciência e a Tecnologia
FP7–Welcome II Programme, European Commission

Collaborators
João Baptista [Ministério da Educação e da Ciência, Portugal]
Maria Eduarda Gonçalves (ISCTE, Universidade de Lisboa, Portugal)
Pedro Magalhães (Instituto de Ciências Sociais, Portugal)
Luís Rocha (IGC, Portugal)

Outreach
Science & Art project - Musical Morphogenesis.
Talks for policy makers, European Parliament, December.
The area of our research interests is Evolutionary Biology, with a great focus on microbial evolution. We combine both theoretical and empirical work with the aim at a better understanding of the major forces that shape variation in bacterial populations. Present and future projects of the research team include:

- study the process of adaptation in the context of ecosystems using Escherichia coli as a model organism;
- test theoretical models of adaptive evolution against genotypic and phenotypic data obtained in experimentally adapted bacterial populations;
- determine the level of epistatic interactions on fitness between mutations that confer resistance to commonly used antibiotics;
- study the evolution of mutation rates and determine the factors that influence polymorphism for mutation rates in bacterial populations.

The main achievements in 2015 were:

- Adaption within Ecosystems
- Adaptation of commensal bacteria to the mammalian gut
- Fitness effects of synonymous mutations


We have studied for the first time the evolution of a commensal bacteria when it colonizes the mammalian gut. Using mouse models of E. coli colonization we compared the pace and repeatability of evolution in immune-competent and immune compromised mice. We found a higher pace of bacterial evolution and increased predictability in immune-competent than in immune compromised hosts. In the context of the evolution of antibiotic resistance, we have shown that mutations causing resistance show strong epistatic interactions across different environments, and that particular combinations of resistance mutations can lead to increased fitness even in the absence of antibiotics. We have also shown that bacteria with resistance mutations, which cause severe fitness impairments, can be maintained in populations due to their high evolvability, i.e., high rate of emergence of mutations with at high compensatory fitness effect.

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<td>João Alpedrinha, Postdoc</td>
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<td>Roberto Balbontin, Postdoc</td>
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<td>Paulo Durão, Postdoc</td>
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<td>Nelson Frazão, Postdoc</td>
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<td>Ricardo Ramiro, Postdoc</td>
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<td>Ana Margarida Sousa, Postdoc</td>
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<td>João Battista, External PhD student</td>
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<td>Luis Cardoso, PhD student, IIB 2015</td>
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<td>Jorge Sousa, PhD student, PIIBS 2010</td>
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<td>Hugo Barreto, Research Assistant</td>
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<td>Marta Lourenço, Research Assistant</td>
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<td>Antónia Pinto, Research Assistant</td>
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<td>Catarina Pinto, Research Assistant</td>
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<td>Daniela Zwerschke, Laboratory Manager</td>
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HOST-PATHOGEN CO-EVOLUTION

GROUP LEADER
Howard, Jonathan

RESEARCH INTERESTS
Our work focuses on mechanisms of resistance to the ubiquitous intracellular protozoan parasite, Toxoplasma gondii, a malaria relative, which infects about 40% of the human race. We study immunity of mice against T. gondii because the primary hosts of the parasite, in which it makes gametes and does meiosis, 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 GTPases (IRG proteins) that cooperatively destroy 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 to preserve PVM integrity. In this study, we confirmed the dense granule protein GRA7 as an additional component of the ROP5/ROP18 kinase complex and identified GRA7 association with the PVM by direct binding to ROPs. The absence of GRA7 results in reduced phosphorylation of Irga6 correlated with increased vacuolar IRG protein amounts and attenuated virulence. Earlier work identified additional IRG proteins as targets of T. gondii ROP18 kinase. We show that the only specific target of ROP18 among IRG proteins is in fact Irga6. Similarly, we demonstrate that GRA7 is strictly an Irga6-specific virulence effector. This identifies T. gondii GRA7 as a regulator for ROP18-specific inactivation of Irga6. The structural diversity of the IRG proteins implies that certain family members constitute additional specific targets for other yet unknown T. gondii virulence effectors.

PROJECTS RUNNING IN 2015
• Regulatory interactions between IRG GTPases
• Recent co-adaptation in the Toxoplasma-mouse parasite-host relationship
• Virulence factors and resistance genes in the ecological relationship between Toxoplasma gondii and Mus musculus

MAIN ACHIEVEMENTS IN 2015
In mice, avirulent strains (e.g. types II and III) of the protozoan parasite Toxoplasma gondii are restricted by the immunity-related GTPase (IRG) resistance system. Loading of IRG proteins onto the parasitophorous vacuolar membrane (PVM) is required for vacuolar rupture resulting in parasite clearance. In virulent strain (e.g. type I) infections, polymorphic effector proteins ROP5 and ROP18 cooperate to phosphorylate and thereby inactivate mouse IRG proteins to preserve PVM integrity. In this study, we confirmed the dense granule protein GRA7 as an additional component of the ROP5/ROP18 kinase complex and identified GRA7 association with the PVM by direct binding to ROPs. The absence of GRA7 results in reduced phosphorylation of Irga6 correlated with increased vacuolar IRG protein amounts and attenuated virulence. Earlier work identified additional IRG proteins as targets of T. gondii ROP18 kinase. We show that the only specific target of ROP18 among IRG proteins is in fact Irga6. Similarly, we demonstrate that GRA7 is strictly an Irga6-specific virulence effector. This identifies T. gondii GRA7 as a regulator for ROP18-specific inactivation of Irga6. The structural diversity of the IRG proteins implies that certain family members constitute additional specific targets for other yet unknown T. gondii virulence effectors.

PUBLICATIONS

GROUP LEADER
Howard, Jonathan

External Website
http://www.genetik.uni-koeln.de/groups/Howard/research.shtml

GROUP MEMBERS

Carolina Alves, Postdoc | Left in November
Joana Loureiro, Postdoc
Catalina Alvarez, PhD student, IBB 2014 | Started in August
Ana Lina Rodrigues, PhD student, PGCD 2014 | Started in November
Ana Cláudia Campos, Laboratory Manager

Funding
Deutsche Forschungsgemeinschaft

Collaborators
John Boothroyd (Stanford University, USA)
Veit Hornung (University of Bonn, Germany)
Eicke Latz (University of Bonn, Germany and University of Massachusetts, USA)
David Sibley (Washington University St Louis, USA)

Outreach
Media appearance in newspapers and radio, January, February, August, September.
We have also identified the nuclear protein Zyxin (2015).

pre-malignant and malignant features and facilitate mechanical forces to Yorkie oncogenic activity (Gaspar et al., 2015). We have also identified the nuclear protein related to the Sno/Ski family of co-repressors Dachshund, as an inhibitor of Yorkie-mediated tissue growth. Based on the critical role of the human dachshund homolog DACH1 in tumorigenesis, our work argues that DACH1 prevents cellular transformation by limiting the oncogenic abilities of YAP/TAZ (Brás-Pereira et al., 2015, in collaboration with the laboratory of Fernando Casares at Universidad Pablo de Olavide, Spain). Finally, in collaboration with the laboratory of Raquel Seruca at Instituto de Investigação e Inovação em Saúde (i3S) in Portugal, we have reported that the loss of the cell-cell adhesion component E-Cadherin triggers the accumulation of laminin in the extracellular matrix that allows E-Cadherin-dysfunctional cells to survive and invade (Caldeira et al., 2013).

Diversity of actin-based structures built within a cell, un three-dimension that recapitulate the multistep de

• Inducible human cell lines cultured in two- or three-dimensional models:
  • Investigating the role of the actin cytoskeleton in Hippo signalling.
  • Cross-talk between the Src proto-oncogene and F-actin during tumoral transformation.
  • Loss of the actin-microtubule cross-linkage: A mechanism of pre-malignant breast cancer progression?
  • Arp2/3-mediated actin filament branching: Friend or enemy during breast cancer progression?
  • Molecular function of the dachshund/DACH1 tumour suppressor

MAIN ACHIEVEMENTS IN 2015

We had previously reported that the pro-growth function of various oncoproteins, including the c-Src non-receptor tyrosine kinase, c-Jun N-terminal kinase (c-JUN) and Yorkie (YAP/TAZ in mammals) is controlled by the actin cytoskeleton in Drosophila epithelia. To understand the role of the actin cytoskeleton in controlling the oncogenic activity of Yorkie, we screened for actin regulators involved. In collaboration with the laboratory of Nicolas Tapou, at the Francis Crick Institute (UK), we have identified the actin-associated LIM protein Zyxin.

We found that Zyxin, together with the Enu/VASP family member Enabled, which favours the elongation of actin filaments bundles, promote Yorkie-mediated tissue growth. Our observations argue that the antagonism between Zyxin/Enabled and Capping Protein on actin filaments, links mechanical forces to Yorkie oncogenic activity (Gaspar et al., 2015). We have also identified the nuclear protein related to the Sno/Ski family of co-repressors Dachshund, as an inhibitor of Yorkie-mediated tissue growth. Based on the critical role of the human dachshund homolog DACH1 in tumorigenesis, our work argues that DACH1 prevents cellular transformation by limiting the oncogenic abilities of YAP/TAZ (Brás-Pereira et al., 2015, in collaboration with the laboratory of Fernando Casares at Universidad Pablo de Olavide, Spain). Finally, in collaboration with the laboratory of Raquel Seruca at Instituto de Investigação e Inovação em Saúde (i3S) in Portugal, we have reported that the loss of the cell-cell adhesion component E-Cadherin triggers the accumulation of laminin in the extracellular matrix that allows E-Cadherin-dysfunctional cells to survive and invade (Caldeira et al., 2013).

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Genomic information is embedded in the primary DNA sequence. In additional epigenetic information is propagated along cell divisions that “memorizes” gene activity states and specific chromatin structures. The laboratory for epigenetic mechanisms has a broad interest in how this works. Epigenetic modes of inheritance impact many aspects of biology that includes development, gene regulation and disease. Several molecular components such as histone proteins and modifications thereof have been implicated in this process but in most cases we don’t understand the logic of how something other than DNA can be faithfully duplicated when a cell divides.

We use the mammalian centromere as a model for chromatin-based epigenetic inheritance. We employ molecular genetic and cell biological tools with a focus on novel fluorescent labelling techniques, high-end microscopy and the latest tricks in genetic engineering of human cells to tackle a wide range of problems in this emerging and fascinating area of biology.

**PROJECTS RUNNING IN 2015**

- **Epimechanism**

**MAIN ACHIEVEMENTS IN 2015**

Centromeres form the site of chromosome attachment to microtubules during mitosis and is responsible for driving chromosome segregation. Identity of these loci is maintained epigenetically by nucleosomes containing the histone H3 variant CENP-A. In 2015, we focused on understanding how CENP-A itself is inherited. Previously we showed that CENP-A is an unusually stable molecule in chromatin (Bodor et al., 2013). This year we uncovered a centromere protein named CENP-C that appears to be involved in specifically stabilizing CENP-A. In collaboration with Ben Black’s lab at UPenn, Philadelphia, we helped show that loss of CENP-C leads to accelerated turnover of CENP-A from chromatin and loss of centromere identity. This work was published in *Science* in May 2015.

**PUBLICATIONS**

We are also incorporating other model systems to our research. More recently, we have also become interested in the role that those processes played in the evolution of the vertebrate body plan. In general, most of our work uses the mouse as the model system, and our approaches have a main focus on in vitro systems. We have explored the mechanisms guiding Hoxb6 activity during formation of the axial skeleton. We have identified the pluripotency factor Oct4 as a main regulator of trunk length in vertebrates. In particular, using a transgenic approach we could show that when Oct4 activity is maintained in the axial progenitors it produces a remarkable extension of the trunk at the expense of the lumbar, sacral and caudal areas. We could also show that persistent Oct4 activity is likely to be in the origin of the remarkably long trunks of snakes and that this could have resulted from differential genomic rearrangement at the Oct4 locus in mammals and snakes that affected regulation of Oct4 expression.

We have explored the mechanisms guiding Hoxb6 activity during formation of the axial skeleton. We have identified a new region of the Hoxb6 protein that is essential for its activity. Using a combination of biochemical and transgenic approaches, we have shown that this region is likely to act as a docking surface to recruit additional functional cofactors required for Hoxb6-mediated activation of the rib-promoting programme during formation of the axial skeleton. In the course of these experiments we also found that Hoxb6 can produce vertebral malformations at the lumbar, sacral and caudal levels but not in the thoracic area, indicating that the mechanisms of somitogenesis are not uniform along the anterior posterior body axis.

We have set to identify the conditions to increase the production of axial progenitors specifically fated to produce neural tissues under conditions that allow their expansion. Using the CRISPR/Cas9 technology, we have produced embryonic stem cells carrying a homozygous null mutation for the Tbx6 gene. With those cells we have observed that culture conditions typically inducing mesodermal fates in wild type stem cells promote neural fates in the absence of Tbx6. We are further exploring these observations and the potential to use them in spinal cord replacement therapies.
LYMPHOCYTE DEVELOPMENT & LEUKEMOGENESIS

GROUP LEADER
Martins, Vera

Research in the lab focuses on the development of T lymphocytes and on the processes that lead to leukemia from precursors of T lymphocytes. We use mouse models that enable us to assess small cell populations in the thymus (where T lymphocytes develop) and learn how they interact with each other. One of our major goals is to learn about the genes that regulate these interactions and whether they are involved in the early steps of leukemogenesis.

PROJECTS RUNNING IN 2015
• Cell competition in the thymus

MAIN ACHIEVEMENTS IN 2015
I joined the IGC in September 2015 to establish myself as an independent group leader. Three lab members were recruited in November that now integrate a very motivated team. We started by establishing several of the key techniques and have expanded part of the mouse colony that will enable us to perform most of our in vivo experiments.

PUBLICATIONS

Section of a wild type thymus graft deprived of progenitor import and stained for the T lymphocyte markers CD4 (green) and CD8 (red).

The same section was also stained for cytokeratin 5 (cyan), which identifies medullary epithelial cells and enables the visualisation of medullary areas in this thymus graft.
DEVELOPMENT, EVOLUTION AND THE ENVIRONMENT

GROUP LEADER
Mirth, Christen

RESEARCH INTERESTS
Changes in the environment profoundly shape developmental and behavioural responses in all organisms, a process known as phenotypic plasticity. We are, however, only beginning to understand the mechanisms that integrate information from the environment to coordinate this plasticity. In my laboratory, we seek to understand how environmental cues influence development and behaviour and how these interactions evolve to generate species-specific phenotypes. We approach this problem at multiple biological levels with the goal of understanding: 1) the mechanisms that allow the environment to modify the synthesis of hormones necessary for development; 2) how organs interpret hormonal cues to coordinate their development and behaviour and how these interactions evolve to generate species-specific phenotypes. Finally, we have explored how nutritional information is conveyed throughout the body to regulate hormone synthesis and secretion. We have found that two peptides produced in the insect fat body regulate insulin-like peptide secretion in response to dietary protein. This, in turn, regulates both growth rate and the duration of the growth period. Changes in the environment profoundly shape developmental and behavioural responses in all organisms, a process known as phenotypic plasticity. We are, however, only beginning to understand the mechanisms that integrate information from the environment to coordinate this plasticity. In my laboratory, we seek to understand how environmental cues influence development and behaviour and how these interactions evolve to generate species-specific phenotypes. We approach this problem at multiple biological levels with the goal of understanding: 1) the mechanisms that allow the environment to modify the synthesis of hormones necessary for development; 2) how organs interpret hormonal cues to coordinate their development and behaviour and how these interactions evolve to generate species-specific phenotypes. Finally, we have explored how nutritional information is conveyed throughout the body to regulate hormone synthesis and secretion. We have found that two peptides produced in the insect fat body regulate insulin-like peptide secretion in response to dietary protein. This, in turn, regulates both growth rate and the duration of the growth period.

PROJECTS RUNNING IN 2015
• Ontogeny of foraging behaviour in Drosophila melanogaster
• Adaptation to new nutritional niches in species of Drosophila

MAIN ACHIEVEMENTS IN 2015
LIFE HISTORY EVOLUTION & FORAGING BEHAVIOUR
We have explored the relationship between the larval nutritional environment and larval and adult life history traits in six different species of fruit flies from the genus Drosophila. By manipulating the macronutrient composition of the larval diet across a broad range of protein to carbohydrate conditions, we have found that species differ in how the specific combinations and quantities of both macronutrients affect their life history traits, including body size, development time, and survival. For some species, like Drosophila melanogaster, the conditions that optimize developmental time are not the same as those that optimize body size and survival. We have found that these larvae make foraging choices that would optimize development time at the expense of maximum body size. Further, we find adult females make oviposition decisions that reflect the order in which they colonize rotting fruit. Females that prefer ripe, not rotting, fruit tend to prefer laying their eggs in foods with lower protein concentrations. Taken together, our system provides a tractable way of understanding how foraging decisions affect the life history of animals, and how these traits evolve with new nutritional niches.

BODY SIZE REGULATION
We have continued our work exploring the mechanisms underlying body size regulation in the fruit fly Drosophila melanogaster. Our work over the past five years has shown that nutrition regulates body size by altering the synthesis and secretion of two important developmental hormones: the insulin-like peptides and the steroid hormone ecdysone. We have found that a pulse of ecdysone early in the final larval instar changes the sensitivity of the developing wing and ovaries to nutrition. In both tissues, we have found that starving larvae before this ecdysone pulse dramatically suppresses both growth and patterning, whereas starvation after the pulse moderately reduces growth and patterning. In the ovary, we have found that this switch in sensitivity to starvation occurs because ecdysone alters the signalling pathways that regulate the growth and patterning of this organ. Finally, we have explored how nutritional information is conveyed throughout the body to regulate hormone synthesis and secretion. We have found that two peptides produced in the insect fat body regulate insulin-like peptide secretion in response to dietary protein. This, in turn, regulates both growth rate and the duration of the growth period, ultimately controlling final body size.

PUBLICATIONS

Funding
Fundo para a Ciência e a Tecnologia

Collaborators
Rosa Barrio (CIC bioGUNE, Spain)
Patricia Belada (IGC, Portugal)
Kristín Branson (Janelia Farm Research Campus, HHMI, USA)
Tony Frankino (University of Houston, USA)
Alisson Gontijo (CEDOC, Portugal)
Alexander Shingleton (Michigan State University, USA)
Élio Sucena (IGC, Portugal)
Yuichiro Suzuki (Wellesley College, USA)

GROUP LEADER
Email christen@igc.gulbenkian.pt
PhD in Zoology
University of Cambridge, UK, 2002
Group Leader at IGC since 2010

Previous positions
Research Specialist, Janelia Farm Research Campus, HHMI, USA
Postdoctoral associate, Department of Zoology, University of Washington, USA

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GROUP MEMBERS
Maria Carvalho, Postdoc
Takashi Koyama, Postdoc
Claudia C. Mendes, PhD student, PIBS 2010 | Left in December
Marisa Oliveira, PhD student, PIBS 2009 | Left in March
Nuno Soares, PhD student, PIBS 2013
Inês Sousa, PhD student, PIBS 2014 | Left in October
Ana Sofia Lindeza, Masters student
Marisa Rodrigues, Masters student | Left in December
André Alves, Trainee | Left in September
Andréa Oliveira, Trainee | Left in September

External Website
http://pages.igc.gulbenkian.pt/SCF/lab_page>Welcome.html

集团公司
Our laboratory works on two different topics: innate immunity and inflammation. Our focus on innate immunity is centred on the study of antigen cross-presentation mechanisms and the immunobiology of dendritic cells. Effective immune responses against tumour antigens that are not endogenously expressed by dendritic cells (DCs) and against viruses that do not infect antigen presenting cells (APCs) require extracellular antigens to stimulate CD8+ T cells via the MHC I pathway through a process poorly characterized at the molecular level known as antigen cross-presentation. We are using a series of systematistic genetic approaches to identify the molecular machinery involved in antigen cross-presentation. In addition, we want to explore antigen cross-presentation as an early immune-regulatory checkpoint in the control of CD8+ T cell priming by dendritic cells, to find drugs that inhibit negative regulators of this process, as they are likely to improve the generation of effective T cells responses against tumours and are good candidates for novel adjuvant therapies for cancer treatment. The second theme of the laboratory relates to inflammation. Severe sepsis remains a poorly understood systemic inflammatory condition with high mortality rates and limited therapeutic options outside of infection control and organ support measures. Based on our recent discovery in mice showing that anthracycline drugs prevent organ failure without affecting the bacterial burden in a model of severe sepsis, we propose that strategies aimed at target organ protection have extraordinary potential for the treatment of sepsis and possibly for other inflammation-driven conditions. However, the mechanisms of organ protection and disease tolerance are either unknown or poorly characterized. The central goal of this research programme is to identify and characterize novel cytoprotective mechanisms, with a focus on DNA damage response dependent protection activated by anthracyclines as a window into stress-induced genetic programmes leading to tissue protection.
both at the cellular and organism level. By studying compromised chromosome cohesion and condensation, we aim to dissect how different cells respond to movement and cell cycle checkpoint signalling. In particular, influences the mechanical aspects of chromosome mechanics of nuclear division we aim to identify novel routes to aneuploidy that underlie several human conditions, including developmental diseases, cancer and infertility.

## RESEARCH INTERESTS

We study how chromosome architecture contributes to faithful genome segregation. Genome stability relies on the fact that at each round of cell division, the genetic information encoded in the DNA molecules is properly segregated into the two daughter cells. Proper completion of this process, in turn, depends on two major changes in chromosome organisation: 1) the two-sister DNA molecules remain tightly associated with each other from the moment of DNA replication until the later stages of the subsequent mitosis; 2) at the onset of nuclear division, chromatin is converted into compact structures with the right mechanical properties (size, flexibility, and rigidity) to facilitate their segregation.

Our laboratory adopts a multidisciplinary approach, combining Drosophila genetics, acute protein inactivation, 4D-live cell imaging and biophysical/mathematical modelling to evaluate how dynamic mitotic chromosomes are assembled and how their morphology influences the mechanical aspects of chromosome movement and cell cycle checkpoint signalling. In parallel we aim to dissect how different cells respond to compromised chromosome cohesion and condensation, both at the cellular and organism level. By studying the contribution of chromosome structure in the mechanics of nuclear division we aim to identify novel routes to aneuploidy that underlie several human conditions, including developmental diseases, cancer and infertility.

## PROJECTS RUNNING IN 2015

- Analysis of Spindle Assembly Checkpoint response to premature loss of sister chromatid cohesion
- Quantitative analysis of sister chromatid cohesion decay
- Building up mitotic chromosomes: sister chromatid resolution and chromatin compaction
- Role of condensin complexes outside mitosis

## MAIN ACHIEVEMENTS IN 2015

Accurate segregation of the genome during mitosis relies on the maintenance of cohesion between identical DNA molecules before their equal distribution into the two daughter cells. Sister chromatid cohesion defects, often found in the context of human disease (e.g. cancer, infertility and developmental disorders), lead to random genome segregation and consequent aneuploidy. Yet, such errors are not efficiently detected by the Spindle Assembly Checkpoint, the principal guardian of mitotic fidelity. Our recent work provided quantitative and mechanistic insights that clarify how this checkpoint fails to sense and prevent aberrant mitotic exit upon premature loss sister chromatid cohesion. Using developing Drosophila brains, we show that full sister chromatid separation elicits a weak checkpoint response resulting in abnormal mitotic exit after a short delay. Quantitative live-cell imaging approaches combined with mathematical modelling indicate that weak SAC activation upon cohesion loss is caused by weak signal generation. This is further attenuated by several feedback loops in the mitotic signalling network. We propose that multiple feedback loops involving cyclin-dependent kinase 1 (Cdk1) gradually impair error-correction efficiency and accelerate mitotic exit upon premature loss of cohesion. Our findings explain how cohesion defects may escape SAC surveillance.

## PUBLICATIONS

**INTEGRATIVE BEHAVIOURAL BIOLOGY**

**GROUP LEADER**
Rui Oliveira

**RESEARCH INTERESTS**
Our main research interest is the integrative study of social behaviour, which combines the study of proximate causes (gene modules, hormones, neural circuits, cognitive processes) and ultimate effects (evolutionary consequences). In particular we aim to understand how brain and behaviour can be shaped by social environment, and how the cognitive, neural and genetic mechanisms underlying plasticity in the expression of social behaviour have evolved. Current research questions centre on four topics:
1. Evolution of social cognition and of its neurobehavioural mechanisms – we aim to understand if social plasticity is an organismal performance trait that impacts Darwinian fitness and may itself be subject to selection;
2. Genomic and epigenomic mechanisms of social plasticity – we seek to understand how the same genome can produce different social phenotypes in response to key social cues in the environment;
3. Neuroendocrinology of social interactions and of social plasticity – this research aims to understand the role of hormones and neuropeptides as neuromodulators involved in the plasticity of social behaviour; and
4. Fish cognition and welfare – we aim to use our knowledge in this field to improve fish husbandry and handling procedures towards better research and animal welfare.

**PROJECTS RUNNING IN 2015**
- Neural mechanisms of cognitive bias
- Neural mechanisms of social cognition in zebrafish
- Molecular mechanisms and evolutionary implications of social plasticity
- Comparative social cognition: zebrafish as a neurobehavioural model
- COPEWELL: A new integrative framework for the study of fish welfare based on the concepts of allostasis, appraisal and coping styles

**MAIN ACHIEVEMENTS IN 2015**
Our lab has been focused on developing zebrafish as a model organism for the study of the mechanisms underlying social cognition. During 2015, three key milestones were achieved in this direction:
1. We have established behavioural paradigms to study social attention and social memory in zebrafish, and we have shown that attention in this species is tuned to social interactions between conspecifics (Abril-de-Abreu et al., 2015). We have also shown that zebrafish can recognize different individuals in its group and that this social memory lasts for at least 24h.
2. We have also shown that social interactions in zebrafish trigger changes in connectivity, rather than localized changes in activity in the neural network known to be involved in social decision-making. Thus, processing of social information seems to occur in a network of forebrain and midbrain structures in a distributed and dynamic fashion, such that the expression of a given social behaviour is better reflected by the overall profile of activation across the different loci rather than by the activity of a single node (Teles et al., 2015).
3. Finally, using a high-throughput gene expression approach to study the response of the brain transcriptome to social interactions, we have shown, for the first time to our knowledge, that what triggers a genomic response to social information is the subjects’ assessment of the interaction rather than a fixed response to a releaser cue in the environment. The occurrence of cognitive appraisal in zebrafish suggests that a cognitive ability classically considered complex is also present in a simple-minded vertebrate.

PUBLICATIONS


SOFTWARE DEVELOPMENT

FishTracker

Custom-made video-tracking system, which determines and extracts into data files the pixel coordinates of the head, centroid and tail of fish for each video-frame, hence allowing to track not only the position but also the orientation of focal fish in relation to a relevant stimulus. This is particularly useful for getting a measure of the attentional engagement of the focal fish, such as in the social attention test developed in our lab. https://github.com/joseaccruz/fishtracker
INFECTION & IMMUNITY

GROUP LEADER

Parkhouse, Michael

RESEARCH INTERESTS

The theme of the group is the reciprocal adaptation between an infectious organism and its host. The necessity to recognise and destroy invading pathogens has played a crucial role in the evolution of the immune system of both vertebrates and invertebrates. At the same time, pathogens, in particular, viruses have evolved strategies to manipulate the immune system. An efficient immune system must select the immune effector mechanism most appropriate to the biology of the pathogen. Thus the study of how pathogens control immune responses will offer novel approaches for the manipulation of the immune responses in health and disease, with novel vaccines and strategies to downregulate the immune system (e.g. inflammation) being the most obvious possibilities. Therefore, we are identifying and characterising virus host evasion genes directed towards subversion of cell biology and innate immunity. We have selected two viruses with very different lifestyles (HCMV and ASFV). We also participate in a collaborative project on the control of human, porcine and bovine cysticercosis (with colleagues in Spain, Mexico, Venezuela, Ecuador, Brazil and Scotland).

PROJECTS RUNNING IN 2015

• Mechanism and consequences of an IL-8 inducing herpesvirus gene
• Inhibition of the Interferon response by African Swine Fever Virus
• Control of Cysticercosis

MAIN ACHIEVEMENTS IN 2015

• Mechanism of an HCMV host modification protein inhibiting cell cycle progression and inducing IL-8 expression through an impact on the DNA damage signalling pathway.
• Mechanism of ASFV host modification proteins inhibiting IFN response.
• Development of a lateral flow assay for the rapid detection and follow up of extraparenchymal neurocysticercosis patients.

PUBLICATIONS


GROUP LEADER

Email parkhouse@igc.gulbenkian.pt

PhD in Biochemistry
University of London, UK, 1963

Group Leader at IGC since 2000

Previous positions

Member of the scientific staff, National Institute for Medical Research, UK

Director, Centro Nacional de Biotecnologia, Spain

Head Immunology, Institute Animal Health, UK

GROUP MEMBERS

Sílvia Correia, Postdoc
Rute Nascimento, Postdoc
Diogo Dias, Masters student | Left in December
Solange Martins, Masters student | Left in December
Pedro Moura, Masters student

Funding

FP7 programme, European Commission

Collaborators

Agnes Fleury (Instituto Nacional de Neurologia y Neurocirugia, Mexico)
Steve Goodbourn (St. George’s Hospital, University of London, UK)
John Sinclair (University of Cambridge, UK)
The liver is another target organ and the chosen disease models are malaria liver stage infection and NAFLD (non-alcoholic fatty liver disease). We will focus on the Kupffer cell-hepatocyte dialogue with the twofold goal of (1) investigating hepatocyte metabolic shifts induced by inflammatory responses to Plasmodium infection and (2) identifying inflammatory pathways underpinning dysmetabolism in NAFLD. Translation of this research will profit from availability of our human malaria collections from Africa as well as Portuguese cohorts of pre-diabetes individuals.

Projects Running in 2015

• Foetal factors protecting from placental malaria
• Brain interferon responses in cerebral malaria
• Insulin clearance regulation in diabetes pathogenesis
• CD26/DPP4 in Fatty Liver Disease progression

Identifying vasoactivor pathways activated in trophoblasts upon exposure to erythrocytes infected with the malaria parasite.

Finding that mouse brain endothelial cells produce interferon upon exposure to erythrocyte derived microvesicles, providing a cellular basis for signalling IFNAR1 that is required for the development of Cerebral Malaria.

Finding that CD26 plays a role in activated Kupffer cells in the context of fatty liver disease induced by western diets in mouse models.

Finding that genetic polymorphisms in insulin-degrading enzyme are associated to pre-diabetes in the Portuguese population providing a link for the involvement of insulin clearance in early diabetes pathogenesis.

Publications


Our previous research in genetics of inflammatory responses to malaria infection drove us to ask how infection/inflammation impacts on cellular metabolism and organ physiology.

One line of research will be focused on how placental inflammation caused by malaria leads to placental dysfunction. We are particularly interested in evaluating the role of foetal-derived trophoblasts, an intriguing cell type that coaps functional roles of endothelial, macrophagic and contractile cells and participates in critical placental functions, namely maternal-fetal exchanges, blood microcirculatory regulation and inflammatory responses. This research will impact our understanding of the involvement of foetal factors in vaso-inflammatory placental disorders and may unveil pharmacological targets to promote foetal viability and protection mechanisms valuable in abortion and stillbirth prevention. Our malaria research is also looking at the dialogue of brain microvesSEL endothelial cells with infected erythrocytes and immune cells in the context of the requirement of interferon in the development of cerebral malaria.
We are interested in the evolutionary mechanisms underlying the origins and evolution of cellular life and the complex structures within the cell, the transitions to multi-cellularity, and the medical applications of evolutionary genomics. Our research encompasses themes that are broadly classified as evolutionary cell biology, systems biology, pathogenomics, and translational or medical bioinformatics.

**RESEARCH INTERESTS**
- Evolution of protein repertoires involved in intracellular compartmentalisation
- Evolution of endosporulation in Bacteria
- Bioinformatics tools for Evolutionary Cell Biology
- Genomics of marine unicellular Eukaryotes

**PROJECTS RUNNING IN 2015**
- Evolution of protein repertoires involved in intracellular compartmentalisation
- Evolution of endosporulation in Bacteria
- Bioinformatics tools for Evolutionary Cell Biology
- Genomics of marine unicellular Eukaryotes

**MAIN ACHIEVEMENTS IN 2015**
During 2015, we invested in the analyses of proteins containing coiled-coils domains, that are frequently structural components of many intracellular organelles. We developed a new evolutionary model to study these proteins, and showed that they carry relevant phylogenetic information, in contrast to the widely held belief that they are not usable in homology mapping sand in general sequence analysis approaches. We further showed the evolution sequence coiled coil domains are under a size constraint that equates with a conservation of their physical linear length. These studies have been published. We have further invested in characterising the evolution of Rab proteins and have discovered an evolutionary transitional state in the evolution of their complex membrane association cycle - publication arising.

We have further invested on deepening our collaboration with the group of Dr. Adriano in studying the origins and contains in the endosporulation programme of bacteria, and have focused on characterising naturally occurring diversity and characterising their genomes and genome dynamics in the context of niche-specific adaptations - publications arising.

We have invested in establishing a new research direction in the group involving a focus on marine micro-organisms, and have participated in sampling exercises in Portuguese and Cabo-Verdian waters, and initiated projects in genome and meta-genome sequencing of both prokaryotic and eukaryotic communities, establishing novel collaborations with the Portuguese State Laboratory for Fisheries (IPMA).

**PUBLICATIONS**

**GROUP LEADER**
Pereira-Leal, José

**GROUP MEMBERS**
Patricia Brito, Postdoc
Ricardo Leite, Postdoc
Paula Ramos Silva, Postdoc
Ana Paula Aguad, PhD student, PGCD 2014
Madalena Carneiro, PhD student, PIBS 2010 | Left in October
Marc Gouw, PhD student, PIBS 2010 | Left in July
Jaroslaw Surkont, PhD student, PIBS 2011

**Funding**
EEA Grants Iceland, Liechtenstein, Norway

**Collaborators**
Mónica Bettencourt Dias (IGC, Portugal)
Jocelyne Demengeot (IGC, Portugal)
Miguel Godinho Ferreira (IGC, Portugal)
Adriano Henriques (Instituto de Tecnologia Química e Biológica, Portugal)
Florence Janody (IGC, Portugal)

**Outreach**
Workshop Inspirar Ciência 2015 - Practical teaching of high school teachers, IGC, September.

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**GROUP LEADER**

Pereira-Leal, José

**Email** leal@igc.gulbenkian.pt

**PhD in Biomedical Sciences**
Universidade do Porto, Portugal, 2001

**Group Leader at IGC since 2006**

**Previous positions**
Postdoc & Career Development Fellow, MRC Laboratory of Molecular Biology, UK
Postdoc, EMBL European Bioinformatics Institute, UK

**External Website**
www.evocell.org
Can we predict evolution? This is one of the most fundamental questions in biology today. If we can predict evolution, we can control it. Doing so will change the way we understand biology, the way we use living organisms in biotechnology, the way we treat disease and indeed the way we see ourselves.

The Evolution and Genome Structure research group aims to create a predictive framework of evolutionary biology by addressing how variations in genetic background in general, and chromosome structure in particular affect the evolutionary path of populations. We use experimental evolution in microorganisms as a method as it allows the precise control of genetic background and of the relative weights of selection and drift. When combined with whole genome sequencing and high-throughput methods to track populations, this approach is very powerful in describing the evolutionary process. For the moment, we use Schizosaccharomyces pombe (fission yeast) as a model organism to answer these fundamental questions.

**RESEARCH INTERESTS**

- How does the genetic background affect evolvability?
- Understanding fitness from molecular mechanisms – a step towards predicting evolution
- The impact of genomic instability on the tempo and mode of adaptation

**PROJECTS RUNNING IN 2015**

During 2015, we adapted a set of four rearrangements and four controls to the lab environment. We observed they have different adaptation rates. These differences can be explained by the initial fitness, with low fitness strains adapting faster than high fitness ones. Moreover, the strains are converging, indicating that irrespective of the genetic basis of fitness differences, all strains tend to the same phenotypic end point. We sequenced clones from these populations and found a modest number of mutations underlying the fitness increases. We are now in the process of characterizing these mutations.

In parallel, we continued a mutation accumulation experiment with the same set of strains, plus four others. We observed that fitness decreased as expected, but at a different rate, depending on the background of the strain.

We are using both experiments to probe the phenotypes under selection and develop a theoretical framework to predict evolution in a simple laboratory environment.
COMPLEX ADAPTIVE SYSTEMS & COMPUTATIONAL BIOLOGY

GROUP LEADER
Rocha, Luis Mateus

RESEARCH INTERESTS
We are interested in the informational properties of natural and artificial systems which enable them to adapt and evolve. This means both understanding how information is fundamental for controlling the behaviour and evolutionary capabilities of complex systems, as well as abstracting principles from natural systems to produce adaptive information technologies. This theoretical and applied research agenda is organised in three main threads: complex networks & systems, Computational & Systems Biology, and Computational Intelligence. Projects in the group range from Biomedical Literature and Social Media Mining to understanding redundancy, robustness, modularity and control in Complex Networks, Collective Intelligence on the Web and in Social Systems, and Agent-based models of Evolutionary Systems such as RNA Editing and Artificial Immune Systems. We are also committed to interdisciplinary research, teaching and graduate training.

PROJECTS RUNNING IN 2015
- Collective Computation and Control in Complex Biochemical Systems

MAIN ACHIEVEMENTS IN 2015
The group had a very productive year with research, both with projects and papers involving students. We published 4 papers in very good journals, with 1 more accepted in Nature Scientific Reports for publication in 2016. We also had papers accepted in the best conferences in our field, including some that received special mentions (Conference on Complex Systems).

The PI was also invited to speak at top research institutions for complex systems, such as the Santa Fe Institute and the University of Tokyo. The PI also received the Indiana University Trustees Award for Teaching Excellence Award 2015.

One of the group’s PhD students, Artemy Kolchinsky finished his PhD and is now a postdoc at the Santa Fe Institute, the leading research institute for complex systems research in the World.

The group also received considerable media coverage, especially with the Computational Fact Checking paper and interviews about Turing.

We are using both experiments to probe the phenotypes under selection and develop a theoretical framework to predict evolution in a simple laboratory environment.


SOFTWARE DEVELOPMENT

Instagram Drug Explorer

http://www.informatics.indiana.edu/rocha/publications/IDE/

PUBLICATIONS


INFLAMMATION

GROUP LEADER
Soares, Miguel

RESEARCH INTERESTS
To understand the biology of inflammation and immunity as it pertains to the maintenance of homeostasis. To identify and develop therapeutic strategies with impact in human diseases associated with major morbidity and/or mortality.

PROJECTS RUNNING IN 2015
- Microbiota control of protective immunity against malaria
- Host microbe interaction at Instituto Gulbenkian
- Treat liver diseases by targeting hepatocyte necrosis
- Tissue Damage Control Regulates The Pathogenesis of Immune Mediated Inflammatory Diseases

PUBLICATIONS


EVOLUTION & DEVELOPMENT

GROUP LEADER
Sucena, Élio

RESEARCH INTERESTS

The Evolution and Development lab aims at exploring the interface between the fields of evolution and developmental biology with the ultimate purpose of contributing to the understanding of the rules by which this interplay shapes organisms across evolutionary time.

In particular, research carried out in the lab focuses on evolutionary novelties, that is, new traits (either morphological, physiological or behavioural) that may participate in the emergence of adaptive radiations into novel niches.

We approach this concept experimentally at different levels of biological organisation and through both the comparative method and experimental evolution. Specifically, we look into novelty at: a) the genetic level, studying gene expression evolution upon gene duplication; b) the cellular level, approaching immune cell function diversity and hematopoiesis in Drosophila; and c) the organismal level, by studying the evolution of the immune response in arthropods using Drosophila melanogaster as a reference model.

PROJECTS RUNNING IN 2015

- Regulatory and functional evolution upon gene duplication
- Drosophila hematopoiesis
- Evolution of immune response in Drosophila
- Immunity in the spider mite Tetanychus urticae

MAIN ACHIEVEMENTS IN 2015

In 2015, we have continued analysing the outcome of the experimental evolution carried out in D. melanogaster between 2010 and 2014. We have shown that the increased capacity of evolved populations to survive pathogens does not entail costs in the absence of infection. These populations have adapted to recurrent infection by a mechanism that is only costly when deployed in the presence of pathogens, thus avoiding maintenance costs. Also, we have initiated the NGS characterization of the populations adapted to bacterial infections and we are pursuing functional tests of candidate genes as done previously for the viral infection adapted populations.

We have established the hemocyte larval clusters as true hematopoietic tissues relying on structure-dependent Notch-mediated signalling events to promote the transdifferentiation of plasmatocytes into crystal cells. This novel mechanism of cell type and number control is seemingly central to blood homeostasis in Drosophila and may be relevant to our understanding of vertebrate systems. We are presently dissecting this mechanism further both in the clusters and in the main larval hematopoietic organ, the lymph gland.

Concerning our project on transcriptional regulation evolution upon gene duplication, we have focused on one duplication event that produced CG9836 and CG9538 at the base of drosophilids. We generated reporter lines with 25 non-coding regions of these loci in five drosophilid species and observe their activities. With this, we have narrowed down to 200 bp, the regions containing the enhancers with tissue-specific activities of our interest - the most conserved expression domain (glia) and the two novel tissue-specific domains (heart and hemocytes).

Taking advantage of this progress, we have moved on to carry out functional analysis of the minimal enhancers identifying upstream transcriptional factors using mutants and genetic tools as well as bioinformatics analysis of the enhancers. This will help us to elucidate the cis-regulatory mechanism underlying the conservation and evolution of novel tissue-specifies after gene duplication with greater precision than originally expected. For identifying the enhancers of the unduplicated gene, we have generated four reporter lines with two candidate non-coding regions from Bactrocera curcurbitae and completed the analysis of their tissue-specific activities.

PUBLICATIONS


HOST-MICROORGANISM INTERACTIONS

GROUP LEADER
Teixeira, Luís

RESEARCH INTERESTS
Multicellular organisms and microorganisms are continuously interacting. Many of these interactions are mutually beneficial. However, multicellular organisms have to actively thwart invasion by opportunistic or overtly pathogenic microbes. We are studying the interaction of the model organism Drosophila melanogaster with different microorganisms, in particular intracellular ones. D. melanogaster has been successfully used as a model system to study innate immunity against many pathogens. Recently it has been shown that there are innate immunity pathways against viruses conserved between insects and mammals. We are investigating mechanisms of resistance to viruses in the fruit fly. Interestingly, we have found that the intracellular bacteria Wolbachia confer resistance to RNA viruses in D. melanogaster. We want to understand the molecular basis of this induced resistance. We are also interested in the interplay between Drosophila and Wolbachia itself. These endosymbionts are one of the most widespread intracellular bacteria in the world but little is known, at the molecular level, on how the hosts control bacteria in the world but little is known, at the molecular level, on how the hosts control bacteria in the world but little is known, at the molecular level.

PROJECTS RUNNING IN 2015

• Drosophila antiviral immunity to natural infection
• Wolbachia as a defence against RNA viruses in insects

MAIN ACHIEVEMENTS IN 2015
In 2015, we have reported the identification of a genomic region in Wolbachia, the Octomom region, responsible for this endosymbiont growth regulation. Genomic amplification of this region leads to overproliferation and a high cost to the host. This was the first genotype-phenotype link shown with this bacteria that currently cannot be genetically manipulated. This work also showed Wolbachia can evolve fast and that a single genetic change can break mutualism. Therefore there must be a constant selection at the symbiont level for densities control. We also collaborated with the group of Casey Bergman (Un. Manchester) in an extensive analysis of Wolbachia gene expression throughout the development of its host. We showed that a part of its genes are regulated throughout this development or are host sex-biased.

Together with Karina Xavier (IGC), Margaret McFall-Ngai (Univ. Hawaii) and Martin Blaser (New York University), Luís Teixeira organised a Summer School on host microbe symbioses. This international Summer School brought together a faculty of eighteen leaders in the field with 34 PhD students to discuss current topics and future directions in the field.

GENOMIC REGION IN WOLBACHIA, THE OCTOMOM REGION, RESPONSIBLE FOR THIS ENDOSYMBIONT GROWTH REGULATION. GENOMIC AMPLIFICATION OF THIS REGION LEADS TO OVERPROLIFERATION AND A HIGH COST TO THE HOST. THIS WAS THE FIRST GENOTYPE-PHENOTYPE LINK SHOWN WITH THIS BACTERIA THAT CURRENTLY CANNOT BE GENETICALLY MANIPULATED. THIS WORK ALSO SHOWED WOLBACHIA CAN EVOLVE FAST AND THAT A SINGLE GENETIC CHANGE CAN BREAK MUTUALISM. THEREFORE THERE MUST BE A CONSTANT SELECTION AT THE SYMBIONT LEVEL FOR DENSITIES CONTROL. WE ALSO COLLABORATED WITH THE GROUP OF CASEY BERGMAN (UN. MANCHESTER) IN AN EXTENSIVE ANALYSIS OF WOLBACHIA GENE EXPRESSION THROUGHOUT THE DEVELOPMENT OF ITS HOST. WE SHOWED THAT A PART OF ITS GENES ARE REGULATED THROUGHOUT THIS DEVELOPMENT OR ARE HOST SEX-BIASED.

Together with Karina Xavier (IGC), Margaret McFall-Ngai (Univ. Hawaii) and Martin Blaser (New York University), Luís Teixeira organised a Summer School on host microbe symbioses. This international Summer School brought together a faculty of eighteen leaders in the field with 34 PhD students to discuss current topics and future directions in the field.

Funding
Fundação para a Ciência e a Tecnologia Welcome Trust

Collaborators
Casey Bergman (University of Manchester, UK)
Gabriela Gomes (IGC, Portugal)
Francis Jiggins (University of Cambridge, UK)
Alain Kohl (MRC-University of Glasgow Centre for Virus Research, UK)
Sara Magalhães (FCUL, Portugal)
Laura Serbus (Florida International University, USA)
Élio Sucena (IGC, Portugal)
William Sullivan (University California Santa Cruz, USA)
Karina Xavier (IGC, Portugal)

Outreach
Media appearance in newspapers and other channels, February, June.
PHYSICAL PRINCIPLES OF NUCLEAR DIVISION

GROUP LEADER
Telley, Ivo

RESEARCH INTERESTS
We are broadly interested in the physical aspects of nuclear division (mitosis) and nuclear positioning inside large egg cells. We approach this topic by means of micro-mechanical engineering, biochemistry and live imaging rather than phenotypic profiling of genes. An integrative understanding of the chemo-mechanical processes behind mitosis is sought.

Our research focus is two-fold: firstly, we aim to decipher the molecular basis, the kinetics of the molecular machines, and the mechanical scaffold that facilitates movement. Addressing the mechanics of mitosis in embryo development will help understand early defects in embryo development that have been found by genetic screens. Secondly, we are working towards a systems level understanding of how the mitotic spindle achieves the eccentric movement of segregating chromosomes. Directed force generation lies at the heart of chromosomal segregation. Thus, our lab strives to be able to measure tension generation and the mechanical scaffold that facilitates the molecular basis, the kinetics of the molecular machines, and the mechanical scaffold that facilitates movement.

PROJECTS RUNNING IN 2015
• Physical principles of nuclear migration and positioning in the Drosophila syncytial embryo
• Cytoskeletal dynamics during nuclear distribution in the Drosophila syncytial embryo
• The mechanics of nuclear division
• Spatial regulation of centriole biogenesis

MAIN ACHIEVEMENTS IN 2015
The intracellular positioning of the nucleus has gained substantial interest among biologists due to its relevance in cell cycle, differentiation, migration, and polarity. Abnormal positioning has been related to cell and tissue function deficiency and severe defects in embryogenesis. We study this process in the Drosophila early embryo, in which nuclei undergo rapid successive divisions without egg cell division. Hundreds of nuclei share the same cytoplasm and arrange regularly in space. How the regular nuclear distribution during early divisions is achieved and maintained is a peculiar yet unresolved phenomenon. Open questions addressing timing, synchronization and spacing of nuclear separation are studied using a novel ex vivo approach. Nuclei and cytoplasm from individual embryos are explanted and made accessible for live imaging and volumetric manipulations.

In 2015, we have finalized the realisation and optimization of a confocal spinning-disk microscope with in-house designed optical extensions enabling high-speed and high-sensitive detection, targeted UV ablation and micro-mechanical manipulation. We have adopted and refined existing protocols for patterned surface chemistry with which we define the adsorption of embryo cytoplasm to surfaces leading to more accurate shape and volume control. We have collected reliable quantitative data supporting the notion that nuclear distribution is independent of spatial perturbations, suggesting a robust mechanical mechanism of organelle distribution. As one of the first groups at IGC, we introduced CRISPR/Cas9 genetic engineering in Drosophila melanogaster to generate a knock-in construct expressing a fluorescent fusion of a gene. Moreover, we started a project in which we test the role of three microtubule associated proteins in maintaining nuclear distance in the syncytium by a microtubule–based repulsion mechanism. In another exciting project we explored the potential of our ex vivo single egg assay in order to time-lapse visualize egg fertilization, pronuclear apposition and the first mitotic nuclear division, processes so far inaccessible to live microscopy. Finally, we have initiated a collaboration with a laboratory at the Department of Physics, Técnico Lisboa, to characterize the mechanical properties and material failure mechanics of the egg membrane using atomic force microscopy.

In 2015, the group size increased to a total of seven members. One of our PhD students (Catarina Nabais) received an MSc in Biomedical Engineering from IST Lisboa. Our research focus is two-fold: firstly, we aim to decipher the molecular basis, the kinetics of the molecular machines, and the mechanical scaffold that facilitates movement. Addressing the mechanics of mitosis in embryo development will help understand early defects in embryo development that have been found by genetic screens. Secondly, we are working towards a systems level understanding of how the mitotic spindle achieves the eccentric movement of segregating chromosomes. Directed force generation lies at the heart of chromosomal segregation. Thus, our lab strives to be able to measure tension generation and the mechanical scaffold that facilitates the molecular basis, the kinetics of the molecular machines, and the mechanical scaffold that facilitates movement.

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Intact embryo

Microtubules

Embryo explant

This scheme illustrates the dimensions of an early fruit fly embryo, which is in syncytial stage and exhibits synchronous mitotic nuclear divisions at the embryo cortex. For our studies of nuclear positioning, the embryo is punctured with a micro-pipette and a small fraction of cytoplasm is extracted to generate an embryo explant (inset). This explant is produced from embryos as early as mitotic division 1, and it enables high temporal and spatial resolution imaging.
BACTERIAL SIGNALLING

GROUP LEADER
Xavier, Karina

RESEARCH INTERESTS

Bacteria use small chemical molecules called autoinducers to communicate with one another by a process called quorum sensing. This process enables a population of bacteria to regulate behaviours, which are only active when many bacteria act in concert as a group, similarly to what happens with multi-cellular organisms. Behaviours regulated by quorum sensing are often crucial for successful bacterial-host relationships whether symbiotic or pathogenic. In our laboratory biochemical and genetic approaches are used to study the molecular mechanisms underlying quorum sensing, with an emphasis on systems promoting bacterial inter-species communication. This research includes an integrated study involving elucidation of the chemical molecules that are used as signals, the network components involved in detecting the signals and processing information inside individual cells, and finally characterization of the behaviour of the bacterial community in multi-species bacterial consortia. Our ultimate goal is to understand how bacteria use inter-species cell-cell communication to coordinate population-wide behaviours in consortia and in microbial-host interactions.

PROJECTS RUNNING IN 2015

• Inter-species cell-cell signalling: its role in bacteria consortia
• Identification of microbiota-derived functions favouring expansion of enteric bacteria in antibiotic-treated mice
• Inhibition of bacterial plant virulence by interference with interspecies cell-cell communication.

MAIN ACHIEVEMENTS IN 2015

Bacteria coordinate group behaviours through production, release, and detection of small chemical signals, autoinducers, via a process called quorum sensing. Because many of these behaviours are important in bacteria-host interactions we are exploiting the natural ability of Escherichia coli to manipulate the interspecies quorum sensing in the environment to determine the impact of interfering with cell-cell interspecies signalling during colonization of the gut microbiota. We successfully showed that mice colonized with E. coli producing the quorum sensing signal AI-2 accumulated this signal, while E. coli strains that consume AI-2 in vitro can scavenge AI-2 present in the gut. We used these strains to manipulate the levels of AI-2 in the mouse gut and determined if changes in AI-2 levels in the mouse gut could have an impact in the emerging microbial community followed by a strong perturbation induced by a prolonged antibiotic treatment. It is well-known that antibiotic can lead to intestinal dysbiosis (microbial imbalance in the gut) with severe detrimental consequence to host health. We showed that microbiota in mice colonized with the E. coli that produced and accumulate high levels of AI-2 was less affected by the antibiotic than in mice colonized with the control strain that does not produce nor destroys the signal (Thompson et al., 2015). This work showed that increasing AI-2 had a positive effect in the antibiotic-treated microbiota. We now want to determine if AI-2 can be used to promote the recovery of microbiota balance after antibiotic-induced dysbiosis. We are currently working with organic chemists to establish new strategies to administrate AI-2 directly to the animals. We will determine the ability AI-2 to accelerate the recovery of bacterial diversity upon stopping antibiotics and determine its consequences in the recovery of microbiota functions such as those that confer host protection against pathogens. Additionally, we are setting up a colonization model with a defined microbiota to identify the mechanisms and functions involved in the microbiota responses to AI-2.

EM photographs of mice intestines with their gut microbiota. These photographs were taken by Ana Rita Oliveira (Bacterial Signalling lab) and Sara Bonucci (from the EM facility).

PUBLICATIONS


EPIGENETICS AND Soma

VISITING SCIENTIST

Barreto, Vasco

RESEARCH INTERESTS

We study the DNA editing of the immunoglobulin genes to understand random mono-allelic expression and the interplay of DNA repair pathways with Activation-Induced Deaminase (AID), the enzyme that triggers class switch recombination (CSR) and somatic hypermutation (SHM). Random mono-allelic expression is the most striking example of an epigenetic phenomenon, because at the level of each cell only one of two identical molecules (the alleles) is expressed. We are studying the immunoglobulin genes as a model to dissect how a given allele undergoes rearrangement first. In SHM, point mutations are introduced into the variable region of the Ig heavy and light chain genes in germinal centre activated B cells, generating the required diversity to fuel the affinity maturation of antibodies. In CSR, the variable region of the heavy chain gene is combined with gene segments encoding distinct constant regions, each with unique effector functions. AID is essential for SHM and CSR. However, its mutagenic ability has a pernicious side effect and AID has been implicated in B lymphomas and other neoplasias. We use classical molecular approaches and genetically engineered mice to discover AID co-factors for CSR, address the rules governing AID targeting to the immunoglobulin loci and establish murine models to evaluate the ectopic expression of AID.

MAIN ACHIEVEMENTS IN 2015

We have reviewed the role of Activation-induced cytidine deaminase (AID) in active DNA demethylation, detailed the evolution of a domain of AID essential for class recombination and established differences in the way AID and the RAG1/RAG2 complex interact with the NHEJ repair pathway.

PUBLICATIONS


EXTERNAL ASSOCIATED GROUPS

— 2015

GASTRULATION
GROUP LEADER Belo, José António
CEDOC – Chronic Diseases Research Center, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Portugal

NEURAL CIRCUITS & BEHAVIOUR
GROUP LEADER Carey, Megan
Champalimaud Neuroscience Programme, Portugal

NEUROBIOLOGY OF ACTION
GROUP LEADER Costa, Rui M.
Champalimaud Neuroscience Programme, Portugal

NEO-VASCULARIZATION
GROUP LEADER Dias, Sérgio
Instituto de Medicina Molecular, Portugal

EVOLUTIONARY ECOLOGY OF MICROORGANISMS
GROUP LEADER Dionísio, Francisco
Faculdade de Ciências da Universidade de Lisboa, Portugal

VASCULAR DEVELOPMENT
GROUP LEADER Duarte, António
Faculdade de Medicina Veterinária, Universidade Técnica de Lisboa, Portugal

SYSTEMS IMMUNOLOGY
GROUP LEADER Faro, José
Universidade de Vigo, Spain

YEAST STRESS
GROUP LEADER Fernandes, Lisete
Biosystems and Integrative Sciences Institute (BioISI), and Escola Superior de Tecnologia da Saúde de Lisboa, Portugal

CELLULAR IMMUNOLOGY
GROUP LEADER Graça, Luís
Instituto de Medicina Molecular, Portugal

DEVELOPMENTAL BIOLOGY
GROUP LEADER Henrique, Domingos
Instituto de Medicina Molecular, Portugal

NEURONAL STRUCTURE & FUNCTION
GROUP LEADER Israely, Inbal
Champalimaud Neuroscience Programme, Portugal

TISSUE MORPHOGENESIS & REPAIR
GROUP LEADER Jacinto, António
CEDOC – Chronic Diseases Research Center, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Portugal

NEUROETHOLOGY
GROUP LEADER Lima, Susana
Champalimaud Neuroscience Programme, Portugal

SYSTEMS NEUROSCIENCE
GROUP LEADER Mainen, Zachary
Champalimaud Neuroscience Programme, Portugal

EARLY FLY DEVELOPMENT
GROUP LEADER Martins, Rui
Universidade do Algarve, Portugal

BEHAVIOURAL NEUROSCIENCE
GROUP LEADER Moita, Marta
Champalimaud Neuroscience Programme, Portugal

MALARIA
GROUP LEADER Mota, Maria
Instituto de Medicina Molecular, Portugal

AZORES GENETICS
GROUP LEADER Mota Vieira, Luísa
Divino Espírito Santo Hospital, Universidade dos Açores, Portugal

GENOMICS OF COMPLEX DISEASES
GROUP LEADER Oliveira, Sofia
Instituto de Medicina Molecular, Portugal

VISION TO ACTION
GROUP LEADER Orger, Michael
Champalimaud Neuroscience Programme, Portugal

DOPAMINE IN ACTION LEARNING
GROUP LEADER Paton, Joseph
Champalimaud Neuroscience Programme, Portugal

BEHAVIOUR AND METABOLISM
GROUP LEADER Ribeiro, Carlos
Champalimaud Neuroscience Programme, Portugal

EMBRYONIC DEVELOPMENT OF VERTEBRATES
GROUP LEADER Saúde, Leonor
Instituto de Medicina Molecular, Portugal

MOLECULAR IMMUNOLOGY
GROUP LEADER Silva Santon, Bruno
Instituto de Medicina Molecular, Portugal

VIRAL PATHOGENESIS
GROUP LEADER Simas, Pedro
Instituto de Medicina Molecular, Portugal

STRESS AND CYTOSKELETON
GROUP LEADER Soares, Helena
Faculdade de Ciências da Universidade de Lisboa, Portugal

DEVELOPMENT & EVOLUTIONARY MORPHOGENESIS
GROUP LEADER Thorsteinsdóttir, Solveig
Faculdade de Ciências da Universidade de Lisboa, Portugal

INNATE BEHAVIOUR
GROUP LEADER Vasconcelos, Maria Luísa
Champalimaud Neuroscience Programme, Portugal

HUMAN MOLECULAR GENETICS & FUNCTIONAL ANALYSIS UNIT
GROUP LEADER Vicente, Astrid
Instituto Nacional de Saúde Dr. Ricardo Jorge, Portugal
Support to Research

- 10 Core Facilities
- 9 Services
- 88 Staff
- 28 Publications
- 41 External Institutions that Used the Core Facilities
ANIMAL HOUSE FACILITY

HEAD OF FACILITY

Rebelo, Manuel

DESCRIPTION OF FACILITY

The Animal House Facility is organised in several areas, specifically prepared for each model organism hosted at the IGC.

RODENT FACILITY

Composed of 1 SPF Production Unit, 4 Experimental Areas, 1 Quarantine. Services offered: common strains production, rederivation, mouse germline cryopreservation, revitalization, germ-free, gnotobiology and bel-2. It is part of the Infranfrontier-I3/European Mouse Mutant Archive (EMMA) consortium (www.infranfron-tier.eu) and the European Consortium for Gnotobiology (www.ecgnoto.eu).

AQUATICS FACILITY

• Zebrafish Facility: composed of 1 Production + Experimental area, 1 Experimental area for behaviour studies, 1 Quarantine and 1 Procedure room. Services offered: husbandry, common strains production, rederivation, mouse germline cryopreservation, revitalization, germ-free, gnotobiology and bel-2.

FLY FACILITY

Hosts thousands of mutant lines. It is composed of 2 controlled-temperature walk-in chambers, 2 controlled-temperature small rooms, 1 food preparation room, 4 procedure labs and 1 Quarantine. Services offered: central food production and fly stock surveillance.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015

EU-FP7 European Mouse Mutant Archive (EMMA) http://www.infranfrontier.eu

EMMA is a not-for-profit repository for the collection, archiving (via cryopreservation) and distribution of mutant mouse strains used in basic biomedical research. EMMA plays a crucial role in exploiting the tremendous potential benefits of current research in mammalian genetics to human health. This grant maintains a state-of-the-art Mouse Germ-Free Facility, used by European and IGC researchers. EMMA is nowadays integrated in the FP7 Infrastructure Infrafrontier-I3.

Host microbe interaction

This FCT funded project (REC/IMI-IMU/0038/2012) aims at enhancing the capacity of the Instituto Gulbenkian de Ciência to study evolutionary conserved mechanisms regulating host-microbial interactions under homeostasis as well as in the context of infection in mice. In this frame, the Animal House Facility implemented, tested and adapted to experimentation the Gnotobiology and the BSL2 facilities.

European Consortium for Gnotobiology http://www.ecgnoto.eu

This consortium aims at developing new tools and technologies in the field of Gnotobiotic and Germ-free mice. It also aims at harmonizing procedures across facilities in Europe.

CONGENTO

CONGENTO was selected to be part of the National Roadmap of Research Infrastructures (RI) that FCT launched in 2013. The goal of CONGENTO is to provide services, making available state of the art technologies in the 3 most commonly used genetically tractable organisms worldwide (mouse, zebrafish and Drosophila). It is a completely innovative infrastructure at the National and International level. The IGC is part of this RI, together with Champalimaud Foundation, Instituto de Medicina Molecular (IMM) and CEDOC-Chronic Diseases Research Center.

Collaborative project with University of São Paulo - USP (Brazil)

Since 2008 the IGC has a collaborative project with USP (Brazil) in the field of cryopreservation of mouse germline, sharing knowledge and human resources to implement the latest developments in our common routines. In 2014 the project was extended to the zebrafish model, in which the IGC is helping on the implementation of the new Fish Facility in USP.

PUBLICATIONS


HEAD OF FACILITY

Email: rebelo@icg.gulbenkian.pt

PhD in Immunology

Universidade de Lisboa, Portugal, 2005

Head of Facility since 2014

STAFF

Ana Cristina Borges, Manager of Fish Facility

Joana Bom, Manager of Germ-Free/Gnotobiology Facility

Liliana Vieira, Manager of Fly Facility

Sandra Cristodomo, Technician

Maysa Franco, Technician

Ana Sofia Leocádio, Technician

Marília Pereira, Technician

Ana Ribeiro, Technician

Liliana Vale, Technician

Adérito Vieira, Technician

Carina Monteiro, Technician

Margarida Pereira, Caretaker | Started in July

Pedro Pinto, Caretaker

Lévi Pires, Caretaker

Graca Ramalho, Caretaker

Marco Rocha, Caretaker

Cátia Silva, Caretaker

FACILITY OVERVIEW

Sandra Rebelo, Head of Animal House Facility

In 2015 the Animal House Facility hosted the annual meeting of the Portuguese Society of Biotechnology (in Portuguese: Sociedade Portuguesa de Biotecnologia). It was also the meeting point for several IGC and USP associates to discuss and plan several projects in the field of mouse and zebrafish germ-free research. The Animal House Facility also hosted a seminar on the role of mice in research, organized by the National Animal Institute. The Animal House Facility was also the venue for the celebration of the 2015 World Zebrafish Day organized by the Portuguese Zebrafish Community. The Animal House Facility was a key player in the IGC’s project (“EMMA”) to develop a mouse germ-free facility. In 2015 the Animal House Facility implemented, tested and adapted to experimentation the Gnotobiology and the BSL2 facilities. The Animal House Facility also hosted the International Conference of the European Consortium for Gnotobiology (ECG) in Lisbon in 2015. The Animal House Facility was also the venue for the celebration of the 2015 World Zebrafish Day organized by the Portuguese Zebrafish Community. The Animal House Facility was a key player in the IGC’s project (“EMMA”) to develop a mouse germ-free facility. In 2015 the Animal House Facility implemented, tested and adapted to experimentation the Gnotobiology and the BSL2 facilities. The Animal House Facility also hosted the International Conference of the European Consortium for Gnotobiology (ECG) in Lisbon in 2015.
EQUIPMENT

RODENT FACILITY
• 7 autoclaves
• 17 IVCs (Individually Ventilated Cages) rack systems
• 9 AHU Smart Flow model, with touch screen for all IVC racks
• 4 cage washers
• 1 bedding disposal station
• 7 conventional biosafety cabinets
• 1 movable biosafety cabinet CS5
• 1 movable biosafety cabinet Aria
• 9 isolators for Germ-free• 2 ISOcage isolator rack system (72 cages each)
• 1 biosafety Cabinet for ISOcage rack system
• 1 ISOTEC transfer chamber with souflet connector for 270 DPTE Isolators door
• 10 stainless steel cylinders for 350 DPTE Isolators door
• 3 stainless steel cylinders for 270 DPTE Isolators door
• 5 transport cars for cylinders
• 1 plastic emergency cylinder for 350 DPTE Isolators door
• 1 paracetic acid sterilizer and compressed air pump
• 1 osmosis reverse system
• 1 vapour-phase hydrogen peroxide decontamination system
• 1 transfer and decontamination chamber
• 1 animal transfer chamber

FLY FACILITY
• 2 controlled-temperature walk-in chambers
• 2 controlled-temperature rooms
• 11 incubators
• 17 working stations with CO2 output pedal system
• 6 working stations with CO2 output flow buddy system
• 1 microinjector
• 1 boiling pan for food preparation, 80L capacity
• 3 food dispensers
• 2 heat shock baths

AQUATICS FACILITY - ZEBRAFISH FACILITY
• 1 multi-linking WTU system (Tecniplast®) with 6 racks, total capacity of 300 aquariums (3.5L)
• 1 multi-linking WTU system (Tecniplast®) with 2 racks, total capacity of 100 aquariums (3.5L) + 60 aquariums (1.1L)
• 5 Stand-Alone Zebtec™ systems (Tecniplast®), total capacity of 200 aquariums (3.5L) + 100 aquariums (1.1L)
• 1 Marine Biotech Z-Mod® Aquaria Rack System, total capacity of 126 aquariums (3.5L), for Quarantine
• 20 glass aquariums (6L) for fish isolation
• 3 reverse osmosis systems
• 2 microinjectors
• 4 stereoscopes
• 2 fluorescent stereoscopes
• 1 microscope

AQUATICS FACILITY - FROG FACILITY
• 1 Xenopus stand-alone with chiller, total capacity of 9 aquariums (27L each)
• 1 aquatic habitat system with 9 tanks
• 1 cooler/heater system for the aquatic habitat system
• 1 incubator

Outreach
Calouste Gulbenkian Foundation
Public talk for high school students, Oeiras, September

FACILITY OVERVIEW
Calouste Gulbenkian Foundation
Fundação para a Ciência e a Tecnologia
Fly Facility
Calouste Gulbenkian Foundation
Outreach
The goal of the Transgenics Unit is to help research groups at the IGC by generating genetically modified mouse strains required for their research activities. Our technical competence covers a wide spectrum of approaches to introduce genetic modifications into the mouse genome. These include:

- The production of transgenic animals by pronuclear DNA injection using both conventional expression constructs and Bacterial Artificial Chromosomes (BACs). We generate transgenic mice in various genetic backgrounds, including C57BL/6.
- Introduction of targeted modifications into endogenous genomic loci both following conventional embryonic stem cell-mediated approaches and, more recently, with the CRISPR/Cas9 technology. Our main goal is to cover the needs of the research groups at the IGC but under specific circumstances we can also produce mice for external users.

As usual, production of transgenic mice was one of the main tasks of the unit, although this year the genesis of genetically modified mice using the CRISPR/Cas9 technology has grown to levels matching our activities involving the production of transgenic mice. In what concerns transgenic mice, during 2015 we injected a total of 24 different constructs that produced 10 transgenic lines and 271 transgenic embryos that were analysed at the embryonic and fetal stages. Our efficiency remained high (around 30%). In addition to the production of transgenic mice using regular DNA constructs, we also produced transgenics with BACs using 3 different constructs to generate a total of 23 transgenic embryos and 3 new lines. As for regular transgenics, our efficiency in the production of BAC transgenics remained high, ranging the 26%.

One of the highlights of the Transgenics Unit activity during 2015 was the remarkable increase in the production of mutant mice using the CRISPR/Cas9 technology. We have successfully used this technique to inactivate genes (both through the indel and the insertion approaches), to remove exons from gene loci, to produce mouse models for specific syndromes by altering the coding region of the relevant genes, to introduce a small tag into the coding region, and to modify target sites for transcription factors and microRNAs, including point mutations. We produced 6 new mouse lines and 50 mutant embryos in both the FVB and C57Bl/6 backgrounds with ~15% efficiency.

### EQUIPMENT

- 1 Microinjection setup with Nikon inverted microscope equipped with DIC optics, and three-dimensional Narishige micromanipulators
- 1 Microinjection setup with Leica inverted microscope equipped with DIC optics, and three-dimensional, power assisted, Narishige micromanipulators
- 2 FemtoJet pump
- 1 Sutter P-87 Flaming/Brown micropipette puller
- 1 Zeiss SV6 Stereomicroscope with training head
- 2 Standard Zeiss SV6 Stereomicroscopes
- 1 CO₂ incubator
- 1 Ultrasonic Cleaning Device
PLANT FACILITY

DESCRIPTION OF FACILITY

The Plant Facility at the IGC ensures the growth and maintenance of Arabidopsis thaliana and Physcomitrella patens plants, the model organisms used by the plant research groups hosted by the Institute. The facility consists of a custom-built greenhouse with lighting control and temperature regulation and three custom-made fully controlled growth chambers with short-day, long-day and continuous light settings, as well as a walk-in plant growth room and five small reach-in chambers that allow the performance of cell-based assays and more precise phenotypical analyses. Three research groups (Plant Molecular Biology, Plant Stress Signalling and Plant Genomics) make use of the IGC Plant Facility.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015


PUBLICATIONS


PROJECTS AND MAIN ACHIEVEMENTS IN 2015


STAFF

Vera Nunes, Technician

Funding

Calouste Gulbenkian Foundation

European Molecular Biology Organisation (EMBO)
BIOINFORMATICS & COMPUTATIONAL BIOLOGY UNIT

HEAD OF FACILITY

Sobral, Daniel

DESCRIPTION OF FACILITY

The mission of the Bioinformatics and Computational Biology Unit is to:

1) Promote the use of computational methods in biological research, through training and development of resources and materials;
2) Provide direct user support in biological data analysis using computational methods;
3) Conduct research and development in bioinformatics, in particular in data-flow, data warehousing and logical research, through training and development of resources and materials;
4) Maintain a computing infrastructure suited for bioinformatics analysis.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015

The Bioinformatics Unit has provided more than 800 hours of direct bioinformatics support to IGC research groups. This work has led to 3 publications, with others in preparation. We have also provided 30 hours of support to external users.

We continue collaborating with the sequencing facility to optimize their sequence data quality assessment and in the development of new services such as high throughput sequencing of 16S. In this context, a new master student has joined the unit to compare and optimize pipelines for 16S metagenomic analysis. The IGC (represented by the Bioinformatics Unit) received 180.000€ from an European Project (Elixir-Evol) to be applied in four years to help build an European infrastructure for the integrated management of biological data. In this context, we are collaborating in the development of best practices in data representation and data analysis. We are also developing technology in the area of ontology-mapping.

We have been maintaining a set of services, the most relevant of which is a costumized galaxy web-based service enabling IGC users easy access to bioinformatics analysis, by providing several short practical tutorials based on the galaxy service we provide IGC users. We have also continued our mission of promoting the use of bioinformatics by giving lectures in courses at the master and doctoral level.

PUBLICATIONS


EQUIPMENT

- One heavy calculation server used for support and hosted projects
- Two virtualization servers dedicated to hosting web services and other computational resources
- Six workstations of which two have analysis software for user access
- Four smaller servers to support virtualization services

FACILITY OVERVIEW

IGC researchers in their ability to perform bioinformatics analysis, by providing several short practical tutorials based on the galaxy service we provide IGC users. We have also continued our mission of promoting the use of bioinformatics by giving lectures in courses at the master and doctoral level.
GENE EXPRESSION UNIT

HEAD OF FACILITY
Becker, Jörg

DESCRIPTION OF FACILITY

The Gene Expression Unit provides three types of services:

NEXT GENERATION SEQUENCING

The unit runs NGS services on an Illumina MiSeq system (in close collaboration with the Genomics Unit). These include de novo and re-sequencing of small to mid-sized genomes as well as amplicon sequencing, for example 16S metagenomics.

MICROARRAYS

We are an Affymetrix Core Lab with reference status for GeneChip technology in Portugal since 2002. Our microarray services focus on gene expression profiling (mRNA and miRNA), starting from experimental design over complete sample processing to expert advice on data analysis.

BIOANALYZER

Our Bioanalyzer is used for RNA and DNA quality analyses.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015

In 2015, the unit has produced 380 Gigabases of sequencing data with its MiSeq. These derived from 427 samples of re-sequencing, 13 RAD-Seq runs of RAD-Seq, 388 samples of 16S metagenomics, and 59 samples processed for custom experiments.

In the end of 2015 we have implemented a new 16S protocol (Earth Microbiome Project), which allows us to multiplex 288 samples into one run and we have already processed 440 samples.

In addition we have run 81 microarrays for 8 different research projects and analysed 1283 RNA/DNA samples on our Bioanalyzer.

For 2016 new NGS services and improvement of existing ones are planned. We will implement protocols for RNAseq, so that we can produce sequencing libraries in-house and have them shipped to service providers abroad for high-volume sequencing. Existing protocols will be optimized to reduce costs.

PUBLICATIONS


EQUIPMENT

- GeneAtlas System
- Scanner 3000 7G with Autoloader
- Fluidics Station 450
- Hybridization Oven 645
- Bioanalyzer 2100
- MiSeq System

OUTREACH

Facility tour for high school and University students, Oeiras, March and September
GENOMICS UNIT

HEAD OF FACILITY
Penha Gonçalves, Carlos

DESCRIPTION OF FACILITY
The Unit provides technological support and expertise for research at the genome scale and is composed by Genotyping and Sequencing Services: The Genotyping Service offers the Sequenom iPLEX technology, allowing rapid SNP genotyping assays with up to forty SNPs assayed simultaneously. The facility collaborates with investigators on: SNP choice and SNP Assay Design, Sequenom Procedure and Data Management for Genetic Studies, providing access to the BC/GENE interface software. Genotyping Service also offers a backcrossing service for users of genetically modified mice and mouse breeders. The facility collaborates with investigators on: SNP choice and SNP Assay Design, Sequenom Procedure and Data Management for Genetic Studies, providing access to the BC/GENE interface software.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015

GROUPS USING GENOTYPING SERVICE
Three In-house, one IGC associated and four non IGC groups have used the Genotyping Service in a total number of 33 chips, and 506 880 SNP genotypes have been produced since January 2015 until January 2016. Groups that have used the Genotyping service: IGC In-house: Host-Microorganism Interactions, PI: L. Teixeira (Project: D. melanogaster backcrossing); Integrative Behavioural Biology, PI: Rui Oliveira (Project: Comparative social cognition: zebrasfa as a neurobehavioural model); Eco-Evolution Genetics, PI: Ivo Chelo/Henrique Teotónio (Project: Population genetics of adaptation in C. elegans). IGC associated: Genetic Epidemiology, PI: Astrid Vieira (Project: 17q21 inversion polymorphism). Other Roles at IGC

GROUPS USING SEQUENCING SERVICE
- DNA Sequencing: nineteen In-house and one IGC associated groups have used the ABI 3130XL Sequencing service, with a total of 10204 samples sequenced during the period of January 2015 until December 2016.

PUBLICATIONS

EQUIPMENT
- Two robotic pipetting devices, robot PlateMate 2x2 (Matrix)
- Five thermocycling machines - ABI 9700 equipped with 2x384 blocks
- Chip spotting robot (MassARRAY Nanodispenser)
- SNP detection, MALDI-TOF technology - MassARRAY Compact (Sequenom)
- Chip spotting robot (MassARRAY Nanodispenser)
- Five thermocycling machines - ABI 9700 equipped with 2x384 blocks
- Two robotic pipetting devices, robot PlateMate 2x2 (Matrix)
- SNP detection, MALDI-TOF technology - MassARRAY Compact (Sequenom)
- ABI 3130XL
- Q57 (ABI) Fast Real-Time PCR
- CFX384 (BioRad) Real-Time System

STAFF
Isabel Marques, Senior Laboratory Manager
João Costa, Genotyping and NGS Research Assistant
Susana Ladeiro, Sequencing and NGS Research Assistant

FACILITY OVERVIEW

STAFF

HEAD OF FACILITY
Email: cpenha@igc.gulbenkian.pt

PHD in Immunology
University of Umeå, Sweden, 1999
Head of Facility since 2003

Other Roles at IGC
Group Leader of the Disease Genetics group
Member of the Ethics Committee

FACILITY OVERVIEW

STAFF
HISTOPATHOLOGY

HEAD OF FACILITY
Soares, Miguel

DESCRIPTION OF FACILITY
The Histopathology Unit provides a wide range of services related to tissue preparation. These include collection, fixation, processing, embedding, sectioning and staining of animal tissue samples. The unit also provides microscopy assistance as well as training to new users in sample preparation and sectioning.

EQUIPMENT
- Tissue processor
- Paraffin embedding station and water bath
- Microtome
- Cryostat
- Vibratome

UNIT OF IMAGING AND CYTOMETRY (UIC)

DESCRIPTION OF FACILITY
The Unit of Imaging and Cytometry (UIC) has been at the forefront of major technological developments at IGC, since its formal creation in 2003. Since then, the UIC has grown in personnel and technological spectrum to anticipate the demands of a growing base of users. Because cellular imaging and cytometry have been in high demand, and new systems and techniques are continuously developed, the facility expanded significantly to facilitate accessibility while introducing the latest innovations to the whole research community. To provide more dedicated and focused services on specific technical areas, the UIC was restructured in 2013 as three autonomous sub-units - Advanced Imaging, Flow Cytometry, and Electron Microscopy – that retain the “UIC” brand of excellence.

HEAD OF FACILITY
Email mpsoares@igc.gulbenkian.pt
PhD in Science
University of Louvain, Belgium, 1995
Head of Facility since 2011
Other Roles at IGC
Group Leader of the Inflammation group

STAFF
Marta Pinto, Technician
Joana Rodrigues, Technician
Rui Pedro Faisca, Pathologist

Funding
Calouste Gulbenkian Foundation
UIC: ADVANCED IMAGING

HEAD OF FACILITY
Martins, Gabriel

DESCRIPTION OF FACILITY
The UIC, Advanced Imaging Unit provides access and support to high-end light microscopy imaging needs of the whole IGC community. The Unit currently stands as an international reference laboratory, with cutting-edge techniques ranging from super-resolution, high-end widefield and confocal systems (high-throughput/screening capabilities), multiphoton, light-sheets microscopy, optical tomography and bioluminescence/fluorescence animal imaging. Some of these techniques are unique in Portugal and were developed in-house. The Unit is also responsible for general maintenance of optical instruments, including satellite microscopes throughout the IGC. Users are trained in dedicated workshops. The UIC also organises advanced workshops on light microscopy techniques, equipment setup, experimental design, collection of high quality data, and image processing and analysis.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015
Participation in funded research projects:
COST action OC-2015-1-19619 BIAS4Life: A new Network of European BioImage Analysts to advance life science imaging (GGM participant)
PTDC/AAG-GLO/19262014 SHARKFIT: Impactos das alterações climáticas no início da ontogenicidade de tubarões temperados e tropicais (GGM participant)
POR-Lisboa, LISBOA-01-0162-FEDER-001151 - LXCLEM: Infraestrutura tecnológica para observação e análise correlativa da dinâmica e ultraestrutura celular por microscopias ótica e eletrônica (GGM participant)
Trans-Domain COST Action “Fast advanced Scintillation Timing (FAST)” TD1401 (GGM participant)
FCT-RECI/BEX-BCM/0083/2013 - Imaging the structure and dynamics of molecules and complexes in living organisms (GGM participant)

PUBLICATIONS

PROTOTYPES

EQUIPMENT
INSPECTION WIDE-FIELD LIGHT MICROSCOPES
- Olympus IMT-2
- Leica DMLB2
- Leica Stereoscope+color cam.
- Macro stage with epi-trans illumination+cam.

RESEARCH WIDEFIELD LIGHT MICROSCOPES
- Leica upright DMRA2
- DeltaVision - Deconvolution microscope
- Leica HCS microscope
- Nikon HCS microscope
- High-throughput microscope setup (custom-built)
- Zeiss high-throughput Biosafety B2 microscope
- Whole-animal imager, Hamamatsu Aequoria with EMCCD camera
- STORM super-resolution microscope (custom-built)
- FCS/FLIM microscope (custom-built)

CONFOCAL/3D IMAGING MICROSCOPES
- Confocal Leica SP5 (HyD detectors)
- Confocal Leica SP5 Inverted with environmental control
- Confocal Zeiss LSM 880
- Confocal Andor W1 wide FOV Spinning disk
- Nikon TIRFM/spinning disk with environmental control
- Prairie Multi-photon microscope with environmental control
- Light-sheet (SPM and DLSM) microscope (custom-built)
- OPenT- optical tomography scanner (custom-built)

HIGH-END IMAGE ANALYSIS WORKSTATIONS
- Huygens workstation
- Imaris v6.4 + FIJI workstation
- Imaris v8.0 + FIJI workstation
- DeltaVision deconvolution workstation
UIC: ELECTRON MICROSCOPY FACILITY

HEAD OF FACILITY
Tranfield, Erin

DESCRIPTION OF FACILITY
At the Electron Microscopy Facility at the IGC we believe that electron microscopy is a powerful research tool that can be used to address research questions in the life sciences.

With this in mind we aim to:
• provide centralized, high quality electron microscopy infrastructure to support scientific investigation.
• offer electron microscopy services, mentorship and skill training.
• collaborate with researchers within our institute, our country and the scientific community abroad to foster knowledge of technical developments in electron microscopy.

The EM Facility has the necessary tools and experience to work with many different biological specimens using multiple technical approaches. When needed, we develop customized protocols for specialized research projects and we train users to process their samples and collect their data independently.

PROJECTS AND MAIN ACHIEVEMENTS IN 2015
Worked on 24 full service projects from groups from across Portugal, and had a growing number of independent users using the facility.

EQUIPMENT
- 1 Reichert Cryo-ultramicrotome
- 1 Leica UC7/FC7 Ultramicrotome
- 1 Wohlwend High Pressure Freezer
- 1 Leica Automatic Freeze Substitution Unit
- 1 Hitachi Transmission Electron Microscope
- 1 Pelco Microwave Processing System
- 1 Carbon Coater
- 1 Fluorescence Light Microscope

HEAD OF FACILITY
Email: etranfield@igc.gulbenkian.pt

PHD in Pathology and Laboratory Medicine
University of British Columbia, Vancouver, Canada, 2001

Head of Facility since 2013

External Website
http://uic.igc.gulbenkian.pt/emf.php

STAFF
André Barros, Technician | Left in March
Sara Bonucci, Technician
Ana Catarina Correia, Technician
Ana Laura Sousa, Technician

Funding
Calouste Gulbenkian Foundation

Outreach
Facility tour for high school students, Oeiras, October.

Hematopoietic cells in the head kidney of a healthy zebrafish. Samples processed and imaged by Ana Catarina Correia and Erin Tranfield in the IGC EMF for a project done by Inês Castro in the laboratory of Miguel Ferreira (Telomeres and Genome Stability).
The aim of the Flow Cytometry Facility is to provide high-quality technical and scientific support in multiparameter cell sorting and flow cytometry analysis to all researchers at the IGC as well as to outside groups and companies. The facility provides a unique service to allow ready access to a wide range of technologies and expertise in an integrated manner that helps drive research forward efficiently. The IGC Flow Cytometry Facility currently stands as a national and international reference for Flow Cytometry and high-throughput cell sorting. The unit is well equipped, with two multicolour high-speed cell sorters, five flow analyzers and a multiplex analyte reader. All users receive basic training in the systems in use, in troubleshooting, and advice on experimental design and data analysis. Due to the high-demand for new flow instruments and techniques the facility is continuously expanding and introducing the latest innovations in Flow Cytometry to the research community.
ACCOUNTING AND INTERNAL AUDIT

HEAD OF UNIT
Leite, José Mário

This service provides support in all administrative and accounting matters, including ordering and stores, financial and fiscal support. The accounts office provides support in preparing financial reports of research projects, and in general accounting and management of projects.

The Accounting and financial reporting of research projects is executed by an external society: PWC.

The Procurement is executed by an external society: FlyBridge.

The internal auditing is executed by an external society: Deloitte.

DESCRIPTION OF SERVICE

HEAD OF UNIT
Leite, José Mário

Email: jleite@igc.gulbenkian.pt
Head of Unit since 1999
Other Roles at IGC
Deputy Director

STAFF
Fátima Mateus, Accounts Officer
Vítor Santos, Accounts and Information Officer
Abilio Simões, Stores Manager
Ana Sofia Oliveira, Team responsible PWC
João Braga, Accounts Officer PWC | Left in December
João Correia, Accounts Officer PWC | Left in December
Tânia Lobão, Accounts Officer PWC
Rafael Clemente | Started in December
António Bretanha, Procurement FlyBridge
Filipe Silva, Auditor Deloitte

ADMINISTRATIVE UNIT

HEAD OF UNIT
Martins, Greta

The Admin Unit is responsible for:
• Post-award project management of projects that are mostly financed externally;
• Admin assistance to the IGC Directors, researchers and visitors;
• Meetings organisation;
• Support to Purchasing;
• Accounting: insertion of payment entries on SAP and associated filing processes.

The unit has strong collaborations with the Purchasing and the Accounting Sectors of the institute.

DESCRIPTION OF SERVICE

HEAD OF UNIT
Martins, Greta

Email: gmartins@igc.gulbenkian.pt
Head of Unit since 2012

STAFF
Liliana Rodrigues, Secretary to the Director
Olena Shydenko, Secretary to the Deputy Directors
Pedro Alves, Tatiana Rocha, Raquel Costa (Left in July), João Antunes (Started in July; left in December) and Anna Maria Fejfer (Started in December), Admin Project Managers
Rita Gusmão and André Sousa, Admin Project Managers/Purchasing Support Officers
Joana Gusmão, Purchasing Support Officer
Ana Maria Santos, Secretary
Jorge Costa, Collaborator

The Admin Unit: Provided admin support to the IGC Directors and to approximately 77 Principal Investigators and/or Unit Heads and their groups; managed around 115 externally funded projects; performed 29 financial reports; monitored and assisted purchasing processes through LabOrders; organised logistics for 66 seminar speakers and/or other researcher visitors; provided admin support to 29 incoming researchers; organised 13 meetings, national and international, for the IGC; PI Selection Colloquium, EU Infrafrontier Consortium, Fish Functionary Neuroanatomy, IGC SAB 2015, Ancegus2015, Evolutionary Predictability, Volkswagen Summer School, EMBO Practical course, EMBO Sectorial meeting, Drostuga 2015, Infecton & Immunity Symposium, Euraxess Roadshow and Postdoc retreat.

NEWS IN 2015

The Admin Unit: Provided admin support to the IGC Directors and to approximately 77 Principal Investigators and/or Unit Heads and their groups; managed around 115 externally funded projects; performed 29 financial reports; monitored and assisted purchasing processes through LabOrders; organised logistics for 66 seminar speakers and/or other researcher visitors; provided admin support to 29 incoming researchers; organised 13 meetings, national and international, for the IGC; PI Selection Colloquium, EU Infrafrontier Consortium, Fish Functionary Neuroanatomy, IGC SAB 2015, Ancegus2015, Evolutionary Predictability, Volkswagen Summer School, EMBO Practical course, EMBO Sectorial meeting, Drostuga 2015, Infecton & Immunity Symposium, Euraxess Roadshow and Postdoc retreat.
BIOSAFETY UNIT

HEAD OF UNIT
Carneiro, Tiago

DESCRIPTION OF SERVICE

The Biosafety unit is focused in promoting protection of all workers and visitors of the IGC. In addition, our implemented safety policies also aim to protect the environment and the community where we are.

The Biosafety unit works to implement rules that meet the best biosafety practices recommended by the European Union and the World Health Organisation.

Among the services we provide are:

- General safety training to all personal working at the IGC;
- Radiation safety training to work with radioactive isotopes. Currently, the IGC has permission from Direção Geral de Saúde (DGS) to work with P-32, P-33, S-35, C-14 and H-3;
- Training of researchers to work in a Biosafety Level 2 containment facility;
- Guidance on biological and chemical waste disposal and decontamination procedures;
- Assisting scientists with the biosafety procedures to adopt in their labs;
- Setting up and implementing emergency procedures and protocols.

EQUIPMENT & TECHNICAL SUPPORT

HEAD OF UNIT
Moreno, Nuno

DESCRIPTION OF SERVICE

A technical platform aiming to support equipment acquisition, distribution and rational usage. Also, to support scientists form the institute on the prototyping of hardware apparatus for innovative experimental approaches (e.g. 3D printing and automation).

We work in close collaboration with core facilities for keeping with the high service standards and equipment uptime, by providing tools for better manage resources and by fostering best practices on financial models.

PUBLICATIONS


SERVICES

INFORMATICS UNIT

HEAD OF UNIT
Sousa, João

DESCRIPTION OF SERVICE

The IGC informatics (ITI) manages most of the ICT needs of the IGC including the development and maintenance of the IT and communications infrastructure, direct support to IGC users (helpdesk), training and consulting as a service, development and maintenance of the scientific computation farm, and application development. These services are multilayered and can be engaged fully or partially as needed.

Most of the IGC infrastructure relies on the use of Open Source technologies and the competence of our dedicated staff to maintain a competitive level of service. Notable exceptions are the dedicated administrative applications that also rely on commercial applications and external consultants to maintain them.

The IGC has a modern IT infrastructure with a local data centre, redundant internet lines, Gigabit Ethernet to the desktop, campus-wide Wi-Fi, centralized file storage, internal helpdesk, knowledge base servers and fully integrated and automated intranet and user management.

GENERAL MAINTENANCE

HEAD OF UNIT
Leite, José Mário

DESCRIPTION OF SERVICE

This service provides support in all general maintenance (excluding scientific equipment and units), electricity, AVAC, buildings, gardening, cleaning and gives support to other activities that need it, such as garbage – general and biohazard – reconstruction and adaptation, etc.
LIBRARY

HEAD OF UNIT

Sousa, João

DESCRIPTION OF SERVICE

The IGC library is an open access, specialized library in biomedicine. Its bibliographic collection covers Biology, Biochemistry, Genetics, Pharmacology, Microbiology, Physiology, Immunology, Virology, Cell Biology, Neuroscience and Developmental Biology.

The library is intended for researchers, faculty and visiting scientists, students and staff of the IGC, but is also opened to external users, either from the national scientific community or from higher education institutions. It aims to provide access to useful, diversified and up to date information, to improve services provided, to acquire, register, maintain and distribute scientific information of interest to or produced by researchers and students who work at the IGC.

The IGC library has a collection of printed journals in the field of health sciences, which spans almost 30 years. Currently it subscribes approximately 336 international scientific journals in electronic version.

HEAD OF UNIT

Email jsousa@igc.gulbenkian.pt

PhD in Theoretical Biochemistry
Universidade de Lisboa, Portugal, 2002

Head of Unit since 2015

Other Roles at IGC

Head of ITI service

STAFF

Jorge Carneiro, Scientific Coordinator
Pedro Homem, Library Officer

RESEARCH FUNDING AFFAIRS

HEAD OF UNIT

Vidal, Sheila

DESCRIPTION OF SERVICE

The Research Funding Affairs Unit is responsible for the implementation of a pre-award grant administration service. Its main goal is to increase the IGC’s capacity to attract competitive research funds launched by national, international, public and private grant programmes. This service reports directly to the IGC Director, understands the different grant policies & requirements and works in collaboration with researchers, the Admin & project management Unit and finance staff. Services offered to the researchers include: identification & dissemination of funding opportunities tailored to the needs of the institute; support the development & submission of grant proposals and; post-award grant agreements negotiation. The unit also organises and lectures several informative sessions and workshops for grant application training of in-house and external researchers at all career stages. This unit also monitors the impact of the services offered through the quantification of several criteria.

HEAD OF UNIT

Email svidal@igc.gulbenkian.pt

PhD in Physiology of Invertebrates
Paris Sud XI University, Orsay, France, 2004

Head of Unit since 2008

STAFF

Teresa Costa, Pre-Award Grant Manager

In 2015, this service supported researchers in attracting several external competitive research funds. IGC researchers secured or signed contracts for a total of 14 new external competitive research grants, 3 prizes as well as 14 other type of funds in a total amount of about 5,2 million EUR. In addition, 1 PhD fellowship, 4 Postdoctoral fellowships and 2 FCT Investigator research positions have started during 2015.
At the institutional level, the IGC, as an “Exceptional” FCT Research Unit, was awarded a budget of about 4 million EUR for 3 years starting on 1st January 2015. Additionally, the IGC received about 241,000 EUR from POR Lisboa-QREN 2007-2014 programme to co-fund 40% of the Advanced Imaging Unit equipment.

The IGC is also a partner of the GREEN-IT FCT Research Unit and the FCT PhD Programme “Plants for Life”, both coordinated by ITQB; and 3 IGC members were selected to participate in European COST Actions.

**PUBLICATIONS**

RESEARCH STRUCTURES & NETWORKS

UNIDADE DE INVESTIGAÇÃO – IGC
In the frame of a national call to evaluate and fund research centres in Portugal, promoted by Fundação para a Ciência e a Tecnologia (FCT), in 2015 the In- stituto Gulbenkian de Ciência (IGC) became an inde- pendent ‘Research Unit’ (Unidade de Investigação). In this nationwide competition, the IGC was rated as “Exceptional”, one of only eleven Research Units in all academic fields in the country.

The scientific programme of the IGC Research Unit is dedicated to complex fundamental problems that fall largely into four research domains, namely quantita- tive biology, evolutionary biology, cell and develop- mental biology, and immunobiology. Modelling, quantitative biology and evolution are the conceptual substrate of the IGC, and influence thinking at the IGC in many ways. The Research Unit Team consists of 12 Research groups, each a cluster of 3 (or more) autonomous labs with sizes ranging from 3 to 15 lab members. The Research Units now established replace the for- mer ‘Laboratórios Associados’, also funded by the FCT. Until now, the Instituto Gulbenkian de Ciência was part of the Laboratório Associado ITQB (LA- ITQB) along with three other institutes of the Oeiras Campus: the Instituto de Tecnologia Química e Bi- ólogica (ITQB), the Instituto de Biologia Experimental (IBET), and the Centro de Estudos de Doenças Crônicas (CEDOC-UNL).

THE EUROPEAN MOUSE MUTANT ARCHIVE (EMMA)

The laboratory mouse is the most important mammalian model for studying genetic and multi-factorial diseases in Man. The European Mouse Mutant Ar- chive (EMMA) is a not-for-profit repository for the collection, archiving (via cryopreservation) and dis- tribution of relevant mutant strains that are essen- tial for biomedical research. EMMA draws on the expertise of 16 leading research institutes across Europe, including the IGC, in Por- tugal. The IGC offers the crucial Germ-Free Service that generates, breeds and houses mice that are free of all microorganisms. These germ-free animals are crucial in studies aimed at understanding the effects of microorganisms on a host, or dissecting the mol- ecular mechanisms underlying the function of the immune system. The germ-free facility of the IGC has generated more than 20 different strains of germ-free mice, request- ed by researchers from Portugal, Germany, USA, France and the UK. The facility has the capacity to temporarily host scientists wishing to carry out their own research with mice at the IGC.

EMMA is part of the Infrafronter Project, that links two complementary infrastructure networks with the aim of establishing a sustainable research infra- structure for systematic phenotyping, archiving and distribution of mouse models. The IGC is one of the Infrafronter partners, together with research facili- ties, government departments and funding agencies from 13 European countries, Canada and Israel.

NATIONAL ROADMAP OF RESEARCH INFRASTRUCTURES OF STRATEGIC RELEVANCE

In 2013, FCT opened a call for research infrastruc- tures to be included in the National Roadmap of Research Infrastructures of Strategic Relevance. This call aimed at assessing the existing research infrastructures, identifying national priority ar- eas and introducing Portugal into the group of European countries who have produced their own national roadmaps in alignment with the Euro- pean Strategic Forum on Research Infrastruc- tures (ESFRI). In total, 40 infrastructures in all scientific domains were integrated in the Portuguese Roadmap, of which 23 are aligned with ESFRI. Four research structures of the IGC were selected to be included in the National Roadmap of Research In- frastructures:

- BioData.pt: Portuguese Biological Data Network (co- ordinated by José Pereira-Leal, IGC)
- PPIB: Portuguese Platform of BioImaging (coordi- nated by Paula Sampaio, Instituto de Biologia Mole- cular e Celular)
- GenosePT: National Facility for Genome Sequenc- ing and Analysis (coordinated by Manuel Santos, Uni- versity of Aveiro)
- CONGENTO: Consortium of Genetically Tractable Organisms (coordinated by Rui Costa, Champalimaud Foundation).

EU-LIFE

EU-LIFE is a new alliance that gathers thirteen ren- owned European research centres in life sciences: CRG-Centre for Genomic Regulation, (Barcelona, Spain); VIB (Flanders, Belgium); Institut Curie (Par- is, France); MDC-Max Delbrück Centre for Molecular Medicine, (Berlin, Germany); Instituto Gulbenkian de Ciência (Oeiras, Portugal); CeMM-Research Centre for Molecular Medicine of the Austrian Academy of Sciences (Vienna, Austria); IEO-European Institute of Oncology, (Milan, Italy); CEITRC-Central Euro- pean Institute of Technology (Brno, Czech Republic); Netherlands Cancer Institute – Antoni van Leeuwen- hoek (Amsterdam, Netherlands); FIMM-Institute for Molecular Medicine Finland (Helsinki, Finland); BRIC-Biotech Research and Innovation Centre (Co- penhagen, Denmark); Babraham Institute (Cam- bridge, UK); PMI- Friedrich Miescher Institute for Biomedical Research (Basel, Switzerland).

Partners in EU-LIFE operate with similar principles of excellence, external review, integrity and independ- ence, competitiveness, internationality, and social re- sponsibility. EU-LIFE partners believe that they can join forces to better address complex questions in re- search, training and research management, thereby contributing to pushing European science forward. Specific working groups join efforts, share best prac- tices, brainstorm, and design common activities in areas of common interest such as technology trans- fer, international collaboration, translational re- search, science communication, competitive funding strategies, recruitment and training.

EMBnet | European Molecular Biology Network

Head of the Portuguese node: Pedro Fernandes

The European Molecular Biology Network (EMBnet) Node is an international foundation that aggregates National Nodes and Specialist Nodes (industrial and research), that provide bioinformatics infra- structural facilities in a geographically distributed way. Since its creation in 1988, EMBnet has evolved from an informal network of individuals in charge of maintaining biological databases into the only organisation worldwide bringing bioinformatics pro- fessionals to work together to serve the expanding fields of genetics and molecular biology. Although composed predominantly of academic nodes, EM- Bnet gains an important added dimension from its industrial members. The success of EMBnet is attracting increasing numbers of organisations out- side Europe to join. With members in more than 30 countries, it promotes useful exchanges between them and facilitates the location of resources and people. EMBnet runs EMBnet-Journal and produces training and reference materials such as the EMB- net Quick-Guides.

The IGC is a member of EMBnet since 1992. The role of the node has evolved according to the needs of the Portuguese community. One of its main ac- tivities, training and tuition in Bioinformatics, is strongly supported in EMBnet’s pool of professional teaching staff.

GOBLET – Global Organisation for Bioinformatics Learning, Education and Training

GOBLET provides a global, sustainable support and networking structure for bioinformatics educa- tors/trainers and students/trainees. This includes a training portal for sharing materials, tools, tips and techniques; guidelines and best practice documents; facilities to help train the trainers; and offering different learning pathways for different types of learner. It facilitates capacity development in bio- informatics in all countries and develops standards and guidelines for bioinformatics education and training. IGC is a member of GOBLET.
PUBLICATIONS

152
PEER REVIEWED IN-HOUSE PUBLICATIONS

5
BOOK CHAPTERS

29
PEER REVIEWED PUBLICATIONS FROM ASSOCIATED GROUPS
IN-HOUSE PUBLICATIONS


Bioinspir Biomim. 10(1): 016014.


PRIZES & HONOURS

2 ERC Consolidator Grants
1 PLoS Genetics Research Prize 2015
1 Pfizer Prize for Basic Science 2015
1 Pulido Valente Science Award
1 EMBO Member nomination
1 Grande Oficial da Ordem Militar de Santiago da Espada
1 Laço Breast Cancer Grant 2015
1 Research Grant March of Dimes
PRIZES & HONOURS — 2015

Adrain, Colin
Editorial Advisory Board Member, FEBS Journal
Editor, Viewpoints’ section of FEBS journal

Braga Areal, Rômulo
SPL travel grant, Sociedade Portuguesa de Imunologia

Bettencourt Dias, Mónica
EMBO member, European Molecular Biology Organisation (EMBO)

ERC Consolidator Grant, European Research Council (ERC)

Laço Grant Jury member, Associação Laço

Correia, Ana Catarina
Fellowship Award, Christian Boulin Fellowship from EMBL

Coutinho, António
Grande Oficial da Ordem Militar de Sant’iago da Espadâ, Presidency of the Portuguese Republic

Demengeot, Jocelyne
Travel award, International Society for Evolution Medicine and Public Health

Invited grant reviewer, NWO - The National Science Organisation in the Netherlands (Earth and Life Sciences)

Gjini, Erida
PLoS Genetics Research Prize 2015 (as co-author), PLoS Genetics

Gordo, Isabel
PLoS Genetics Research Prize 2015 (as co-author), PLoS Genetics

Janody, Florence
Laço Breast Cancer Grant 2015, Associação Laço

Mello, Maiá
Editorial Board member, Developmental Dynamics

Editorial Board, ISRN Developmental Biology

Academic Editor, PLoS ONE

Mena, Ana
Chair of the Science Communication Working Group, EU-LIFE

Mirth, Christopher
Editorial Board member, Insect Biochemistry and Molecular Biology

Ferreira, Miguel Godinho
Member of FCT Scientific Council for the Life and Health Sciences, Fundação para a Ciência e a Tecnologia (FCT)

Fonseca, Rosalina
FCT Investigator, Fundação para a Ciência e a Tecnologia (FCT)

Gordo, Isabel
PLoS Genetics Research Prize 2015 (as co-author), PLoS Genetics

FCT Investigator, Fundação para a Ciência e a Tecnologia (FCT)

Janody, Florence
Laço Breast Cancer Grant 2015, Associação Laço

Mello, Maiá
Editorial Board member, Developmental Dynamics

Editorial Board, ISRN Developmental Biology

Academic Editor, PLoS ONE

Mena, Ana
Chair of the Science Communication Working Group, EU-LIFE

Mirth, Christopher
Editorial Board member, Insect Biochemistry and Molecular Biology

Nabais, Catarina
Boehringer Ingelheim PhD fellowship, Boehringer Ingelheim Fonds

Oliveira, Rui
Member of FCT Scientific Council for the Natural and Environmental Sciences, Fundação para a Ciência e a Tecnologia (FCT)

Member of the ERC evaluation panel for the Life Sciences (LSB), European Research Council

Parkhouse, Michael
Pfizer Prize for Clinical Research 2015 (as co-author), Sociedade de Ciências Médicas de Lisboa and Laboratórios Pfizer, Lda.

Portuguese Delegate, EU Cost Action TD1302 - CYSTINET

Portuguese Delegate, Ibero-latinoamericano network CYTED-ILA ("Hacia el control de la cisticercosis por Taenia solium en Ibero-Latinoamerica")

Advisory Group member, Volkswagen Foundation’s African Initiative

Penha-Gonçalves, Carlos
Research Grant March of Dimes, March of Dimes Foundation

Rocha, Luís
Trustees Award for Teaching Excellence 2015, Indiana University, School of Informatics & Computing

Sibaja, Vânia
SPL Travel Grant, Sociedade Portuguesa de Imunologia

EFIS Short Term Fellowship, European Federation of Immunological Societies

Soares, Miguel
Pfizer Prize for Basic Science 2015, Sociedade de Ciências Médicas de Lisboa and Laboratórios Pfizer, Lda.

Sobral, Daniel
PLoS Genetics Research Prize 2015 (as co-author), PLoS Genetics

Tavares, Sandra
Liga Portuguesa Contra o Cancro/ Pfizer Research Award, Liga Portuguesa Contra o Cancro and Laboratórios Pfizer, Lda.

Teixeira, Luís
Member of Board of Directors, Scientific Secretary of Portuguese Society of Immunology

Vidal, Sheila
EARMA Working Group member, EARMA Working Group on Cultures and Diversity in Research Management and Administration

Xavier, Karina
PLoS Genetics Research Prize 2015 (as co-author), PLoS Genetics

ERC Panel Member, European Research Council (ERC - 2016) Panel Member in the qualitative evaluation of completed ERC-funded projects

Yilmaz, Bahtiyar
Púlido Valente Science Award 2015, Fundação Púlido Valente and Fundação para a Ciência e a Tecnologia (FCT)
GRADUATE EDUCATION & TRAINING

5 PhD PROGRAMMES
151 STUDENTS ATTENDING ADVANCED TRAINING
2 PhD STUDENTS
81 ADVANCED TRAINING PROGRAMME
PhD PROGRAMME IN INTEGRATIVE BIOLOGY AND BIOMEDICINE

HEAD OF PROGRAMME
Sucena, Élio

DESCRIPTION OF THE PROGRAMME
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 intensive academic semester before choosing research groups to join, and writing their thesis projects. Candidates hail from all over the globe, and diverse academic backgrounds. The class of 2011-2012 was marked by a new international collaboration with the University of Cologne, and the Max Planck Institute for Plant Breeding Research involving bilateral student exchanges. This continuing programme inaugurates a new phase of international collaboration for our teaching programme, in addition to local partnerships with the Champalimaud Neuroscience Programme and the Instituto de Tecnologia Química e Biológica (ITQB) from Nova University of Lisbon. Students also benefit from many educational courses and workshops throughout their PhD, including our popular bioinformatics training programme, weekly seminars and an annual retreat. Graduate students drive social life at the Institute, organising cultural events year round. The IBB programme is supported by the Fundação para Ciência e a Tecnologia and the Calouste Gulbenkian Foundation.

HEAD OF PROGRAMME

Email esucena@igc.gulbenkian.pt
PhD in Evolution and Development, Genetics University of Cambridge, UK, 2001
Head of Programme since 2013
Other Roles at IGC
Group Leader of Evolution and Development group

SUPPORT STAFF
Manuela Cordeiro, Administrative Assistant

STUDENTS ADMITTED IN 2015

<table>
<thead>
<tr>
<th>NAME</th>
<th>NATIONALITY</th>
<th>FIRST DEGREE</th>
<th>INSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ana Rita Oliveira</td>
<td>Portugal</td>
<td>MSc (Evolutionary and Developmental Biology)</td>
<td>Faculdade de Ciências da Universidade de Lisboa, Portugal</td>
</tr>
<tr>
<td>Catalina Alvarez</td>
<td>Colombia</td>
<td>MSc (Microbiology)</td>
<td>Universidad de los Andes, Colombia</td>
</tr>
<tr>
<td>Eleonora Tumellera</td>
<td>Italy</td>
<td>MSc (Mathematics)</td>
<td>Università di Andes, Colombia</td>
</tr>
<tr>
<td>Henrique Colaço</td>
<td>Portugal</td>
<td>MSc (Pharmacy)</td>
<td>Faculdade de Farmácia da Universidade de Lisboa</td>
</tr>
<tr>
<td>Ibukun Akinrinade</td>
<td>Nigeria</td>
<td>MSc (Anatomy)</td>
<td>University of Ibirin, Nigeria</td>
</tr>
<tr>
<td>Inês Coelho</td>
<td>Portugal</td>
<td>MSc (Biochemistry)</td>
<td>Faculdade de Ciências da Universidade de Lisboa, Portugal</td>
</tr>
<tr>
<td>Luís Cardoso</td>
<td>Portugal</td>
<td>MSc (Evolutionary and Developmental Biology)</td>
<td>Faculdade de Ciências da Universidade de Lisboa, Portugal</td>
</tr>
<tr>
<td>Mário Soares</td>
<td>Portugal</td>
<td>MSc (Cell and Molecular Biology)</td>
<td>Università di Benevento, Italy/ Universidade de Coimbra, Portugal</td>
</tr>
<tr>
<td>Vital Domingues</td>
<td>Portugal</td>
<td>MSc (Medicine)</td>
<td>Faculdade de Medicina da Universidade do Porto, Portugal</td>
</tr>
<tr>
<td>Yash Pandya</td>
<td>Tanzania</td>
<td>MSc (Pharmacy)</td>
<td>School of Pharmacy, University of Reading, UK</td>
</tr>
</tbody>
</table>

MODULES | COURSES RUN IN 2015

JANUARY 5-9
HISTORY OF BIOLOGICAL CONCEPTS
Organiser: Élio Sucena (IGC, Portugal)
Faculty: Michael Dietrich (Dartmouth College, New Hampshire, USA), Lars Jansen, Élio Sucena, Jonathan Howard (IGC, Portugal)

JANUARY 12-20
STATISTICS AND QUANTITATIVE BIOLOGY
Organiser: Jorge Carneiro and Claudine Chaouya (IGC, Portugal)
Faculty: Nuno Sepúlveda (London School of Hygiene & Tropical Medicine, UK), Jorge Carneiro, Claudine Chaouya (IGC, Portugal)

JANUARY 21-22
STRUCTURAL BIOLOGY
Organiser: Alekos Athanasiadis (IGC, Portugal)
Faculty: Alekos Athanasiadis (IGC, Portugal)

JANUARY 22-FEB 6
INSIDE THE CELL/CELL BIOLOGY
Organisers: Raquel Oliveira, Colin Adrain, Maria João Amarim, Florence Janody and Mónica Bettencourt-Dias (IGC, Portugal)
Faculty: Daniel St Johnston (University of Cambridge, UK), Olivier Pertz (University of Basel, Switzerland), Yanlan Mao (University College London, UK), Margaret S. Robinson (Cambridge Institute for Medical Research, UK), Ari Helenius (ETH Zürich, Switzerland), Seamus Martin (Thirteenth College, Ireland),
Zuzana Storchova (Max Planck Institute of Biochemistry, Germany), Sérgio Almeida, Nuno Morais (Instituto de Medicina Molecular, Portugal), José Pereira-Leal, Raquel Oliveira, Colín Adria, Maria João Amarim, Florence Jansdy, Mónica Bettencourt-Dias, Lars Jansen, Miguel Godinho, Helena Soares (IGC, Portugal)

FEBRUARY 9-13
BIOPHYSICS
Organisers: Filipa Alves and Ivo Telley (IGC, Portugal)
Faculty: José Givli (Israel Institute of Technology, Israel), Hans Meinhardt (Max Planck Institute for Developmental Biology, Germany), Cláudio Franco (Instituto de Medicina Molecular, Portugal), António Jacinto (CEDOC-Chronic Diseases Research Centre, Portugal), Jorge Carneiro, Gabriel Martins, Dani Bador (IGC, Portugal)

FEBRUARY 23-27
DEVELOPMENTAL BIOLOGY
Organisers: Diogo Castro and Moisés Mallo (IGC, Portugal)
Faculty: Denene Wellek (University of Michigan Medical Center, USA), Jonas Muhr (Karolinska Institutet, Sweden), Joaquín Rodríguez León (Universidad de Extremadura, Spain), Rui Martinho (Universidade do Algarve, Portugal), Cristina Borges (CEDOC-Chronic Diseases Research Centre, Portugal), Élio Sucena, Ivo Chelo, Diogo Castro, Moisés Mallo (IGC, Portugal)

MARCH 2-6
EVOLUTION
Organisers: Isabel Gordo and Lounès Chikhi (IGC, Portugal)
Faculty: Wei Ni Huang (Max Planck Institute For Evolutionary Biology, Germany), Susan F Bailey (Aarhus University, Denmark), Isabel Gordo, Lounès Chikhi, Ivo Chelo, Lília Perfeito, Ana Sousa, Ricardo Ramiro, Roberto Balbontin (IGC, Portugal)

MARCH 9-13
EVOLUTION, DEVELOPMENT AND ECOLOGY
Organisers: Patricia Beldade and Christen Mirth (IGC, Portugal)
Faculty: Christian Braendle (Université Nice Sophia Antipolis, France), Johannes Jaeger (Centre de Regulació Genòmica-Barcelona, Spain), Frederik Nijhout (Duke University, USA), Takaaki Daimon (University of Tokyo, Japan), Patricia Beldade, Christen Mirth (IGC, Portugal)

MARCH 15-20
ECOLOGY
Organisers: Sara Magalhães (Faculdade de Ciências da Universidade de Lisboa, Portugal)
Faculty: Lukas Schärer (University of Basel, Switzerland), Marc-André Selosse (Centre d’Ecologie Fonctionnelle et Evolution - CNRS, France), Sara Magalhães (Faculdade de Ciências da Universidade de Lisboa, Portugal)

MARCH 23-31
HOST-PATHOGEN INTERACTIONS/IMMUNOBIOLOGY
Organisers: Luis Teixeira and Miguel Soares (IGC, Portugal)
Faculty: Siamon Gordon (University College London, UK), Sidonie Fagarasan (RIKEN, Japan), Sergei Grivennikov (Fox Chase Cancer Center, USA), Bruno Silva Santos (Instituto de Medicina Molecular, Portugal), Padrack Fallon (School of Medicine, Dublin, Ireland), Kathleen McCoy (University of Bern, Switzerland), Jonathan Howard, Luis Ferreira Moita, Vâsco Barreto, Jocelyne Demengeot, Helena Soares, António Coutinho, Miguel P. Soares, Luis Teixeira (IGC, Portugal)

APRIL 8-10
NEUROBIOLOGY - BRAIN AND BEHAVIOUR
Organisers: Rui Oliveira, Ana Domingos (IGC, Portugal) and Alfonso Renart (Champalimaud Neurosciences Programme, Portugal)
Faculty: Shelley Adamo (Dalhousie University, Canada), Reallonishy (Université de Neuchâtel, Switzerland), Hans Hofmann (University of Texas at Austin, USA), Monica Dus (University of Michigan, USA), Denis Burdakov (The Francis Crick Institute, UK), Joe Paton, Inbal Israeli, Mike Orger, Carlos Ribeiro, Megan Carey, Christian Machens, Marta Moita, Susana Lima, Gonzalo Polavieja (Champalimaud Neurosciences Programme, Portugal)

APRIL 17-23
FROM CELLS TO ORGANISMS
Organisers: Karina Xavier and Miguel Godinho Ferreira (IGC, Portugal)
Faculty: Vera Gorbunova (University of Rochester, USA), Marek Basler (Biozentrum, Switzerland), Adriano O. Henriques (Instituto de Tecnologia Química e Biológica, Portugal), Bruno Bernardes de Jesus, Sandrina Pereira (Instituto de Medicina Molecular, Portugal)

APRIL 24-30
SYSTEMS BIOLOGY
Organisers: Claudia Chaouiya and Jorge Carneiro (IGC, Portugal)
Faculty: Ioannis Xenarios (Swiss Institute of Bioinformatics, Switzerland), Albert Goldbeter (Université libre de Bruxelles, Belgium), Christine Brun (Technological Advances for Genomics and Clinics INSERM-UMR 1090, France), Susana Vinga (Instituto Superior Técnico, Portugal), Claudia Chaouiya (IGC, Portugal)

MAY 4-8
PLANT SCIENCE (Cologne, Germany)
Organisers: Siamon Gordon (Max Planck Institute for Plant Breeding Research, Germany)
Faculty: Cathie Martin (John Innes Centre, Norwich, UK), Andreas Weber, Ute Schluter, Andrea Brautigam (Heinrich-Heine-Universität Düsseldorf, Germany), Jörg Becker, Paula Duque, Elena Baena-Gonzalez (IGC, Portugal), Ute Hocker, Maria Albani, Marijn Hulsink (Botanical Institute Cologne Biocenter, Germany)

MAY 11-15
HYPOTHESIS DRIVEN RESEARCH
Organisers: Jocelyne Demengeot and José Pereira-Leal (IGC, Portugal)
Faculty: Jocelyne Demengeot, José Pereira-Leal (IGC, Portugal)
GRADUATE PROGRAMME
SCIENCE FOR DEVELOPMENT

HEAD OF PROGRAMME
Gonçalves-Sá, Joana

DESCRIPTION OF THE PROGRAMME

The Graduate Programme Science for Development (PGCD) is an advanced training programme designed to prepare students from the various Portuguese Speaking African Countries (PALOP) to pursue research careers in Science and Technology, particularly in the Life Sciences. It is currently being developed as a partnership between the IGC, the Fundação para a Ciência e a Tecnologia and the Ministry of Higher Education, Science and Innovation of Cape Verde, with three main goals:
1) To train the next generation of Portuguese-speaking African students, giving them the opportunity to learn advanced science;
2) To improve the quality of science education and scientific research in the Portuguese-Speaking African Countries;
3) To use science and technology as effective tools for development.

The programme offers basic training in the life sciences, particularly Plant Biology, Marine Biology and Tropical Diseases, consisting of one year of graduate courses, taking place in Praia, Cape Verde, followed by a 40 month research period leading to PhD thesis, divided between the home countries and select institutes and universities abroad.

STUDENTS ADMITTED IN 2015

<table>
<thead>
<tr>
<th>NAME</th>
<th>NATIONALITY</th>
<th>FIRST DEGREE</th>
<th>INSTITUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ana Lina Rodrigues</td>
<td>Cape Verde</td>
<td>Biology</td>
<td>Universidade de Cabo Verde, Cape Verde</td>
</tr>
<tr>
<td>Armando Semo</td>
<td>Mozambique</td>
<td>Biomedical Sciences</td>
<td>Universidade Eduardo Mondlane, Mozambique</td>
</tr>
<tr>
<td>Abdul Fahamo</td>
<td>Mozambique</td>
<td>Statistics</td>
<td>Universidade Eduardo Mondlane, Mozambique</td>
</tr>
<tr>
<td>Baltazar Cá</td>
<td>Guinea-Bissau</td>
<td>Tropical Health</td>
<td>Universidade Nova de Lisboa, Portugal</td>
</tr>
<tr>
<td>Crispiniano Furtado</td>
<td>Cape Verde</td>
<td>Mathematics</td>
<td>Universidade do Porto, Portugal</td>
</tr>
<tr>
<td>Elias Maxombe</td>
<td>Mozambique</td>
<td>Geography</td>
<td>Universidade Pedagógica, Mozambique</td>
</tr>
<tr>
<td>Gaspar da Graça</td>
<td>São Tomé and Príncipe</td>
<td>Biology</td>
<td>Instituto Superior Politécnico de São Tomé, São Tomé and Príncipe</td>
</tr>
<tr>
<td>Ilyane Martins Lima</td>
<td>Cape Verde</td>
<td>Pharmaceutical Biotechnology</td>
<td>Universidade de Coimbra, Portugal</td>
</tr>
<tr>
<td>Kaori Fonseca</td>
<td>Cape Verde</td>
<td>Biotechnology of Marine Resources</td>
<td>Instituto Politécnico de Leiria, Portugal</td>
</tr>
<tr>
<td>Lucindo Cardoso de Pina</td>
<td>Cape Verde</td>
<td>Biological Sciences</td>
<td>Universidade de Cabo Verde, Cape Verde</td>
</tr>
<tr>
<td>Maria Helena António</td>
<td>Mozambique</td>
<td>Oceanography</td>
<td>Universidade Eduardo Mondlane, Mozambique</td>
</tr>
<tr>
<td>Pâmela Borges</td>
<td>Cape Verde</td>
<td>Biomedical Engineering</td>
<td>Universidade de Coimbra, Portugal</td>
</tr>
<tr>
<td>Raquel Delgado</td>
<td>Cape Verde</td>
<td>Human Biology and Environment</td>
<td>Universidade Nova de Lisboa, Portugal</td>
</tr>
<tr>
<td>Sara Baptista</td>
<td>Cape Verde</td>
<td>Public Health</td>
<td>Universidade Católica, Portugal</td>
</tr>
<tr>
<td>Yara Rodrigues</td>
<td>Cape Verde</td>
<td>Cellular and Molecular Biology</td>
<td>Universidade Federal de Paraíba, Brazil</td>
</tr>
</tbody>
</table>
JANUARY 12-16
HISTORY OF CONCEPTS IN BIOLOGY
Organiser: Thiago Carvalho (IGC, Portugal)
Faculty: Rui Martinho (Universidade do Algarve, Portugal), Joaquim Leon (Universidad de Extremadura, Spain)

JANUARY 19-23
GENES AND DNA
Organiser: Miguel Godinho Ferreira (IGC, Portugal)
Faculty: Rui Martinho and João Matos (Universidade do Algarve, Portugal), José Antão (Instituto Superior de Agronomia, Portugal)

JANUARY 26-29
THEORETICAL BIOLOGY
Organiser: Jorge Cameiro (IGC, Portugal)
Faculty: Filipe Alves (IGC, Portugal), Tiago Paixão (Institute of Science and Technology, Austria)

JANUARY 30
MOLECULAR BIOLOGY
Organiser and Faculty: Joana Sá (IGC, Portugal), José Antão (Instituto Superior de Agronomia, Portugal)

FEBRUARY 2-6
INTESTINAL INFECTIONS
Organiser: Diogo Sales (Universidade Federal do Rio Grande do Sul, Brazil)
Faculty: Rui Silva (Universidade Federal do Rio Grande do Sul, Brazil), São Paulo, Brazil

FEBRUARY 2-6
TRAFFICKING AND SIGNALLING
Organiser: João Loureiro (IGC, Portugal), Nuno Correia (Instituto Superior de Agronomia, Portugal)
Faculty: Rui Martinho (Universidade do Algarve, Portugal), José Antão (Instituto Superior de Agronomia, Portugal)

FEBRUARY 9-13
CELL CYCLE
Organiser: Susana Godinho (St. Barts, UK), Raquel Oliveira (IGC, Portugal)
Faculty: Dinis Calado (London Research Institute, UK), Joana Paredes (IPATIMUP, Portugal), Elsa Logarinho (Instituto de Biologia Molecular e Celular, Portugal)

FEBRUARY 9-13
AQUATIC PLANTS AND ALGAE
Organiser: Ana Godinho (Fundação para a Ciência e a Tecnologia, Portugal)
Faculty: Rui Martinho and João Matos (Universidade do Algarve, Portugal), José Antão (Instituto Superior de Agronomia, Portugal)

FEBRUARY 16-20
PLANT BIOTECHNOLOGY
Organiser: Fátima Grossi de Sá (Universidade de Brasília, Brazil)
Faculty: José Diário Antonino de Souza Junior (Universidade de Brasília, Brazil)

FEBRUARY 16-20
PLANT STRESS AND PHYSIOLOGY
Organiser: Elena Bena (IGC, Portugal)
Faculty: Nelson Salmo (Instituto de Tecnologia Química e Biológica, Portugal), José Feijó (University of Maryland, USA)

FEBRUARY 23-27
INTRODUCTION TO MARINE BIOLOGY
Organiser: Manuel dos Santos (Instituto Superior de Psicologia Aplicada, Portugal)
Faculty: Joana Robalo (Instituto Superior de Psicologia Aplicada, Portugal)

FEBRUARY 23-27
MARINE ECOLOGY
Organiser: Maria Dornelas (St. Andrews, UK)
Faculty: Miguel Barbosa (St. Andrews, UK), Roberta Bonaldo (Universidade de São Paulo, Brazil)

FEBRUARY 23-27
AQUATIC PLANTS AND ALGAE
Organiser: Ester Serrão (Universidade do Algarve, Portugal)
Faculty: Joel Creed (Universidade do Estado do Rio de Janeiro, Brazil), Salomão Bandeira (Universidade Eduardo Mondlane, Mozambique), Ashwin Engelen (Universidade do Algarve, Portugal)

MARCH 2-6
Biodiversity, Genomics and Conservation
Organiser: Nuno Ferrand (Research Center in Biodiversity and Genetic Resources, Portugal)
Faculty: Raquel Vasconcelos and Fernando Sequeira (Research Center in Biodiversity and Genetic Resources, Portugal)

MARCH 9-13
PLANT BIOLOGY AND BIOCHEMISTRY
Organiser: Paula Duque (IGC, Portugal)
Faculty: Americo Rodrigues, Anaílva Bernardes da Silva and Cristina Cruz Houghton (Faculdade de Ciências da Universidade de Lisboa, Portugal)

MARCH 16-20
PLANT BIOTECHNOLOGY
Organiser: Raffaella Gazzellino (CEDOC-Chronic Diseases Research Centre, Portugal), Ana Maria Caetano Faria (Universidade Federal de Minas Gerais, Brazil), André Vale (Instituto de Biofísica Carlos Chagas Filho, Brazil)

MARCH 22-27
IMMUNITY OF HOST-PATHOGEN INTERACTIONS
Organiser: Helena Soares (IGC, Portugal)
Faculty: Marcelo Bozza (Universidade Federal do Rio de Janeiro, Brazil), Margarida Saraiva (Instituto de Biologia Molecular e Celular, Portugal), Silvia Silva (National Institute of Health, USA)

MAY 4-8
POPULATION GENETICS AND EVOLUTION OF MARINE ORGANISMS
Organiser: Ricardo Beldade (Centre National de la Recherche Scientifique, France)
Faculty: Rui Faria (Universidade do Porto, Portugal), Sérgio Floeter (Universidade Federal de Santa Catarina, Brazil)

MAY 11-15
AQUACULTURE AND FISHERIES
Organiser: Karim Eziri (Universidade do Algarve, Portugal)
Faculty: Cláudia Aragão (Universidade do Algarve, Portugal)

MAY 25-29
TROPICAL AGRICULTURE
Organiser: Manuel Correia (Instituto Superior de Agronomia, Portugal)
Faculty: Manuel Valeriano Madeira and, João Neves Martins (Instituto Superior de Agronomia, Portugal), José Alexandre Andrade (Universidade de Évora, Portugal)

JUNE 1-5
PUBLIC HEALTH
Organiser: Susana Nery (University of Queensland, Australia)
Faculty: Amabélia Rodrigues (Bandim, Guinea-Bissau), Maria Jesus Trovaiada (Ministry of Health, Sao Tome and Principe), Eusebio Macete (Manhiça Health Research Centre, Mozambique)

JUNE 13-17
EPIDEMIOLOGY
Organiser: Ana Godinho (Fundação para a Ciência e a Tecnologia, Portugal)
Faculty: Ana Menia (IGC, Portugal), Margarida Trindade (ISCTE-Instituto Universitário de Lisboa, Portugal), Sheila Vidal (IGC, Portugal)

JUNE 29-JULY 3
TROPICAL MEDICINE AND CLINICAL MICROBIOLOGY
Organiser: Emília Valadas and Thomas Hanscheid (Instituto de Medicina Molecular, Portugal)
Faculty: Sandra Aguilera and Carla Santos (Instituto de Medicina Molecular, Portugal)

JULY 6-10
NON-INFECTIOUS DISEASES
Organiser: Marly Cardoso (Universidade de São Paulo, Brazil)
Faculty: Suely Gimeno (Universidade Federal de São Paulo, Brazil), Márzia Machado (UFC, Brazil)

JULY 13-17
AQUATIC PLANTS AND ALGAE
Organiser: Ana Godinho (Fundação para a Ciência e a Tecnologia, Portugal)
Faculty: Ana Menia (IGC, Portugal), Margarida Trindade (ISCTE-Instituto Universitário de Lisboa, Portugal), Sheila Vidal (IGC, Portugal)
The Gulbenkian Training Programme in Bioinformatics (GTPB) provides practical skills in Bioinformatics. The general objective is to efficiently deliver skills while ensuring maximal autonomy in their usage. It consists of short, intensive training courses, held in a specialised training room where the focus on the e-learner is maximised. The courses are taught and fully documented in English. The majority of the course participants are graduate students and mature researchers. In 2015, the GTPB has provided 11 training courses to a grand total of 151 participants, 78 from Portuguese institutions, 43 from the IGC and 30 from foreign institutions.

The courses are self-assessed by the participants through a standardised questionnaire. GTPB experiments with innovative training methodologies, aiming at increasing the learning rate and ensuring the consolidation of new skills. Such improvements are regularly providing valuable input to the lifelong learning community that trains Bioinformatics users and developers.
The IGC has a creative and engaging Postdoctoral community that run several activities throughout the year, aiming to promote the professional development of all IGC Postdocs, to foster a solid institutional environment capable of sustaining this progress, and to provide “peer support” network for all postdocs. These activities are organised by a Postdoc Committee, composed of a group of volunteer Postdoctoral fellows elected every year, and supported by the IGC Directors, mentoring group leaders, and heads of facilities and services. Workshops, seminars, retreats and social events are some of the activities being held at the IGC.

POSTDOCTORAL TRAINING

SCIENTIFIC COORDINATOR

Xavier, Karina

DESCRIPTION OF THE PROGRAMME

The IGC has a creative and engaging Postdoctoral community that run several activities throughout the year, aiming to promote the professional development of all IGC Postdocs, to foster a solid institutional environment capable of sustaining this progress, and to provide “peer support” network for all postdocs. These activities are organised by a Postdoc Committee, composed of a group of volunteer Postdoctoral fellows elected every year, and supported by the IGC Directors, mentoring group leaders, and heads of facilities and services. Workshops, seminars, retreats and social events are some of the activities being held at the IGC.

POSTDOCTORAL COMMITTEE

2015

Rita Carlos
Concetta Valerio
Paula Ramos-Silva
Birte Blankenhaus
Dale Richardson
Jose Planells

POSTDOCTORAL COMMITTEE

2015

In 2015, several initiatives took place, encompassing workshops, seminars, social events and the comprehensive implementation of the private Health Insurance Programme, secured by previous committees.

SEMINAR SERIES

PhD/Postdoc seminars
Throughout the year, Postdocs and senior PhD students had the opportunity to give a 30 minutes seminar for the IGC community.

‘Career path in science’ seminars
Inspiring scientists and professionals from science-related areas share their personal experiences and address different career options and scientific challenges in an informal seminar. In 2015, seven Career path seminars took place at IGC: three senior scientists and four on alternative careers (Science administration, Intellectual Property and Technology Transfer Manager, Professional Editor, and Head of Service Facilities).

Workshops
Four workshops to improve skills and science were provided in 2015 including: i) how to build your CV; ii) how to communicate your science to lay audiences; iii) scientific writing; iv) recognizing and communicating your skills to make informed career choices and increase personal effectiveness. To organise these workshops, the Postdoc Committee liaised with in-house experts of the Research Funding Affairs and the Science Communication & Outreach units, as well as with external experts, such as Barbara Janssens, Career Manager at the German Cancer Research Centre (DKFZ), in Germany and Sarah Blackford, Head of Education and Public affairs of Society for Experimental Biology, in UK.

ANNUAL POSTDOC RETREAT

The IGC annual Postdoc retreat has slowly expanded over the years to include more institutes in the Lisbon area and lay the fertile ground for networking outside of the IGC. In 2015, the retreat brought together researchers from the major life sciences research institutes including IGC, iBET, ITQB, iMM, and CCU. Over a hundred postdocs participated on a three-day retreat focused on scientific interactions, networking and career development.

PORTUGUESE CLASSES

The Postdoc Committee runs Portuguese language classes for international peers joining the IGC community for a nominal fee.
The IGC and Oxford University established in 2014 a partnership via the Oxford University Internship Programme to bring to the IGC young science undergraduates from the University, for an 8-week lab internship, each fully supported by the University. In 2015, 3 students spent the summer with different IGC groups.

Groups that hosted the internship in 2015:
Cell Biology of Viral Infection
Membrane Traffic
Network modelling
**THESES**

2015

**BSc THESES**

Manguinhos, Rita
Papel do citoesqueleto de actina na manutenção da plasticidade sináptica
Universidade Nova de Lisboa, Portugal - June 2015

Martins, Raquel
The effect of chronic unpredictable stress on cellular aging in zebrafish
Universidade de Lisboa, Portugal - April 2015

Nascimento, Ana
The role of ARL15 in influenza A virus infection
Universidade do Porto, Portugal - September 2015

Simões de Matos, Brigitte
Desenvolvimento de mutantes de E.coli para uso como referência em ensaios de fitness e adaptação com Cenorhabditis elegans
Universidade de Évora, Portugal - July 2015

**MSc THESES**

Araújo, Margarida
Helicobacter hepaticus colonization in mice: newborn tolerance properties and distribution throughout the gut
Universidade Lisboa, Portugal - October 2015

Azevedo Gatoão, Maria
Mathematical modelling of co-colonization and with-in-host abundance ratios in multi-type pathogen dynamics
Universidade de Lisboa, Portugal - July 2015

Doreo, Katharina
How do cancer cells cope with supernumerary centrosomes?
Universidade Nova de Lisboa, Portugal - November 2015

Eugénio, Ana Teresa
Effect of environment and genetic background on transposable element activity in Drosophila melanogaster
Universidade de Lisboa, Portugal - October 2015

Ferreira Cunha, Sónia
Avaliação da eficácia da vacina contra malária placentária em modelo experimental
Universidade de Lisboa, Portugal - October 2015

Madeira, Natalie
Social memory in zebrafish: behavioural assessment and the role of Brain-Derived Neurotrophic Factor (BDNF)
Universidade de Lisboa, Portugal - December 2015

Martins Eduardo, Gustavo
Impact of chromosomal structure on the evolution of Schizosaccharomyces pombe undergoing mutation accumulation
Universidade Nova de Lisboa, Portugal - December 2015

Mendonça, Susana
Protocol optimization for the ultra-structural preservation of cilia in Drosophila melanogaster's antenna
Universidade de Lisboa, Portugal - November 2015

Morais, Ana Catarina
How does chromosomal instability affect the tempo and mode of adaptation
Universidade de Lisboa, Portugal - December 2015

Moura, Pedro
Determining the mechanism of inhibition of TLR3 by the I229L ASVF protein
Universidade de Lisboa, Portugal - July 2015

Nunes, Júlia
Reconstitution of Drosophila fertilization for time-lapse imaging
Universidade de Lisboa, Portugal - November 2015

Paulo, Tânia
Testing endosymbiont-mediated immune protection in a novel host species
Universidade de Lisboa, Portugal - September 2015

Pereira, Mafalda
Role of sympathetic innervation in obesity
Universidade Nova de Lisboa, Portugal - October 2015

Pereira, Sónia
Deciphering the role of antherozoid specific DNA methyltransferases in Physcomitrella patens
Universidade de Lisboa, Portugal - November 2015

Teixeira, Andreia
Morphological and behavioural variation in ants: comparing species, casts, and individuals
Universidade de Lisboa, Portugal - November 2015

Silva, Carolina
Genetics of diversification: a hotspot locus for pigmentation evolution
Universidade de Lisboa, Portugal - November 2015

Vozcho, Halyna
Development of biosensors for discerning autoantibody-mediated beta cell dysfunction
Universidade de Lisboa, Portugal - July 2015

**PHD THESES**

Abreu, Rodrigo
Social eavesdropping in zebrafish
Universidade Nova de Lisboa, Portugal - December 2015

Bodor, Dani
Quantitative centromere epigenetics
Universidade Nova de Lisboa, Portugal - June 2015

Carneiro, Madalena
The role of short telomeres as cause of natural aging in zebrafish
Universidade Nova de Lisboa, Portugal - October 2015

Garcês, Sandra
The clinical relevance of drug immunogenicity
Universidade de Lisboa, Portugal - March 2015

Gouveia, Zélia
Targeting Heme with single domain antibodies
Universidade Nova de Lisboa, Portugal - June 2015

Gouve, Marc
New tools for old organelles: Bioinformatics for Evolutionary Cell Biology
Universidade Nova de Lisboa, Portugal - July 2015

Hernandez-Coronado, Marcela
Comparative transcriptome analysis in the moss Physcomitrella patens and the genetic basis of key reproductive innovations
Universidade Nova de Lisboa, Portugal - July 2015

Margalha, Leonar
Regulation of SnRK1-dependent energy signalling by SUMOylation
Universidade Nova de Lisboa, Portugal - October 2015

Mendes, Cláudia
Nutritional plasticity and evolutionary diversification in the Drosophila ovary
Universidade Nova de Lisboa, Portugal - May 2015

Oliveira, Gonçalo
Social modulation of androgens in humans: Psychological mechanisms and adaptive function
Instituto Superior de Psicologia Aplicada, Portugal - December 2015

Ramirez, Carlos
Generation of Physcomitrella patens transcriptome atlases and identification of GLR genes as crucial mediators of reproduction processes in early land plants
Universidade Nova de Lisboa, Portugal - January 2015

Salmona, Jordi
Comparative conservation genetics of several threatened lemur species living in fragmented environments - A glimpse through natural history of northern Madagascar lemurs
Universidade Nova de Lisboa, Portugal - December 2015

Teles, Magda
Socially driven changes in neural and behavioural plasticity in zebrafish
Universidade de Lisboa, Portugal - December 2015

Trancoso, Inês
DNA editors of the adaptive immune system – physiology, repair regulation and evolution
Universidade Nova de Lisboa, Portugal - September 2015

Vasconcelos, Francisco
Ascl1 and MyT1 transcriptional networks in vertebrate neurogenesis
Universidade Nova de Lisboa, Portugal - September 2015

Yilmaz, Bahtiyar
Comparative conservation genetics of several threatened lemur species living in fragmented environments - A glimpse through natural history of northern Madagascar lemurs
Universidade Nova de Lisboa, Portugal - December 2015

Yilmaz, Bahar
A natural protective mechanism against malaria – The role of gut flora
Universidade Nova de Lisboa, Portugal - February 2015
TEACHING AT OTHER PhD PROGRAMMES

2015

Alexes, Filipe
Quantifying natural colour patterns
Course on Image Analysis, Instituto de Biotecnologia de la Universidad Nacional Autónoma de México, Cuernavaca, Mexico
November 2015

Amorim, Maria João
Viruses and the recycling endosome Molecular Mechanisms of Disease PhD Programme, University of Coimbra, Portugal
November 2015

Baena-González, Elena
Functional genomics and methods for gene identification
International PhD programme Plants for Life, ITQB, Oeiras, Portugal
April 2015

Barreto, Vasco
RAG proteins and receptor diversity
Immunology course, GABBA Programme, Porto, Portugal
May 2015

Bettencourt Dias, Mónica
Introductory course to microscopy
ITQB PhD Programme, Oeiras, Portugal
May 2015

Castro, Diogo S.
Transcriptional control of vertebrate neurogenesis by Proneural and Notch pathways
GABBA Programme, Porto, Portugal
July 2015

Chaoüiya, Claudine
Logical modelling
Cajal Advanced Neuroscience Training "Bioinformatics for the neuroscience", Bordeaux, France
May 2015

Duque, Paula
Alternative splicing controls translation efficiency of a membrane transporter to promote plant tolerance to zinc
BioSys PhD Programme FCUL, Lisboa, Portugal
January 2015

Ecophysiology & Plant Interactions
International PhD Programme Plants for Life, ITQB, Oeiras, Portugal
March 2015

Ferreira, Miguel Godinho
From Cells to Organism
ITQB PhD Programme, Oeiras, Portugal
March 2015

Gjini, Erilda
Mathematical Modelling for Medicine and Public Health Evolutionary Medicine, Faculdade de Ciências Médicas, Universidade Nova de Lisboa
April 2015

Jansen, Lars
Chromatin-based epigenetic inheritance: Lessons from the mammalian centromere
Oncology Graduate School Amsterdam, Netherlands Cancer Institute, The Netherlands
May 2015

Mallo, Moisés
The spinal cord
Axonal regeneration module of the GABBA Programme, Porto, Portugal
May 2015

Martins, Gabriel G.
Introduction to Light Microscopy
ITQB PhD Programme, Oeiras, Portugal
April 2015

Penha Gonçalves, Carlos
Translational Genomics
Course Doutorat en Medicine et Cours Doutoral en Mécanismes de Disease et Medecine Regenerativa, Lisboa, Portugal
March 2015

Pereira Leal, José
Bioinformatics
Doctoral Programmes in Bioengineering and in Medicine, Portugal
February 2015

Rebelo, Manuel
Biotério and regulamentação para experimentação animal
Programa de Doutoramento em Ciências da Saúde, Faculdade de Medicina da Universidade de Coimbra, Portugal
October 2015

Roche, Luis M.
Director of the Complex Networks and Systems PhD Programme at Indiana University, USA

Introduction to Informatics
Complex Networks and Systems PhD Programme at Indiana University, USA

Soares, Miguel
Immunology module of the GABBA Programme, Porto, Portugal
March 2015

Tranfield, Erin
Introduction to Electron Microscopy
PhD Programme in Molecular Biosciences, ITQB, Oeiras, Portugal
January 2015

Xavier, Karina B.
Manipulation of the quorum sensing signal AI-2 affects the antibiotic-treated gut microbiota
BioSys PhD programme, FCUL, Lisboa, Portugal
February 2015
SEMINARS AND MEETINGS

92 INTERNAL SPEAKERS
122 EXTERNAL SPEAKERS
23 MEETINGS, CONFERENCES AND WORKSHOPS HELD AT THE IGC
53 AT NATIONAL MEETINGS
169 AT INTERNATIONAL MEETINGS

PRESENTATIONS BY IGC RESEARCHERS
# SEMINARS AT THE IGC

## 2015

### JANUARY

**Date:** 07.01  
**Title:** Myosin and actin steer plant cell division  
**Speaker:** Magdalena Bezanilla  
**Affiliation:** University of Massachusetts, USA

**Date:** 09.01  
**Title:** DNA Evolution and the multi model regress  
**Speaker:** Michael R. Dietrich  
**Affiliation:** Department of Biological Sciences, Dartmouth College, USA

**Date:** 09.01  
**Title:** From evolution of excitability in phytoplankton to responses to a changing ocean  
**Speaker:** Colin Brownlee  
**Affiliation:** Plymouth Marine Biological Laboratory, UK

**Date:** 13.01  
**Title:** That which does not kill us makes us stronger  
**Speaker:** Luis Moita  
**Affiliation:** IGC

**Date:** 14.01  
**Title:** Novel concepts and tools for studying adaptive cell reprogramming in applied systems ‘alternative breathing’ in Alentejo  
**Speaker:** Birgit Arnholdt Schmitt  
**Affiliation:** Instituto de Ciências Agrárias e Ambientais Mediterrânicas, Portugal

**Date:** 20.01  
**Title:** Packing and Gluing DNA molecules for mitosis  
**Speaker:** Raquel Oliveira  
**Affiliation:** IGC

**Date:** 21.01  
**Title:** IGC PhD Seminars: CSS Regulatory basis of transcriptional divergence between recent gene duplicates  
**Speaker:** Kohtaro Tanaka  
**Affiliation:** IGC

**Date:** 21.01  
**Title:** IGC PhD Seminars: Developmental and paleontological insights into skull bone homology and evolution  
**Speaker:** Rui Castanhinha  
**Affiliation:** IGC

**Date:** 22.01  
**Title:** Epithelial polarity and spindle orientation  
**Speaker:** Daniel Saint Johnston  
**Affiliation:** Gurdon Institute, UK

**Date:** 26.01  
**Title:** Imaging spatio temporal signaling programs regulating cell morphogenesis  
**Speaker:** Olivier Pertz  
**Affiliation:** Department of Biomedicine, University of Basel, Switzerland

**Date:** 27.01  
**Title:** Gut microbiota elicits a protective immune response against malaria transmission  
**Speaker:** Miguel Soares  
**Affiliation:** IGC

**Date:** 27.01  
**Title:** Getting in Shape: in vivo and in silico studies of tissue mechanics in growth control  
**Speaker:** Yanan Mao  
**Affiliation:** MRC Laboratory for Molecular Cell Biology, University College London, UK

**Date:** 28.01  
**Title:** IGC PhD Seminars: Quantitative Centromere Epigenetics  
**Speaker:** Dani Bodor  
**Affiliation:** University of Stockholm, Sweden

### FEBRUARY

**Date:** 02.02  
**Title:** Coated vesicle adaptors  
**Speaker:** Margaret Scottie Robinson  
**Affiliation:** Cambridge Institute for Medical Research, UK

**Date:** 03.02  
**Title:** Viral entry mechanisms  
**Speaker:** Ari Helenius  
**Affiliation:** ETH Zürich, Institute of Biochemistry, Switzerland

**Date:** 05.02  
**Title:** Dynamic karyotype, dynamic proteome: how aneuploidy affects human cells  
**Speaker:** Zuzana Storchova  
**Affiliation:** Max Planck Institute of Biochemistry, Germany

**Date:** 09.02  
**Title:** Models for organism formation: the BMP-Chordin interaction for the establishment of the dorsoventral axis from a pattern forming perspective  
**Speaker:** Hans Meinhardt  
**Affiliation:** Max Planck Institute for Developmental Biology, Germany

**Date:** 10.02  
**Title:** Artificial selection reveals the costs and benefits of large brain size in a vertebrate  
**Speaker:** Alex Kotschal  
**Affiliation:** University of Stockholm, Sweden

### MARCH

**Date:** 11.02  
**Title:** IGC PhD Seminars: Dissecting the biophysical mechanisms underlying regeneration of complex organs in vertebrates  
**Speaker:** Jaana Monteiro  
**Affiliation:** IGC

**Date:** 11.02  
**Title:** IGC Postdoc Seminars: Advanced microscopy techniques developed at the Imaging Facility  
**Speaker:** Emilio Gualda Manzana  
**Affiliation:** IGC

**Date:** 13.02  
**Title:** The impact of genetic background on the evolutionary path of populations  
**Speaker:** Lília Pefeito  
**Affiliation:** IGC

**Date:** 18.02  
**Title:** IGC PhD Seminars: Newborn colonization with Helicobacter hepticus induces long lasting tolerance in mice  
**Speaker:** Rómulo Areal  
**Affiliation:** IGC

**Date:** 18.02  
**Title:** IGC Postdoc Seminars: Small but mighty: genetic and phenotypic basis of Escherichia coli small colony variants  
**Speaker:** Ricardo Ramiro  
**Affiliation:** IGC

**Date:** 23.02  
**Title:** HLA as a biomarker for immunogenicity and update on the two faced T cell epitope: Role of “Self” and “Other” in Vaccines and Therapeutics  
**Speaker:** Annie de Groot  
**Affiliation:** Institute for Immunology and Informatics, University of Rhode Island and CEO/CSO EpVax, Inc.

**Date:** 24.02  
**Title:** What, how, why? Problems in co evolution  
**Speaker:** Jonathan Howard  
**Affiliation:** IGC

**Date:** 25.02  
**Title:** IGC PhD Seminars: Can the transcription factor Nr12 inhibit Rip3K dependent programmed cell death?  
**Speaker:** Ana Ribeiro  
**Affiliation:** IGC

**Date:** 25.02  
**Title:** IGC Postdoc Seminars: Macrophages control tissue homeostasis via Ferriin heavy chain  
**Speaker:** Birte Blankenhaus  
**Affiliation:** IGC

**Date:** 25.02  
**Title:** Transcriptional control of cortical stem cell proliferation  
**Speaker:** Jonas Muhr  
**Affiliation:** Ludwig Institute for Cancer Research, Karolinska Institute, Sweden

**Date:** 25.02  
**Title:** Career Path in Science  
**Speaker:** Deneen Wellik  
**Affiliation:** University of Michigan Medical Center, USA

**Date:** 26.02  
**Title:** A reserve Hox expressing population functions in the adult musculoskeletal system  
**Speaker:** Deneen Wellik  
**Affiliation:** University of Michigan Medical Center, USA

**Date:** 27.02  
**Title:** The development of colour
### March

#### 03.03
**Title** A to 1 RNA editing: New roles for a multifaceted post transcriptional mRNA modification  
**Speaker** Aleks Althanasiadis  
**Affiliation** IGC

#### 04.03
**Title** IGC PhD Seminars: Characterization of stable bacterial populations in laboratory and wild Drosophila populations  
**Speaker** Inês Pais  
**Affiliation** IGC

#### 06.03
**Title** Opposing effects of folding and assembly chaperones on evolvability of Rubisco  
**Speaker** Paulo Durão  
**Affiliation** Max Planck Institute of Biochemistry, Germany

#### 10.03
**Title** Regulatory T cells in Systemic Lupus: from phenotyping toward cellular dynamics  
**Speaker** Constantin Fesel  
**Affiliation** IGC

#### 11.03
**Title** IGC PhD Seminars: Short telomeres in key tissues initiate local and systemic aging in zebrafish  
**Speaker** Madalena Carneiro  
**Affiliation** IGC

#### 13.03
**Title** The developmental physiology of body size  
**Speaker** Fred Nijhout  
**Affiliation** Department of Biology, Duke University, USA

#### 16.03
**Title** Early events in type 1 diabetes pathogenesis  
**Speaker** Dan Holmberg  
**Affiliation** Lund University, Sweden

#### 17.03
**Title** Manipulation of the quorum sensing signal AI 2 affects the antibiotic treated gut microbiota  
**Speaker** Karina Xavier  
**Affiliation** IGC

#### 18.03
**Title** IGC Postdoc Seminars: ATM: novel role in the protection against hemolytic conditions?  
**Speaker** Rita Carlos  
**Affiliation** IGC

#### 20.03
**Title** Of fluorescent sperm in a transparent flatworm: using energy signaling  
**Speaker** Mattia Adamo  
**Affiliation** IGC

#### 24.03
**Title** Phenotypic Mosaicism: A new concept on macrosphere activation  
**Speaker** Siomon Gordon  
**Affiliation** University College London, UK

### April

#### 06.04
**Title** A Lost World  
**Speaker** Valeria Souza

#### 25.03
**Title** IGC PhD Seminars: Actin, we have a problem: Cross talk between Src signaling activity and F-actin during tumoral transformation  
**Speaker** Sandra Tavares  
**Affiliation** IGC

#### 25.03
**Title** IGC Postdoc Seminars: Loss of telomerase in zebrafish triggers mitochondrial dysfunction  
**Speaker** Inês Pimenta de Castro  
**Affiliation** IGC

#### 25.03
**Title** Career Path in Science  
**Speaker** Sandra Aresta  
**Affiliation** Institut de Recherche pour le Développement, France

#### 27.03
**Title** The interaction of influenza A virus genome with the recycling endosome  
**Speaker** Maria João Amarim  
**Affiliation** IGC

#### 30.03
**Title** Tumor elicited inflammation - how cytokines link immune system and tumor progression  
**Speaker** Sergei Grivennikov  
**Affiliation** Fox Chase Cancer Center, USA

#### 31.03
**Title** Modelling stories illustrating the versatility of the logical formalism  
**Speaker** Claudine Chauviya  
**Affiliation** IGC

### May

#### 07.04
**Title** Land plant evolution from the perspective of a tiny moss  
**Speaker** Jorg Becker  
**Affiliation** IGC

#### 08.04
**Title** Mind control in the real world: Parasitic manipulation of behaviour  
**Speaker** Shelley Adamo  
**Affiliation** Department of Psychology and Neuroscience, Dalhousie University, Canada

#### 08.04
**Title** IGC PhD Seminars: Molecular mechanism of cell cycle coupling to centromeric chromatin propagation  
**Speaker** Ana Stankovic  
**Affiliation** IGC

#### 08.04
**Title** Bioinformatics Unit @ IGC  
**Speaker** Daniel Sobral  
**Affiliation** IGC

#### 09.04
**Title** Marine cleaning mutualism: from game theory to endocrinology and cognition  
**Speaker** Redouan Bshary  
**Affiliation** IGC

#### 10.04
**Title** Evolution of the social brain  
**Speaker** Hans Hofmann  
**Affiliation** University of Texas at Austin, USA

#### 15.04
**Title** Transmission of a multifaceted post translational modifications: Cell Cycle, Cilia, Neurons  
**Speaker** Carsten Janke  
**Affiliation** Institut Curie, France

#### 17.04
**Title** Mechanisms and function of mitochondrial inheritance in germ line stem cells  
**Speaker** Ruth Lehmann  
**Affiliation** HHMI, Skirball Institute and Department of Cell Biology, NYU School of Medicine, USA

#### 20.04
**Title** Control of microtubule functions by posttranslational modifications: Cilium, Neuroendocrine mechanisms, Cilia  
**Speaker** Monica Dus  
**Affiliation** ITQB

#### 21.04
**Title** Characterization of the molecular and neuroendocrine mechanisms triggered by kisspeptins in the brain of male European sea bass (Dicentrarchus labrax) related with puberty and fertility  
**Speaker** Felipe Espigares  
**Affiliation** Department of Fish Physiology and Biotechnology, Institute of Aquaculture of Torre la Sal (IATS), Spanish National Research Council (CSIC), Spain

#### 21.04
**Title** Structure, function and dynamics of Type VI secretion system  
**Speaker** Marek Basler  
**Affiliation** University of Basel, Switzerland

#### 22.04
**Title** IGC Postdoc Seminars: Deciphering molecular mechanisms of plasma membrane repair - the unexpected role of Rbβ3a  
**Speaker** Marisa Encarnação  
**Affiliation** IGC

#### 08.04
**Title** Transcriptome Profiling of Moss Spermatogenesis  
**Speaker** Marcela Coronado  
**Affiliation** IGC

#### 15.04
**Title** ITCB IGC Plant Interaction Meeting: How can a light regulated protein (OsPf14) be involved in rice root curling?  
**Speaker** Andre Cordeiro  
**Affiliation** ITQB

#### 15.04
**Title** Glucose sensing in rodent hypothalamus  
**Speaker** Denis Burdakov  
**Affiliation** The Francis Crick Institute, UK

#### 15.04
**Title** Molecular and neuronal basis for nutrient sensing in Drosophila  
**Speaker** Monica Dus  
**Affiliation** University of Michigan, USA

#### 16.04
**Title** Making and breaking neuromuscular synapses  
**Speaker** Steven Burden  
**Affiliation** Shirball Institute, Departments of Neuroscience & Cell Biology, NYU School of Medicine, USA
Date 22.04
Title IGC PhD Seminars: Melanoma progression requires the activation of telomere maintenance mechanisms
Speaker Joanna Nabais
Affiliation IGC

Date 24.04
Title Mechanisms of longevity and cancer resistance in long lived rodent species
Speaker Vera Gorborora
Affiliation Department of Biology, University of Rochester, USA

Date 24.04
Title From computational model to experimental design and validation: application of logical modelling to the infiltrating proangiogenic monocytes in breast cancer
Speaker Ioannis Xenarios
Affiliation Vital IT Unil, CIG Lausanne, Switzerland

Date 28.04
Title Interactomes of multifunctional proteins
Speaker Christine Brun
Affiliation TAGC, Inserm U1090, Université Aix Marseille, France

Date 28.04
Title Variation and ancestral states in cellular evolution
Speaker José Pereira Leal
Affiliation IGC

Date 29.04
Title Hybrid methods as a strategy for predicting the structure of large macromolecular complexes
Speaker Joanna M. Kasprzak
Affiliation Adam Mickiewicz University & International Institute

Date 29.04
Title A tale of trunks: how Gdf11/Oc4 interactions control mouse trunk length
Speaker Rita Aires
Affiliation IGC

Date 02.06
Title From mice to snakes: understanding the differences in vertebrate body shape
Speaker Motse Mello
Affiliation IGC

Date 03.06
Title IGC PhD Seminars: Social life of bacteria: cheating on cheaters prevents the tragedy of the commons
Speaker Oszkay
Affiliation IGC

Date 04.06
Title Beyond the schools rankings: measuring and understanding student progression
Speaker João Oliveira Baptista
Affiliation Direção Geral de Estatísticas de Educação e Estatística, Portugal

Date 05.06
Title Shedding light on alternative splicing
Speaker Alberto Korribliht
Affiliation Facultad de Ciencias Exactas y Naturales, University of Buenos Aires, Argentina

Date 08.06
Title Home mediated diversification of immunoglobulin specificity - mechanism and physiological significance
Speaker Jordan Dimitrov
Affiliation INSERM UMR 1138, Centre de Recherche des Cordeliers, France

Date 09.06
Title Lessons from bloodless worms
Speaker Ibgal Hamza
Affiliation Department of Animal and Avian Sciences, University of Maryland, USA

Date 06.05
Title Facilitating Science: best of both worlds?
Speaker Rui Gardner
Affiliation IGC

Date 07.05
Title Pharmacologic activation of integrin CD11b/CD18 As a novel mechanism to suppress inflammatory injury
Speaker Vinod Gupta
Affiliation Department of Immunology/Microbiology, Rush University Medical Center, USA

Date 19.05
Title Frequency dependent selection in C. elegans: undisclosed games in the struggle for existence in a Petri dish
Speaker Ivo Chelo
Affiliation IGC

Date 20.05
Title Probing transcriptional mechanisms by retro biochemistry and single molecule imaging
Speaker Robert Tjan
Affiliation University of California, Berkeley and Howard Hughes Medical Institute, USA

Date 22.05
Title The Lagoon, or, how to create a new science
Speaker Armand Leroi
Affiliation Department of Life Sciences, Imperial College London, UK

Date 25.05
Title Chromatin dynamics and genomic integrity: Interplay between histone deposition and condensins
Speaker Marina Murillo
Affiliation Arabidopsis Centre for Molecular Biology and Regenerative Medicine, Spain

Date 26.05
Title Dynamic memories: how past experience can shape the future
Speaker Rosalina Fonseca
Affiliation IGC

Date 02.06
Title The genomics of clinal adaptation in Drosophila
Speaker Thomas Flatt
Affiliation Université de Lausanne, Switzerland

Date 04.06
Title The evolution of vertebrate body shape
Speaker Iqbal Hamza
Affiliation IGC

Date 06.05
Title Springer UpDates
Speaker Diana Alkema and Adriano Crespo
Affiliation Springer, Portugal

Date 07.05
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Affiliation Department of Life Sciences, Imperial College London, UK

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Speaker Robert Tjan
Affiliation University of California, Berkeley and Howard Hughes Medical Institute, USA

Date 27.05
Title IGC Postdoc Seminars: Variability in centrolere number and length is a hallmark of cancer
Speaker Gaëlle Marteil
Affiliation IGC

Date 29.05
Title Hybrids of Saccharomyces yeast
Speaker Duncan Greig
Affiliation Max Planck Institute for Evolutionary Biology, Germany

Date 27.05
Title IGC PhD Seminars: p62/ SQSTM1 is selectively required for phagosomal maturation of apoptotic cell
Speaker Inês Santarino
Affiliation CEDOC

Date 28.05
Title The genomics of clinal adaptation in Drosophila
Speaker Thomas Flatt
Affiliation Université de Lausanne, Switzerland

Date 29.05
Title The evolution of developmental regulation in spiders and flies: diversification of body plans and body parts
Speaker Alistair McGregor
Affiliation Oxford Brookes University, UK

Date 19.05
Title Different cells count differently: centromere number and structure regulation in development and disease
Speaker Mónica Dias
Affiliation IGC

Date 22.05
Title The Alzheimers risk factors Bin1 and CD2AP differentially regulate the endocytic generation of amyloid?
Speaker Florent Ubelmann
Affiliation CEDOC

Date 13.05
Title IGC Postdoc Seminars: The Alzheimers risk factors Bin1 and CD2AP differentially regulate the endocytic generation of amyloid?
Speaker Florent Ubelmann
Affiliation CEDOC

Date 05.05
Title Can big data help us solve real world problems?
Speaker Joana Sá
Affiliation IGC

Date 06.05
Title IGC PhD Seminars: A tale of trunks: how Gdf11/Oc4 interactions control mouse trunk length
Speaker Rita Aires
Affiliation IGC

Date 07.05
Title IGC PhD Seminars: Immunity and colour pattern formation: insights from butterfly wings
Speaker Maria Adélia Jerónimo
Affiliation IGC

Date 29.04
Title IGC Postdoc Seminars: Architectural landscape of diverse ciliary functions
Speaker Swadhin Chandra Jana
Affiliation IGC

Date 30.04
Title The balance between cell cycle arrest and cell proliferation: Cdk oscillations drive the mammalian cell cycle
Speaker Albert Goldbeter
Affiliation Université Libre de Bruxelles, Belgium

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Title Can big data help us solve real world problems?
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Speaker Rita Aires
Affiliation IGC

Date 15.05
Title The acrosome reaction, a unique exocytotic event key for fertilization
Speaker Alberto Darson
Affiliation Instituto de Biotecnologia, Universidad Nacional Autónoma de México, México

Date 19.05
Title Facilitating Science: best of both worlds?
Speaker Rui Gardner
Affiliation IGC

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Affiliation IGC

Date 06.05
Title IGC Postdoc Seminars: Bacterial signalling in the gut microbiota
Speaker Jessica Thompson
Affiliation IGC
Title: Before, during and after the storm: The return of CD28 superagonist therapy to clinical development
Speaker: Thomas Höög
Affiliation: Institute for Virology and Immunobiology, Germany

Date: 20.11
Title: Transcription control of vertebrate neurogenesis by Ascl1/Mash1
Speaker: Diogo Castro
Affiliation: IGC

Date: 11.11
Title: IGC PhD Seminars: Socially driven changes in neural and behavioural plasticity in zebrafish
Speaker: Magda Teles
Affiliation: IGC

Date: 11.11
Title: IGC Postdoc Seminars: Functional tetraspanin associations in sperm cells and their relevance in double fertilization
Speaker: Leonor Boavida
Affiliation: IGC

Date: 13.11
Title: Exploring a mutualism: The transmission mechanisms and the role of Wolbachia endosymbionts in a human parasite, the filarial nematode
Speaker: Frederic Landmann
Affiliation: Centre de Recherche de Biochimie Macromoléculaire, France

Date: 13.11
Title: Frataxin knockdown in Drosophila alters mitochondrial homeostasis and degradation in muscles and glia
Speaker: Juan Navarro
Affiliation: Institut für Zoologie, Universität Regensburg, Germany

Date: 16.11
Title: Cell polarity and pheromone gradient tracking in yeast
Speaker: Daniel Lew
Affiliation: Duke University School of Medicine, USA

Date: 17.11
Title: Plant SnRK1 kinases are novel components of abscisic acid signaling
Speaker: Elena Baena
Affiliation: IGC

Date: 17.11
Title: Past, Present and Future of Science Publishing: How the scientific community has failed to use the Internet to improve the ways we communicate with each other and the public, and how we can fix it
Speaker: Michael Eisen
Affiliation: University of California Berkeley, USA

Date: 18.11
Title: Activation of enhancer activity in the Drosophila embryo
Speaker: Michael Eisen
Affiliation: University of California Berkeley, USA

Date: 20.11
Title: Recent concepts on the role of DNA damage and the ubiquitin system in the regulation of the innate immune system
Speaker: Nelson Gekara
Affiliation: Molecular Infection Medicine Sweden, Nordic EMBL Partnership for Molecular Medicine, Sweden

Date: 24.11
Title: An Arabidopsis RNA binding protein conferring seed tolerance to drought and salt stress during germination
Speaker: Paula Duque
Affiliation: IGC

Date: 25.11
Title: IGC PhD Seminars: Adaptive immunity increases the pace and predictability of evolutionary change in commensal gut bacteria
Speaker: João Batista
Affiliation: IGC

Date: 25.11
Title: IGC Postdoc Seminars: iRhom, the tumor necrosis factor converting enzyme (TACE) trafficking regulator, is stabilized in response to PMA
Speaker: Miguel Cavadas
Affiliation: IGC

Date: 27.11
Title: What does mathematics have to do with cancer research?
Speaker: Simon Tavaré
Affiliation: Cancer Research UK Cambridge Institute, University of Cambridge, UK

Date: 01.12
Title: DNA damage response independent protection against sepsis
Speaker: Luis Moita
Affiliation: IGC

Date: 11.12
Title: A mechanism of DNA double strand break repair by transcript RNA
Speaker: Francesca Storici
Affiliation: School of Biology, Georgia Institute of Technology, USA

Date: 12.12
Title: Responsible Research and Innovation (RRI) in practice: agendas, processes and outcomes
Speaker: Carlos Catalão
Affiliation: Agência Nacional para a Cultura Científica Ciência Viva, Portugal

Date: 14.12
Title: From Nature to the Lab: a story with five chapters and twenty years told in forty minutes
Speaker: Margarida Matos
Affiliation: Centre for Ecology, Evolution and Environmental Changes, Portugal

Date: 14.12
Title: Lining up the ‘omics: a multi level approach to understanding local adaptation in saker falcons
Speaker: Michael Brutford
Affiliation: School of Biosciences, Cardiff University, UK

Date: 15.12
Title: Biogeographic origins and patterns of diversification in the amphibians and reptiles (and other vertebrates) of Madagascar
Speaker: Miguel Vences
Affiliation: Division of Evolutionary Biology, Technical University of Braunschweig, Germany

Date: 15.12
Title: Intracellular endosymbiont selection contributes to Drosophila adaptation to viral infection
Speaker: Biao Suen
Affiliation: IGC

Date: 15.12
Title: Dry forest, biodiversity and vicariance
Speaker: Lucienne Wilné
Affiliation: Madagascar Research & Conservation Programme, Madagascar

Date: 16.12
Title: IGC Postdoc Seminars: Centrosomes in cancer: when we have one too many
Speaker: Carla Lopes
Affiliation: IGC

Date: 16.12
Title: IGC Postdoc Seminars: Escherichia coli adaptation to the mouse gut – mimicking nature
Speaker: Nelson Frazão
Affiliation: IGC

Date: 17.12
Title: Collagen export from the endoplasmic reticulum
Speaker: António Santos
Affiliation: CRG-Barcelona, Spain

Date: 17.12
Title: The plant lytic vacuole: space filler, garbage bag, or something more interesting?
Speaker: Dale Sanders
Affiliation: Department of Metabolic Biology, John Innes Centre, UK

Date: 17.12
Title: Biolo-Ing the human centrosome cilium interface
Speaker: João Gonçalves
Affiliation: The Lunenfeld Tanenbaum Research Institute, Canada

Date: 18.12
Title: Regulators of inflammatory responses
Speaker: Thirumala Devi Kanneganti
Affiliation: Department of Immunology, St. Jude Children’s Research Hospital, USA
CONFERENCE & MEETINGS AT THE IGC

TRAFFIC CLUB
Traffic club brings together several groups of the CE-DCC and the IGC to discuss projects and review literature on the topic.
Organisers: Maria João Amorim (IGC)

PLANT INTERACTIONS MEETING
Monthly meetings amongst plant groups in the Oeiras campus. These meetings are organised monthly to promote interactions amongst plant research groups in the Oeiras Campus and beyond. Two talks with their respective Q&A sessions are followed by an informal gathering for further discussion.
Organisers: Ana Confraria (IGC) and Tiago Lourenço (ITQB)

CAREER PATH IN SCIENCE SEMINAR SERIES AT IGC
Regularly throughout the year, well-established invited scientists give an informal seminar based on their personal experience in terms of career options and challenges. The talks last approximately for one hour and are accompanied by drinks and snacks. In 2015 we had seminars given by scientists in academics, facilities, science editors, science administration, and other alternative careers in science.
Organisers: Karina Xavier and Postdoc Committee

FCT R&D PROJECTS IN ALL SCIENTIFIC DOMAINS CALL 2014 - HOW TO APPLY
JANUARY 12
The FCT Projects on R&D in all Scientific Domains national call for funds can provide researcher with up to 200,000 Euros funding for a maximum of 36 months research project. This work session aims to inform and guide potential applicants (PI & postdoctoral fellows) into the insights of the application procedure and online-forms, hopefully providing advice for future success. A total of 35 potential applicants attended this session.
Organisers: Research Funding Affairs Unit (Speaker: Sheila Vidal)

WORKSHOP ON “IMPROVING SKILLS TO BETTER COMMUNICATE WITH LAY AUDIENCES”
FEBRUARY 20 AND 27
The main aim of this workshop is to improve the communication skills of postdoctoral fellows when addressing lay audiences. Some strategies and tips were discussed, together with written and oral exercises. A total of 11 postdoctoral fellows attended this workshop, which is included in the Postdoctoral Workshop Series: Skills and tools to improve your career.
Organisers: Science Communication Unit and Postdoctoral committee (Speakers: Ana Mena and Inês Domingues)

WORKSHOP ON “ADVICE AND TIPS TO IMPROVE YOUR CV”
MARCH 6 AND 13
This workshop aims to provide advises and tips in a practical setting to help young researchers to compose a more effective and tailored scientific CV. A scientific Curriculum Vitae is the most common communication tool used to self-marketing expertises when applying for academic research jobs, fellowships or grants. A total of 12 postdoctoral fellows attended this workshop, which is included in the Postdoctoral Workshop Series: Skills and tools to improve your career.
Organisers: RFA Unit and Postdoc Committee (Speakers: Sheila Vidal and Teresa Costa)

MOUSE MICROBIOTA: GENOTYPE-PHENOTYPE CONTROL AND TECHNOLOGICAL CHALLENGES
MARCH 26-27
Dissecting the dialogue between the host and its microbiota is an essential element of modern organism-centered Biology. Understanding this complex relationship requires specific equipment and skills. In this workshop, it was reviewed some of the most advanced findings addressing the interaction of the microbiota and mouse genotypes to produce a range of phenotypes. Also, infrastructure needs and experimental strategies required for the development of this thriving research field were discussed. This workshop brought together 12 speakers and 70 participants.
Organisers: Jocelyne Demengeot and Joana Bom
Sponsors: EU-FP7 (Infrinstagram 31 consortium), Ultra-gen, Orm

WORKSHOP ON “FUNCTIONAL NEUROANATOMY OF FISH: MAPPING BEHAVIOURAL AND INTERNAL STATES INTO THE BRAIN”
APRIL 10-11
The main aim of this workshop was to bring together researchers working on fish behavioural neuroscience with an interest in mapping behavioural and internal states into underlying brain circuits. Three key questions were addressed: (1) How to establish brain homologies between different species? (2) How to quantify relevant behaviours and internal states in order to map them into specific brain areas? (3) How to visualize brain activity in relation to behaviour?
Organisers: Rui F. Oliveira (IGC) and Lars Ebbesson (Univ. Bergen, Norway)
Sponsors: FP7-COPEWELL Project, European Commission

HOW TO APPLY TO THE 2015 FCT CALL FOR INDIVIDUAL FELLOWSHIPS
APRIL 20
Annually FCT open calls to fund PhD or postdoc fellowships. This session aims to inform and guide potential applicants on how to apply to the 2015 FCT Call for Doctoral (BD) and Postdoctoral fellowship (BPD) hopefully providing advice for future success. We intent to clarify questions and help to solve specific regarding procedures, online-forms, rules and give some tips and numbers to help potential candidates to be more successful. A total of 22 potential applicants attended this session.
Organisers: Research Funding Affairs Unit (Speaker: Teresa Costa)

FLOW CYTOMETRY: FUNDAMENTALS AND APPLICATIONS
APRIL 20-24
The workshop, aimed at both experienced and inexperienced researchers, covered the fundamentals of Flow Cytometry, focused on the main applications run at the IGC. Topics included Planning a Flow Experiment, Cell Dynamics (cell death, cell cycle, proliferation), Multicolor Flow, Small Particle analysis, High Throughput Flow, cell Sorting as well as Data Analysis and Publishing.
Organisers: Flow Cytometry Facility/Enzifarma
Sponsors: Enzifarma

SYMPOSIUM IN CELL DIVISION
MAY 18
Seminars by Peter Lenart, Florence Janody, Isabel Vernooy, Marie Helene Verhac, Edgar Gomes.
Organisers: Monica Bettencourt Dias
Sponsors: EMBL

H2020 INFORMATIVE SESSION: 2015 MARIE S. CURIE INDIVIDUAL FELLOWSHIPS
JUNE 4
The Marie Sklodowska-Curie Individual Fellowships support 1 to 2 year postdoctoral research involving mobility within and beyond Europe. The aim of this informative session is to guide potential candidates through the general conditions and rules of this call. Special attention will be given to the eligibility rules, typical activities expected to be developed during the postdoctoral training and the evaluation criteria. A total of 11 potential applicants attended this session.
Organisers: Research Funding Affairs Unit (Speaker: Teresa Costa)

CAREER DEVELOPMENT WORKSHOP FOR YOUNG PRINCIPAL INVESTIGATORS. GERM STORIES – FIVE DECADES IN MICROBIOLOGY. SCENE II
JUNE 8-10
This master course included a 3 day-lecture series aimed at young principal investigators to reflect about the development scientific careers. The 3 main topics covered included: I - Building and Leading a Research Group; II - Scientific Writing and Publishing; III - What research is worth doing? 16 young principal investigators from ITQB and IGC attended the course.
Organisers: Karina Xavier (IGC), Raquel Sá-Leao (ITQB), Roberto Kolter (Harvard)

FORECASTING EVOLUTION?
JULY 8 - 11
Evolutionary biology is changing its focus from reconstructing history to predicting future processes. For a number of systems, quantitative prediction methods have emerged recently or will be available in the near future. These include parallel evolution experiments with microbes, viral evolution and epidemiology, somatic evolution of cancer and cancer therapy, and evolutionary ecology. This meeting brings together experts on all of these areas to discuss what is, what may become, and what is not predictable in evolution.

Organisers: Isabel Gordo (IGC), Michael Lässig (Univer- sity of Cologne) and Ville Mustonen (Wellcome Trust Sanger Institute)
Sponsors: DFG, Wellcome Trust, Instituto Gulbenkian de Ciência

EUROPEAN SUMMER SCHOOL “HOST-MICROBE SYMBIOSIS – OLD FRIENDS AND FOES”
JULY 19-AUGUST 1
In the Summer School “Host-microbe symbioses – old friends and foes” we explored the stable host-microbe interactions as a spectrum from parasitic to mutualistic. It is becoming clear that most animals and plants associate with microbes during their life and that these greatly influence host biology. During this two-weeks course we explored this field with leading scientists that bring a broad range of expertise and approaches. The Summer School was targeted at second or later years PhD students. The main aim of this course was to help the students define their future research interests. 34 PhD students of 17 different nationalities attended the course and by 14 invited speakers.

Organisers: Karina Xavier (IGC), Luis Teixeira (IGC)
Sponsors: Volkswagen Foundation, Calouste Gulbenkian Foundation and Câmara Municipal de Oeiras

EMBO PRACTICAL COURSE ON MEASURING INTRA-SPECIES DIVERSITY USING HIGH-THROUGH-PUT SEQUENCING
JULY 27 – 31
This EMBO Practical Course aimed to show evolutionary biologists and population geneticists the potentials and perils of using high throughput sequencing to estimate intra-specific genetic diversity, from individuals to populations. Participants had the opportunity to interact with experienced researchers that have successfully applied the technology in a wide variety of high impact studies, and learn from their successes as well as from their failures. Participants listened to theoretical lectures and practiced some of the techniques used in those high impact studies.

Organisers: Daniel Sobral, Pedro Fernandes, Jeffrey Barrick
Sponsors: EMBO

FIRST EMBO OBESITY SECTORIAL MEETING
AUGUST 8-10
The 1st EMBO Obesity Sectorial Meeting brought together EMBO Young investigators with an interest in Obesity research.

Organiser: Ana Domingos
Sponsors: EMBO

IGC’S PRACTICAL COURSE ON ANIMAL HANDLING AND EXPERIMENTATION IN MICE AND ZEBRAFISH
SEPTEMBER 29 – OCTOBER 2
People working with laboratory animals need to be trained and educated, and the acquired competence evaluated. This course is directed to users of Animal House Facilities that need to be licensed by DGAV (Direção Geral de Alimentação e Veterinária) in order to work with animals. The objective of the course is to present principles that are essential for the humane use and care of vertebrate laboratory animals and for the quality of research.

Organiser: Ana Sofia Lencâdio, Manuel Rebelo and Jocelyne Demengeot
Sponsors: Ultragenex and Tecniplast

SUPER-RESOLUTION MICROSCOPY IN INFECTION AND IMMUNITY SYMPOSIUM
OCTOBER 21-22
Microscopy has been a major driving force in Cell Biology. Its inception in the 16th century led to the first ‘wave of discovery’ - the finding and comprehension of cells and their internal structure. However, the intrinsic limitations of light microscopes prevent the accurate resolution of structures smaller than 300 nm. It took 3 centuries to achieve a second ‘wave of discovery’ - the development of Electron Microscopes (EM) able to overcome this limit, offering a new view into the realm of small biological complexes, such as Viruses. We are now at the forefront of a third ‘wave of discovery’ brought about by the recent development of Super-Resolution light microscopy – a range of methods that approach the resolution of EM with the added capability of live cell imaging and molecule-specific labelling. Super-Resolution microscopy promises exciting new insights into how pathogens penetrate into host cells and how mechanisms contribute towards their survival and escape from immune detection.

Organisers: Helena Soares (IGC & CEDOC), Mariana Pinho (ITQB), Nuno Moreno (IGC) and Ricardo Henriques (UCL)
Sponsors: Ibidi, zeiss, svi, Nikon,Hamamatsu, FEI, Cirk-lo, Innova, MTBraandao, Chroma, ASI, Andor, Monocomp, Picoquant, Leica, MCL

EURAXESS ROADSHOW 2016
This tour was a pan-European information campaign organised by Euraxess that visited 34 European cities in 16 countries, targeted at students and young researchers, to raise awareness of the Euraxess network in the assistance of researcher mobility. The IGC was chosen as the “London stop”. Other than IGC researchers, we received around 50 visitors from the Lisbon area - mainly final-year university students. Activities included some outdoor activities as well as workshops and seminars that counted on the presence of high authorities of the FCT and the IGC as well as interventions from IGC members as well as other local research institutions such as the ITQB, the Champalimaud Foundation and the UNL.

Organisers: Local Organiser for Euraxess: Greta Martins
Sponsors: European Commission, Euraxess

“WORKSHOP: FUNDING OPPORTUNITIES” UNDER THE SCOPE OF THE EURAXESS ON TOUR 2015 AT THE IGC
OCTOBER 28
Sooner than expected, young researchers have to spend a large part of their time communicating their scientific ideas to funding agencies to obtain the necessary funds to carry out their research and progress in their academic careers. The aim of this workshop is to raise a better understanding of the international funding environment. In addition, it also intends to guide on the insights of the most well-known international funding opportunities sponsoring highest quality young research.

Organiser: Admin Team Unit and RFA Unit (Speaker: Sheila Vidal)

SECOND JOINT POSTDOC RETREAT (IGC/ITQB/IBET/CF/IMM)
NOVEMBER 4-6
This meeting served to gather postdoctoral researchers from the Lisbon Area to promote scientific collaboration and career development. The meeting included: i) a debate with leaders from the research institutes on the future of the postdoc in the scientific community, ii) an interactive scientific exchange round-table presentation, iii) a full-day workshop on professional development and career options, iv) Q&A discussion panels on perspectives of success by young investigators, v) a final session on entrepreneurship and start-up companies with invited speakers from Portuguese companies in the area of medical science and biotechnology, vi) various social activities.

Organisers: IGC Postdoc Committee together with representatives of the other institutions
Sponsors: FCT, Setúbal city hall and the following companies: TebuBio, STAVIDA, NZYTech, Beckman Coulter Genomics, Soquimich, Enzymatic, Solítica, Dias de Souza, SantaCruz

FIRST SCIENTIFIC MEETING OF AFRICAN AND TIMORESE GRADUATE STUDENTS
DECEMBER 17
This mini-symposium gathered the African and Timorese students community that is conducting a PhD thesis in Portugal, aiming at sharing scientific knowledge. Renowned scientists, such as Dale Sanders, Director of John Innes Research Institute (UK), and the Nobel laureate Craig Mello (University of Massachusetts, USA) participated in this event, interacting with the students. About 40 students from three different programmes (PGCD, Gulbenkian Fellowships, and Programa Ciência Global de Fundação para a Ciência e a Tecnologia) attended this symposium.

Organisers: Joana Gonçalves-Sá (PGDB)

CONFERENCES & MEETINGS AT THE IGC
PRESENTATIONS BY IGC RESEARCHERS

2015

Adrain, Colin
Traffic control of ADAMs, key regulators of inflammation and cell fate decisions
Czech Academy of Sciences
Prague, Czech Republic
October 2015

Alices, Filipa
Quantifying and modelling patterned cell fate determination
John Innes Centre
Norwich, UK
October 2015

Amorim, Maria João
Influenza A virus infection "stalls" sorting of recycling endosomes
Gordon Research Conferences
Girona, Spain
June 2015

Baena-González, Elena
Regulation of SnRK1 signalling by SUMOylation
Max Planck Institute of Molecular Plant Physiology
Golm, Germany
February 2015

Regulation of SnRK1 signalling by SUMOylation
Max Planck Institute for Molecular Plant Breeding
Cologne, Germany
May 2015

Energy signaling: connecting environmental stress and plant growth
University of Utrecht
Utrecht, The Netherlands
June 2015

Regulation of SnRK1 kinases: a first step towards linking environmental stress and plant growth
Julius-Maximilians-Universität Würzburg
Würzburg, Germany
July 2015

Energy signaling: connecting environmental stress and plant growth
University of Turku
Turku, Finland
September 2015

Becker, Jörg
Evolution of Sexual Reproduction in Plants (EVOREPRO)
ERA-CAPS 2nd Grant Holders Workshop
Lisboa, Portugal
May 2015

A NOT so simple change of fate: NOT1 as a major regulator of late gametophyte maturation
University of Zurich, Institute of Plant Biology
Zurich, Switzerland
May 2015

Reshaping the epigenetic landscape of the male gametophyte for genome stability and transgenerational inheritance
Fisiología Vegetal 2015
Toledo, Spain
June 2015

A transcriptome atlas of Physcomitrella patens provides insights into the evolution and development of land plants
Moss 2015
Cancun, Mexico
December 2015

Beldade, Patricia
Eco-evo-dev: mechanisms underlying variation & diversity in adaptive traits
Turkish Evolution Conference
Ankara, Turkey
February 2015

Bettencourt Dias, Mónica
Evolutionary Cell Biology
March 2015
Janelia Farm
USA
March 2015

Szeged, Hungary
June 2015

Vienna Biocenter
Vienna, Austria
June 2015

Physics of Life Sciences
Cambridge, UK
September 2015

Cytoskeleton Meeting
Cologne, Germany
September 2015

EMBO Cell Cycle meeting
Baeza, Spain
October 2015

EMBO members meeting
Heidelberg, Germany
October 2015

Boavida, Leonor
Functional Tetraspanin associations in sperm cells and their relevance in double fertilization
EMBO Signaling in Plant Development
Brno, Czech Republic
September 2015

Braga Areal, Rúmulo
Newborn colonization with Helicobacter hepaticus induces long lasting tolerance in mice
RIKEN IMS Summer Programme (RISP)
Yokohama, Japan
June 2015

Brito, Patricia
Genomic dynamics in Bacillus subtilis, patterns of niche adaptation and domestication
8th International conference on gram-positive microorganisms; 18th international conference on Bacilli Tuscany, Italy
June 2015

Cardoso, Sara
Brain transcriptome analysis of alternative reproductive tactics in a bennitid fish
2015 J.B. Johnston Club for Evolutionary Neuroscience Annual Meeting
Chicago, USA
October 2015

Carneiro, Madalena
Molecular signatures of aging in teleomerase mutant zebrafish
Fusion Conferences - Interventions in Aging
Cancun, Mexico
February 2015

Carvalho, Inês
Using habitat modelling to identify hot spots for cetaceans off São Tomé Island (São Tomé and Príncipe) – Implications for conservation
29th European Cetacean Society Conference
Malta
March 2015

The biology of a myth: how historical sources help explaining patterns of cetaceans occurrence
Oceans Past V Conference
Tallinn, Estonia
May 2015

Carvalho, Jorge
Space constraints in mitosis
10th European Biophysics Congress
Dresden, Germany
July 2015

Castro, Diogo
Ascl1/Mash1 coordinates regulates gene expression and the chromatin landscape during neurogenesis
ISSCR 2015 Annual Meeting
Stockholm, Sweden
June 2015

Transcriptional control of vertebrate neurogenesis by the proneural factor Mash1/Ascl1
Max Delbrück Centre for Molecular Medicine
Berlin, Germany
November 2015

Chelo, Ico
Maintaining the dynamics of genetic variation during experimental adaptation of sexual populations
Institute of Environmental Sciences
Kralow, Poland
October 2015

Chaouiyia, Claudine
A discrete model of eggshell patterning reveals cell-autonomous and juxtacrine effects
12th African Small Mammals Symposium
Mantasa, Madagascar
April 2015

Demographic inference using genetic data from a single individual: separating population size variation from population structure
TIBE: 2015 meeting
Porto, Portugal
June 2015

From conservation genetics to conservation genomics of northern Madagascar lemurs
TIBE: 2015 meeting
Porto, Portugal
June 2015

Chrostek, Ewa
Mutualistic and pathogenic symbions of Drosophila melanogaster
École Polytechnique Fédérale de Lausanne
208– Annual Report 2015

Logical modelling
Workshop & Tutorial 16th Int Conf on Syst Biol (ICSB)
Singapore
November 2015

When intricate regulatory networks defy intuition: computational models to decipher the control of cellular processes
Cancer Research Centre of Marseille
Marseille, France
December 2015

Chikhi, Lounès
Some issues on structure, the Neolithic transition and aDNA
Okinawa Institute of Science and Technology (OIST)
Okinawa, Japan
January 2015

Some genetic consequences of population and social structure
12th African Small Mammals Symposium
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### Presentations by IGC Researchers

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<td>Werner, Sasha</td>
<td>Lisbon, Portugal</td>
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<td>Xavier, Karina</td>
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<td>Vidal, Sheila</td>
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<td>Brás-Pereira, Catarina</td>
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<td>Lau, João</td>
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<td>Duan, Frank</td>
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<td>Da Silva, Joana</td>
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<td>De Sousa, Fernando</td>
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<td>Leite, J.</td>
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### Abstracts of Invited Presentations

**La reconstruction de l’histoire démographique à partir de l’ADN**
Institut de Mathématiques de Toulouse, Toulouse, France, December 2015

**Salmona, Jordi**
Towards conservation genomics of northern Madagascar mouse lemur TIBE - Global Biodiversity Change - From Genes To Ecosystems CIBIO-InBIO, Porto, Portugal, June 2015

**Santos, Diogo**
The impact of genomic rearrangements on the evolutionary path of populations Forecasting evolution? Lisbon, Portugal, June 2015

**Silva, Zoé**
Deficiency in regulators of complement activation - DAF and CD59 - protects against influenza A virus infection Keystone Symposium on Innate Immunity and Determinants of Microbial Pathogenesis California, USA, April 2015

**Soares, Miguel**
The Keap1/Nrf2 Pathway in Health and Disease Biochemical Society Cambridge, UK, January 2015

**Soares, Ana Margarida**
The repeatability of Escherichia coli evolution in its natural environment Forecasting Evolution?, Calouste Gulbenkian Foundation Lisbon, Portugal, July 2015

**Sousa, Ana Margarida**
The IGC and Funding Opportunities for Postdoctoral in Portugal Netherlands Cancer Institute Amsterdam, The Netherlands, July 2015

**Soares, Ana Margarida**
The IGC and Funding Opportunities for Postdoctoral in Portugal Netherlands Cancer Institute Amsterdam, The Netherlands, July 2015

**Soresa, Nuno**
Understanding nutritional adaptation to new ecological niches: the case of Drosophila suzukii Annual European Meeting of PhD Students in Evolutionary Biology (EMPSEB) Stirling, UK, September 2015

**Sousa, Ana Margarida**
The repeatability of Escherichia coli evolution in its natural environment Forecasting Evolution?, Calouste Gulbenkian Foundation Lisbon, Portugal, July 2015

**Teixeira, Luis**

**Tello, Ivo**
An ex vivo approach to study the mechanics of nuclear positioning in syncytial embryos CRC-Barcelona, Barcelona, Spain, October 2015

**Trancoso, Inês**
AID and Repair in Class Switch Recombination Max Planck Institute of Immunobiology and Epigenetics Freiburg, Germany, February 2015

**Tranfield, Erin**
Optimizing and adapting sample preservation protocols for Transmission Electron Microscopy 4th Joint Congress of the Portuguese and Spanish Microscopy Societies Porto, Portugal, September 2015

**Vidal, Sheila**
Assessing the impact of Grant Managers on the success of grant application 21st Annual Conference EARMA 2015 Leiden, The Netherlands, June 2015

**Werner, Sasha**
FIAC'T Summer School Lisbon, Portugal, September 2015

**Xavier, Karina**
Manipulating interspecies quorum sensing in bacterial consortia Centre of Excellence in Bacteriology, University of Geneva Geneva, Switzerland, February 2015

**Amorim, Maria Joao**
The interaction of influenza A virus with the recycling endosome Encontro Nacional de Estudantes de Biologia (ENEIB) Braga, Portugal, March 2015

**Becker, Jörg**
(Ep)genetic basis of sexual reproduction in land plants: A focus on the male gametophyte Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM) Évora, Portugal, February 2015

**Braga, Areal, Rômulo**
Newborn colonization with Helicobacter hepaticus induces long lasting tolerance in mice XI Annual Meeting of the Portuguese Society for Immunology Braga, Portugal, October 2015

**Braga, Areal, Rômulo**
Newborn colonization with Helicobacter hepaticus induces long lasting tolerance in mice XI Annual Meeting of the Portuguese Society for Immunology Braga, Portugal, October 2015

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(Ep)genetic basis of sexual reproduction in land plants: A focus on the male gametophyte Instituto de Ciências Agrárias e Ambientais Mediterrânicas (ICAAM) Évora, Portugal, February 2015

**Diogo, Castelo, J.**
Overview of the Annual EARMA Conference 2015 and identification of network and training opportunities for the development of the Portuguese Research Manager Community Fines-Pè Meetings Lisbon, Portugal, July 2015

**Demengeot, Jocelyne**
Layers of regulation and window of opportunity in autoimmunity Instituto Medicina Molecular Lisboa, Portugal, May 2015

**Duarte, Paula**
Alternative splicing of root membrane transporter controls plant tolerance to zinc toxicity Instituto de Tecnologia Química e Biológica (ITQB) Oeiras, Portugal, November 2015

**Spilki, André**
Splicing alternativo de um transportador em Arabidopsis: Quando um gene vale por dois Faculdade de Ciências da Universidade de Lisboa (FCUL) Lisboa, Portugal, December 2015
Ferreira, Miguel Godinho
The role of telomeres in cancer and ageing
Jornadas Nacionais de Ciências Biomédicas
Faro, Portugal
March 2015

Gonçalves, Sá Joana
Data Mining for Decision-Making: Effectiveness and Risks
Copiando With Health Risks in the Big Data Age, Centro de Estudos sobre a Mudança Socioeconómica e o Território do ISCTE-Instituto Universitário de Lisboa (DINÂMIA’CET-IUL)
Lisboa, Portugal
June 2015

Janody, Florence
A study in Drosophila, human cells and breast tumours reveals a role of cytoskeletal regulators in Src-dependent tumour growth
Tomar, Portugal
September 2015

Lafuente, Elvira
Genetic basis of variation in thermal plasticity for body pigmentation
Encontro Nacional de Biologia Evolutiva (ENBE)
Lisboa, Portugal
December 2015

Mallo, Moisés
The role of host immunity in resistance management: perspectives from mathematical models
1st Porto Meeting in Mathematics and Biology
Porto, Portugal
March 2015

Margalha, Leonor
Sumoylation represses SnRK1-dependent energy signalling in Arabidopsis
Instituto de Tecnologia Química e Biológica (ITQB)
Oeiras, Portugal
September 2015

Marques Pita, Manel
Computation Analysis of the Law-Making Process: Flu as a Case Study
Copiando With Health Risks in the Big Data Age, Centro de Estudos sobre a Mudança Socioeconómica e o Território do ISCTE-Instituto Universitário de Lisboa (DINÂMIA’CET-IUL)
Lisboa, Portugal
June 2015

Martins, Gabriel
Novel developments in Bioimaging in the life-sciences
Global Health and Tropical Medicine sessions, Instituto de Higiene e Medicina Tropical (IHMST)
Lisboa, Portugal
March 2015

Mena, Ana
Morfogénese de um projeto ScCom Pt 2015
Lagos, Portugal
April 2015

Molta, Luís Ferreira
Inflammation: the importance of being tolerant
XXI Jornadas de Pediatria
Lisboa, Portugal
February 2015

Oliveira, Rui
Behavioural and neuromolecular mechanisms of social cognition in zebrafish
Champalimaud Neuroscience Symposium
Lisboa, Portugal
September 2015

Pereira, Sónia
Transcriptomic atlas of Physcomitrella patens to decipher the evolution of epigenetic mechanisms in land plants
Jornadas Portuguesas de Genética Braga, Portugal
May 2015

Pishaadlo, Eeva
Tackling the enigmatic role of condensin I - Sister chromatids resolution or structural enforcement?
Tomar, Portugal
March 2015

Raposo, Alexandre
Ascl1/Mash1 coordinately regulates gene expression and the chromatin landscape during neurogenesis
3rd Meeting of the Portuguese Society for Developmental Biology Faro, Portugal
October 2015

Rocha, Luis
Structure and Dynamics on Networks: from fact-checking to biochemical control
Fundação Champalimaud
Lisboa, Portugal
July 2015

Rosmaninho, Pedro
Zeb1 potentiates gene transcription genome-wide in Glioblastoma
May 2015

Salmona, Jordi
Towards conservation genomics of northern Madagascar mouse lemur
Annual Meeting of Galbenkian Students (AmeGuS)
Montim de Basto, Portugal
May 2015

Soares, Miguel
Sociedade Portuguesa de Imunologia Braga, Portugal
October 2015

Sousa, Ana Laura
PUBLIC ENGAGEMENT IN SCIENCE

>2000 VISITORS IN PUBLIC EVENTS

263 STUDENTS VISITED THE IGC

~100 RESEARCHERS ENGAGED IN OUTREACH ACTIVITIES

2 NEW MULTIMEDIA RESOURCES

2 TEACHER TRAINING PROGRAMMES

3 PARTICIPATIONS IN FESTIVALS

1 ARTIST IN RESIDENCE
The IGC runs a dedicated science communication and outreach programme, which actively engages IGC researchers, staff and PhD students in a dialogue with society. We aim at promoting the values of science, namely, critical thinking, honesty and ethics, and openness to share and discuss new knowledge, encouraging public engagement in science. We also aim to raise the profile of the IGC and its research, both nationally and internationally. Our programme involves a broad range of audiences: the media, students, teachers, general public, artists and policy makers.

**DESCRIPTION**

**PROJECTS AND MAIN ACHIEVEMENTS IN 2015**

**INSTITUTIONAL COMMUNICATION**

**NEW MEDIA**

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**Production of multimedia resources**

The first episode of a new series of videos was released in 2015. This series aims at bringing scientific results of research developed at the IGC to a wider audience, through our social media channels. The video “How do cells control the localization of new internal structures” had 1020 views on YouTube. Based on the scientific article published in *Dev Cell* by Mónica Bettencourt-Dias’ laboratory, the video counted with the participation of Carla Lopes and Swadhin Jana.

**First episode of the series IGC Paper video: How do cells control the localization of internal structures, with Carla Lopes and Swadhin Jana from Cell Cycle Regulation group.**

**MEDIA OFFICE**

- **Press releases**: 18
- **News clippings**: 479
- **FANS ON FACEBOOK**: 31,185
- **FOLLOWERS ON TWITTER**: 2,484
- **VIEWS ON THE YOUTUBE CHANNEL**: 201,090
- **IGC WEBSITE VISITS**: 493,272

**HEAD OF UNIT**

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PhD in Cell Biology
Universidade Nova de Lisboa, Portugal, 2008
Head of Unit since 2012

**STAFF**

Vanessa Borges, Communication Officer
Inês Domingues, Communication Officer
Catarina Júlio, Communication Officer

**Collaborators**

Élia Morais (Centro de Formação)
Teacher training programme for Pre- and Primary School Teachers: ‘Aqui há Ciência! Oeiras’

This collaborative project aims to develop in-class laboratory activities and teacher training for pre- and primary schools, using methodologies in inquiry-based learning. The fourth edition of this project occurred from January until July 2015, with a small group of 5 selected and invited teachers from 2 local schools. We accompanied and provided support to the group of selected teachers in 11 actions to implement activities in the classroom.

**Funding:** Técnico (Portugal)

**Partners:** Instituto Superior de Técnico e Instituto Superior de Psicologia Aplicada

**Collaborators:** Centro de Formação das Escolas de Torres Vedras e Lourinhã, Portugal

**Schools’ outreach**

In 2015, 223 students from 8 high schools (from Barreiro, Sintra, Serpa, Eatori, Coimbra, Oeiras, Linda-a-Velha, and Denmark) and 40 students from 2 universities (Instituto Superior de Técnico e Instituto Superior de Psicologia Aplicada) visited the IGC. We received 13 requests either to visit the IGC or to provide material or assistance in the development of experiments.

**Workshop Inspirar Ciência class of 2015. 25 high school Math teachers spent 4 days of intense scientific discussions and group work at IGC with 8 IGC scientists.**

**Online Education Resources**

The video “My genes: should or should I not know who I am?” is a new animation aimed at high school students. Launched in the beginning of 2015, it addresses genetic and heredity concepts, as well as societal and ethical aspects related to genome-generated knowledge, and it has 4200 views on YouTube.

**PUBLIC EVENTS**

**IGC presence at Belém Art Fest | 15-16 May, 2015**

In 2015, the IGC was invited to participate for the first time in Belém Art Fest, a music and art festival that takes place in 3 museums in Belém (Lisbon). An exhibition showing how different animals perceive nature, and a fluorescent room with luminescent biological samples were the activities taken to the festival. About 400 visitors passed by the IGC space.

**IGC presence at NOS Alive’15 | 9-11 July, 2015**

Science, music and art came together for the eight year running at the NOS Alive’15 music festival. During the three days of this major music and art event the main activities at the IGC corner were speed dating with scientists, a biodiversity game, a card game addressing tu...
mourn formation, a photo exhibition of the NOS Alive fellows, and molecular cooking (in partnership with the Cooking Lab company). Around 60 IGC volunteers made these activities possible for about 1500 young people who visited the IGC corner.

**IGC presence at GreenFest | 8-11 October, 2015**
During this year, the IGC was also invited to participate in GreenFest, a festival that addresses the environment and health sustainability. Ten scientists volunteered either to give a talk or participate in a speed-dating activity.

**FUNDRAISING**

The IGC develops an in-house programme aimed at raising private funds for science through fundraising initiatives with private companies, charities and the general public.

The IGC is under the Scientific Sponsorship Law. This law provides tax benefits for science-related donations by either individuals or companies.

**PROJECTS AND MAIN ACHIEVEMENTS IN 2015**

**THE IGC – EVERYTHING IS NEW (EIN) PARTNERSHIP: NOS ALIVE – IGC RESEARCH FELLOWSHIPS**
Established in 2007, the partnership between the Instituto Gulbenkian de Ciência (IGC) and Everything is New, promoter of the NOS Alive music festival, aims to bring science closer to the Portuguese society and to raise funds for scientific research. In addition to the IGC participation in the NOS Alive music festival, this partnership results in two research fellowships per year, funded by Everything is New, that allow young graduates to start their scientific careers. In 2015, Patrícia Santos and Margarida Araújo received a fellowship to develop one-year research projects at the Population and Conservation Genetics, and the Actin Dynamics research groups, respectively. These projects were carried out at the IGC with practical works in France and United Kingdom. Since 2008, over 400 young graduates around the country have applied to these fellowships, and 12 received a fellowship. In 2015, 2 NOS Alive-IGC alumni were conducting a postdoc abroad, 5 were doing a PhD, and the other 3 were pursuing research projects.

**ART AND SCIENCE PROJECTS**

**‘Musical Morphogenesis’**
Musical Morphogenesis is an interactive installation that translates in sound, light and movement the development of a flower, unveiling the role of genetic networks during that process. During 2015, work has been done to ameliorate and implement new features in this installation.

**Collaborators:** DESCObRiR – the Gulbenkian Education Programme for Culture and Science, LabMóvel, and Vitruvius FabLab - ISCTE-Instituto Universitário de Lisboa

**Sponsors:** Fundação Calouste Gulbenkian

**Composer in Residence: Camille van Lunen**
The French-Dutch composer and singer Camille van Lunen joined the IGC in October as Artist in Residence galvanising a torrent of musical engagement and activity from IGC members including forming a choir. Camille’s activity has also been generously supported by Risto Nieminen, Director of Gulbenkian Musica, and colleagues.

**FUNDRAISING ACTIVITIES ORGANISED BY THE IGC**
PhD DELEGATES AND POSTDOCTORAL COMMITTEE
Several fundraising activities (beer hours, wine hours, thematic parties, etc.) were organised in 2015 to raise funds for the 9th PhD AMeeGuS meeting and for the Postdoctoral retreat, via donations from attendees at the events, both from IGC staff and the general public.

**DESCRIPTION**
The IGC stands at NOS Alive’15 where around 60 scientists talked about science and performed hands-on activities during the 3 days of the festival.

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**COLEÇÃO CIÊNCIA – A PARTNERSHIP BETWEEN THE IGC AND VISTA ALEGRE**
A collection of porcelain products, Coleção Ciência, results from a partnership between the IGC and Vista Alegre, a prestigious and market leader Portuguese porcelain manufacturer. Young scientists obtained the original images of this collection, as part of their research at the IGC. Part of the money raised by selling this collection has been used in scientific meetings organised by the PhD students and postdocs from the IGC.

In 2015, the porcelain Coleção Ciência was available at the IGC and at the Calouste Gulbenkian Foundation.

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ACKNOWLEDGMENTS

We are grateful to everyone at the IGC - researchers, students and staff - who supplied information, text and images used in this report.

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The Instituto Gulbenkian de Ciência (IGC) Annual Report is also available to download from the IGC website at www.igc.gulbenkian.pt

If you would like to receive a copy of this report, on a USB memory stick, please contact:

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