## Index

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>2</td>
</tr>
<tr>
<td>Statistics</td>
<td>6</td>
</tr>
<tr>
<td>News 2011</td>
<td>9</td>
</tr>
<tr>
<td>Research Highlights</td>
<td>14</td>
</tr>
</tbody>
</table>

## Appendix

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full List of Staff</td>
<td>iii</td>
</tr>
<tr>
<td>Research Output</td>
<td>xiv</td>
</tr>
<tr>
<td>Education Output</td>
<td>xliv</td>
</tr>
<tr>
<td>Other Activities</td>
<td>xlvi</td>
</tr>
</tbody>
</table>
Introduction

What is ITQB

The Instituto de Tecnologia Química e Biológica (ITQB) is an academic research centre of the Universidade Nova de Lisboa. Its mission is to carry out scientific research and post-graduate teaching in Chemistry, Life Sciences, and associated technologies, while also serving the community and performing university extension activities for the promotion of science and technology.

ITQB’s highly multidisciplinary nature makes it a leading centre for advanced training of researchers in Portugal. With 63 independent teams in 2011, ITQB hosts over 400 researchers, including 145 PhD students, with different backgrounds and research interests, who benefit from outstanding research facilities, equipment, and scientific support services, some of which unique in the country.

ITQB further coordinates the largest Laboratório Associado, a status attributed by the Portuguese Government in recognition of scientific excellence, as determined by international evaluation panels. This consortium includes the Instituto Gulbenkian de Ciência (IGC), the Instituto de Biologia Experimental e Tecnológica (IBET), and the Centro de Estudos de Doenças Crónicas (CEDOC), and has competencies and expertise ranging from the molecule to clinical trials.

Research

The quality of the research at ITQB is reflected in its contribution to the overall national publications in Nature and Science as leading institution (20% in 2006-2010), in the number of papers annually published in WoS journals and in the impact of research (263 papers and over 7300 citations in 2011).

Research at ITQB is mainly supported by contracted projects (upon evaluation) with national and international R&D funding agencies such as Fundação para a Ciência e Tecnologia and the European Commission.

Opportunities for industrial applications sometimes arise from research developed at ITQB. Collaboration with industry, patent submissions or the creation of start-up companies are the paths to follow from lab to business. This competence is mainly carried out by ITQB’s association with IBET, the largest private, non-profit biotechnology research organization in Portugal.

ITQB Research Groups are organized into five Research Divisions - Chemistry, Biological Chemistry, Biology, Plant Sciences, and Technology. Collaboration between divisions is strongly encouraged.

All scientific matters at ITQB are overseen by the Scientific Council, formed by elected PhD holders, and the Scientific Advisory Board.

Education

ITQB’s highly multidisciplinary nature makes it a leading centre for the advanced training of researchers in Portugal. Education at ITQB is thus strongly embedded in its research activities. The Pedagogical Council oversees the educational activities at ITQB.

ITQB PhD Program

The focus of research education at ITQB is the PhD Program, with a strong component of research complemented by seven curricular units to which students should commit a tenth of their time. The PhD course reflects the highly multidisciplinary nature of the institute and aims to provide a broad perspective of Chemistry, Life Sciences and Bioengineering, and prepare students for their future careers.

- Advances in Chemistry and Structural Biology (4 ECTS)
- Trends in Microbial and Cell Biology (4 ECTS)
- Frontiers in Biotechnology (3 ECTS)
- Research Training (9 ECTS)
- Free Option (4 ECTS)
- Bioentrepreneurship (3 ECTS)
- Science, Culture and Society (3 ECTS)
- Thesis (270 ECTS)
Master Research Projects
ITQB welcomes master’s students who wish to develop their research at the institute; students then defend their theses at their host universities. Every year, in March, ITQB laboratories announce the available research projects for the coming curricular year. Potential students are invited to visit the labs and talk directly with the researchers and other students.

Master's Degree Programs
ITQB participates in two master’s degree programs in collaboration with other units from Universidade NOVA de Lisboa.

Master's Course in Medical Microbiology with the Instituto de Higiene e Medicina Tropical, Faculdade de Ciências Médicas, and Faculdade de Ciências e Tecnologia, aims to train specialists in microbiology skilled in the application of advanced laboratory techniques for diagnoses, for microbiological research, and for quality control and certification of microbiology laboratories.

Master's Course in Science Communication with the Faculdade de Ciências Sociais e Humanas focuses on the particularities of communicating science to different audiences, be this via media, via formal and informal education, or directly from research institutions.

Research Training
Training can take different formats, ranging from a small regular participation in the lab activities to a one-year research project.

- **Post-Graduation Courses**
  - Scientific Research Training A - 60 ECTS

- **University Extension Courses**
  - Scientific Research Training B (Graduates / Masters) - 40 ECTS
  - Scientific Research Training C (Graduates / Masters) - 30 ECTS
  - Scientific Research Training D (Graduates / Masters / Undergraduates) - 15 ECTS
  - Research Integration (Undergraduates) - 16 ECTS

Support Services
Researchers at ITQB are supported by technical and administrative staff in a number of areas (see organizational flowchart). These support services include:

- **Science Management** collaborates with researchers in identifying potential funding sources and in the application process.
- **Projects Office** supports researchers in applying for and managing projects.
- **Academics Office** centralizes information regarding advanced education at ITQB.
- **Accounting and Treasury** offers accounting support to all financed projects, manages all purchases and payroll processing, and is responsible for the inventory and property.
- **Lab Management** coordinates the purchase and maintenance of scientific equipment for ITQB and supervises common scientific equipment.
- **Washing Room** conducts washing and sterilization of material and culture media.
- **Industry Liaison Office** offers support in the management of intellectual property and technology transfer, and contracts with industry.
- **Information Technology (IT) Support** offers computational support.
- **Storages** handles the purchase, storage, and supply of materials and reagents.
- **Maintenance Support** oversees the maintenance of the building and all infrastructures.
- **Communication Office** manages institutional and scientific communication.

Additionally, some scientific support services are also available to outside researchers and companies:

- **Analytical Services Unit ITQB/IBET**: analytical development, validation and testing of chemicals and biologicals and studies on candidate pharmaceutical products according to OECD Good Laboratory Practices Principles.
- **Centro de Ressonância Magnética António Xavier (CERMAX)** with several NMR spectrometers (300, 400, 500 and 800 MHz), including the highest field NMR spectrometer in Portugal. It is part of the National NMR Facility.
- **Library**: maintains ITQB publication records and manages bibliographic databases.
- **Teaching Laboratory**: designed and equipped to support the teaching activities in areas ranging from Biochemistry to Genetics.
- **Greenhouses**: manages the cultivation of plants for research purposes.

See full list of staff in the appendix (page iii)
Research Groups

Chemistry

Bioorganic Chemistry and Peptide Design
Olga Iranzo

Biorganic Chemistry
Rita Ventura

Colloids Polymers & Surfaces
António Lopes

Coordination and Supramolecular Chemistry
Rita Delgado

Homogeneous Catalysis
Beatriz Royo Cantabrana

Micro-heterogeneous Systems
Eurico de Melo

Organic Synthesis
Christopher Maycock

Organometallic Chemistry
Carlos C. Romão

Single Molecule Processes
Yann Astier

Biological Chemistry

Bacterial Energy Metabolism
Inês Cardoso Pereira

Metalloproteins and Bioenergetics Unit
Manuela M. Pereira

Biological Energy Transduction
Carlos Maria Franco Frazão

Metalloenzymes and Molecular Bioenergetics
Miguel Teixeira

Biomolecular NMR
Manolis Matzapetakis

Genomics and Stress
Candida Rodrigues-Pousada

Macromolecular Crystallography Unit
Pedro Manuel Marques Matias

Membrane Protein Crystallography
Margarida Archer Frazão

Structural Genomics
Maria Arménia Carrondo

Inorganic Biochemistry and NMR
Ricardo Saraiva L. Oliveira Louro

Microbial & Enzyme Technology
Lígia D. Martins

Molecular Genetics of Microbial Resistance
Lígia M. Saraiva

Molecular Interactions and NMR
Patrick Groves

Molecular Simulation
António Baptista

Mössbauer Spectroscopy
Filipe Tiago de Oliveira

Protein Biochemistry Folding & Stability
Claudio M. Gomes

Protein Modelling
Claudio M. Soares

Raman Spectroscopy
Smilja Todorovic

Biology

Bacterial Cell Biology
Marina G. Pinho

Bacterial Cell Surfaces and Pathogenesis
Sérgio R. Filipe

Bacterial Signaling
Karin B. Xavier

Cell Physiology and NMR
Helena Santos

Cell Signaling in Drosophila
Pedro Domingos

Control of Gene Expression
Cecília M. Arraião

Glycobiology
Julia Costa

Infection Biology
Lucas Jaime Mota

Lactic Acid Bacteria & In Vivo NMR
Ana Rute Ramos Neves

Microbial Development
Adriano O. Henriques

Microbiology of Human Pathogens Unit
Hermínia de Lencastre

Molecular Genetics
Rafael S. Leão

Plant Sciences

Disease and Stress Biology
Ricardo Boavida Ferreira

Forest Biotech
Célia Miguel

Genomics of Plant Stress
Margarida Oliveira

Technology

Analytical Chemistry
Luís Vilas Boas / Maria da Rosário Bronze

Antibiotic Stress and Virulence of Enterococci
Fatima Lopes

Applied and Environmental Mycology
Cristina Silva Pereira

Biomolecular Diagnostic
Abel Oliva

Animal Cell Technology Unit
Cidália Peres

Cell Bioprocesses
Ana Sofia Coroainha

Cell Line Development and Molecular Biotechnology
Paula M. Alves

Molecular Microbiology of Human Pathogens
Manuel J.T. Carrondo

Food Microbial Technology
Peter F. Lindley

Genomics of Plant Stress
Teresa Crespo

Mass Spectrometry
Ana V. Coelho

Microbiology of Man-Made Environments
José Canongia Lopes

Molecular Thermodynamics
Luís Paula N. Rebelo

Nutraceuticals and Delivery
Catarina Duarte

Pharmacokinetics and Biopharm. Analysis
Peter Alfred Donner

Phys. of Environment Conditioned Microbiota
Vitoria San Romão

Systems Biodynamics
Andreas Bohn

Invited and Visiting Professors

Alessandro Giuffrè | Fast Kinetics
Alexander A. Konstantinov | Bioenergetics
Alexander Tomasz | Microbiology
Daniel H. Murgida | Raman Spectroscopy
David Edward Onions | Virology / Vectorology
David L. Turner | Biology

Hansjörg Hauser | Eukaryotic Molecular Biology
John G. Aunins | Bioprocess Engineering
Jonas Almeida | Biometrics
José Artur Martinho Simões | Chemistry
José Canongia Lopes | Molecular Simulation
Maria Teresa N. Duarte | Crystallography

Kenneth R. Seddon | Ionic Liquids
Peter Alfred Donner | Biotechnology
Peter F. Lindley | Structural Biology
Peter G. Hildebrandt | Raman Spectroscopy
Robert Archibald Samson | Plant Pathology
Statistics 2011

63 Research Groups
423 Researchers
(plus 47 trainees)

PhD holders 184
- Permanent staff 25
- Other institutions 22
- Laboratorio Associado 19
- Ciencia 2007 18
- Ciencia 2008 6
- MIT-Portugal 2
- Post Doctoral Fellows 92

PhD students 145
- Integrated into research groups
- BI fellows 94

Researchers in the last five years

Average group size 6.8 researchers
Group leaders by gender 33 female / 29 male
Group leaders by nationality 53 Portuguese / 9 other
PhD holders by gender 119 female / 65 male
PhD holders by nationality 145 Portuguese / 39 other
PhD students by gender 106 female / 39 male
PhD students by nationality 134 Portuguese / 11 other

Post Doctoral Fellows 92

PhD holders

PhD students by discipline
Chemistry 157
Biology 166
Biology 190
Biotechnology 184

PhD students

BI fellows

Post Docs
Others
274 Research Articles

ISI journals 263
Other peer review articles 10
Book chapters 26
(see full list in the Research Output Section)

Average number of papers per group 4.4
Average number of papers per PhD holder 2.97
(excluding post-docs)

Citations 7315
Total ITQB papers (1990-2011) 2,626
Total ITQB citations (1990-2011) 51,300

h-index 83

Average citations per paper 27.4
Considering a paper’s maturation time of three years (includes all ITQB papers until 2008 and the corresponding total citations to date)

Highly Cited Papers 27
Papers included in the Highly Cited Papers list by Essential Science Indicators SM (Thompson Reuters): top 1% of articles by total citations in each annual cohort from each of the 22 disciplines (updated as of Jul 1, 2012 to cover a 10-year plus 4-month period, Jan 1, 2002-Apr 30, 2012)

146 Research Projects

124 Fundação para a Ciência e a Tecnologia | 9 European Commission | 7 European Commission (individual grants)
1 Fundação Calouste Gulbenkian | 1 Ministério da Defesa | 2 Pfizer Contract
1 Sudoe Interreg IV B Programme | 1 Georgia Institute of Technology

Projects by division (number and amount in M€)

Projects in the last five years

In the 2011 FCT call for projects, ITQB researchers successfully secured 17 projects (and 7 as participants). These are not included here.
Statistics

PhD Theses distribution
- 23 Biology
- 14 Biochemistry
- 4 Chemistry
- 4 Technological and Engineering Sciences

PhD Theses since 1995: 268

Registered PhD students: 249
including 104 PhD students from IGC (as of 31 December 2011)

New PhD students in 2011: 56

Concluded Post-graduation Courses: 11

Overall budget 12.76 M€

Funding sources in the last five years:
- Ciência Programme 15.9%
- LA 26%
- Research Projects 26.3%
- State Budget 24%
- Others 7.8%

Most ITQB PhD students and post-docs are financed directly through FCT fellowships. The chart below depicts ITQB’s budget including this figure (2.3 M€).
News 2011
Prizes and Awards

Individual distinctions

Karina B. Xavier
Appointed as International Early Career Scientist of the Howard Hughes Medical Institute.

Cristina Silva Pereira
Selected for 2nd evaluation round (interview) of ERC Starting Grant Call (classification excellent; not funded).

Hermínia de Lencastre
Professor Nicolau van Uden Prize attributed by The Portuguese Society for Microbiology (SPM) to award an outstanding researcher for his/her lifetime contributions in the field of microbiology.

Rita Ventura
Selection and Participation in Cohitec Program 2011 (successfully concluded in 2012).

Claudina Rodrigues-Pousada
Elected fellow of the AAAS (American Association for the Advancement of Science).

Research distinctions

Cláudio Gomes
Award Terry Fox - Liga Portuguesa contra o Cancro for project ‘Amyloidogenesis of the S100A8/A9 cytokine as an anti-proliferative mechanism in prostate cancer’ (2011-2013).

Catarina Duarte
First prize of the 2nd edition of the “Nutrition Awards” promoted by the Portuguese Association of Nutritionists, in the category of “Innovation and Development of Products and Services”, with the project “Extracto de cereja obtido por tecnologia supercritica – um agente quimioterapêutico natural para o cancro do cólon”.

António Roldão

Leonor Norton

Maria Miragaia
51st ICAAC Infectious Disease Fellows Award. Chicago, USA.

Rita Sobral
European Society of Clinical Microbiology and Infectious Diseases (ESCMID) Research Grant “The association of extracellular DNA to the Staphylococcus aureus surface: roles and mechanisms.”

In scientific meetings

Best oral communication
Catarina Franco, Romana Santos, Ana Varela Coelho
“Exploring the proteome of an echinoderm nervous system: 2-DE of the sea star radial nerve cord and the synaptosomal membranes subproteome”

Best poster
Bruno Fonseca, Catarina Paquete, Alexandra Alves, Ricardo O. Louro
“Characterization of multiheme cytochromes from Shewanella oneidensis MR-1: A key step for the optimization of Microbial Fuel Cells”

Best poster award in Bacterial and Animal Proteomics
Catarina Franco, Renata Soares, Romana Santos, Ana Varela Coelho
“Differential phosphoproteome of the regenerating radial nerve cord of the sea star M. glacialis”
2nd International Congress on Analytical Proteomics, Ourence, Spain.

Best poster on Microbiology Research
Catarina S. Pereira
“Phosphoenolpyruvate phosphotransferase system regulates detection and processing of the quorum sensing signal Autoinducer-2.”
Attributed by The Portuguese Society for Microbiology and sponsored by The American Society for Microbiology in MICROBIOTEC’11.

Best poster
Mafalda Xavier Henriques
“Synthesis of capsular polysaccharide at the division septum of Streptococcus pneumoniae is dependent on a bacterial tyrosine kinase” at the Cellular Microbiology and Pathogenesis Symposium.

In Scientific Journals

Awarded with the Editors selection of the American Chemical Society (2011) as ranked 1st of JCED among circa 500 publications of high impact in the field.

Ranked 1st in the Most Read Articles of JCED in 2011.
Happenings

Happenings at ITQB in 2011
For a full list of seminars at ITQB in 2011, see appendix

New ITQB Direction appointed
Luis Paulo N. Rebelo
M. Margarida Oliveira
Cláudio M. Soares

ITQB PhD Course ’11
The 2011 ITQB PhD course started in January 17 with an informal opening session presenting the structure and the contents of the curricular units.

Open Day – “Aqui há química!”
Celebrating the International Year of Chemistry, the 7th annual Open Day was organized with the theme of the Nobel Prizes.

What would you ask a Nobel Prize winner?
Discussion session with Ada Yonath, Nobel Prize in Chemistry 2009

InterBIO
Symposium Frontiers in Protein Research
5 - 7 May, 2011, Oeiras, Portugal
Cláudio M. Gomes & Miguel Teixeira, Chairs
Organising committee C. Gomes, M. Teixeira, A. Sanchez, A. Veiga, L. Conceição

4th CERMAX practical course on basic NMR
14 - 17 June 2011, ITQB, Oeiras, Portugal
Helena Matias, Manolis Matzapetakis, Patrick Groves, Pedro Lamosa

ITQB Day
Celebrating ITQB’s integration in UNL
8 July 2011

Awarded Best PhD Thesis Prize 2010
Thesis on systems biology by António Roldão

New ITQB Direction appointed
Luis Paulo N. Rebelo
M. Margarida Oliveira
Cláudio M. Soares

4th CERMAX practical course on basic NMR
14 - 17 June 2011, ITQB, Oeiras, Portugal
Helena Matias, Manolis Matzapetakis, Patrick Groves, Pedro Lamosa

ITQB Day
Celebrating ITQB’s integration in UNL
8 July 2011

Awarded Best PhD Thesis Prize 2010
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INTERBIO
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Cláudio M. Gomes & Miguel Teixeira, Chairs
Organising committee C. Gomes, M. Teixeira, A. Sanchez, A. Veiga, L. Conceição

Protein Data Bank roadshow
5 May, 2011, ITQB, Oeiras, Portugal
Pedro Matias, local organizer
Business opportunity for vaccine stabiliser
ITQB's team successfully completes COHiTEC Program

August

Masters Course in Science Communication starts
Innovative course coordinated by FCSH and ITQB

September

European Researchers Night
Pavilhão do Conhecimento, Lisboa
23 September

October

Workshop on “Basic Experimental Techniques in Biological Dynamics”,
European Science Foundation (ESF) Networking Program “Functional Dynamics
in Complex Chemical and Biological Systems”
5-9 September 2011, ITQB, Oeiras
Adriano Henriques, scientific and organizing committee

International Interbio Summer School on Structural Biology
“NMR applications in Protein Research”
26 September - 1 October, 2011, Oeiras, Portugal
Manolis Matzapetakis, local organizer

November

2nd ITQB PhD Students Meeting starts
Young scientists discuss ongoing research projects

CCPN Europa 2011
Supporting best practices in Biomolecular NMR

December

“Differential gel electrophoresis (ETTANTM 2D-DIGE) - Check it with your own samples”
GE Healthcare hands-on training workshop
October 2011, ITQB, Oeiras, Portugal
Carla Pinheiro and Ana Coelho, organizers

Extraordinary success of internal fundraising campaign
An open letter from the Director of ITQB

Present and Future of Cork Oak in Portugal
21 October 2011, ITQB, Oeiras, Portugal
Margarida Oliveira, Nelson Saibo, Célia Miguel and Cândido Pinto Ricardo, organizers

Be Green Challenge
Relaunch of the energy saving campaign with a new challenge: video competition of green ideas

Green Re_Store
A new system for researchers to recycle and trade laboratory items

RNEM Course on Protein identification by Mass Spectrometry
2 November 2011, ITQB, Oeiras, Portugal
Ana Coelho, organizer

Science & Technology Week
During the Science & Technology Week, researchers went to schools to talk with students about what is like to be a researcher at ITQB.
Other Meetings and Courses organized by ITQB Researchers

Annual Meeting of the EU project
Sustainable water use securing food production in dry areas of the mediterranean region (SWUPMED) and an Open Seminar
3-6 May 2011, University of Évora, Évora, Portugal
Manuela Chaves, member of the organizing committee

FEBS combined practical and lecture course Chemistry of Metals in Biological Systems
15-22 May 2011, Louvain-la-Neuve, Belgium
Ricardo Louro, member of the organizing committee

Young Scientist Forum
23 - 25 June 2011, Torino, Italy
Claudina Rodrigues-Pousada, member of the organizing committee

9-12 September 2011, Cascais, Portugal
Mariana G. Pinho, Sérgio R. Filipe, and Adriano Henriques, local organizing committee

Floresta 2050 Pensar o Futuro
6-7 October 2011, INRB, Oeiras, Portugal
Pedro Fevereiro and Célia Miguel, members of the organizing committee

10th Short course of the Portuguese Biophysical Society “Nanosciences for Life”
17-19 November 2011, Santarém, Portugal
Cláudio M. Soares, Lígia Martins, and Manuela M. Pereira, members of the organizing committee

Forest sustainability and the global climate changes
Seminar in the context of the International Year of the Forests
25 November 2011, Academia de Ciências de Lisboa, Lisboa, Portugal
Manuela Chaves, member of the organizing committee

International Symposium on Applied Bioinorganic Chemistry
2-5 December 2011, Barcelona, Spain
Olga Iranzo, member of the organizing committee
Members of scientific committees

Cândido Pinto Ricardo
Portuguese member of the Managing Committee COST Action nº FA0603 “Plant Proteomics in Europe”

Carla Pinheiro
Portuguese member of the Managing Committee COST Action nº FA0603 “Plant Proteomics in Europe”

Catarina Duarte
Member of the Scientific Committee of the 1st Iberian Meeting on Natural Bioctives Entrapment for Food Industry - Challenges and Perspectives, from nanotecnology to bioavailability
May, 2011, Lisbon, Portugal

Cecília M. Arraiano
Member of the Scientific Committee of the XXXVI Jornadas Portuguesas de Genética
May 2011, Coimbra, Portugal

Claudina Rodrigues-Pousada
Member of the Scientific Committee of the 38th of the FEBS Congress
June 2011, Torino, Italy

Helena Santos
Permanent Member of the "International Organizing Committee" in the series of conferences "International Congress on Extremophiles"

Member of Scientific Committee of the Microbiotec11 - Congresso Nacional de Microbiologia e Biotecnologia
December 2011, Braga, Portugal

Júlia Costa
Member of Scientific Committee of the 9th International Meeting of the Portuguese Carbohydrate Group / 5th Iberian Carbohydrate Meeting.
4-7 September 2011, Vila Real, Portugal

Karina B. Xavier
Member of the searchcommittee for Associate Professorship at the Department of Biology, University of Copenhagen

Luis Paulo N. Rebelo
Permanent member of the council of chairs, congresses on Ionic Liquids (COIL)

Member International Scientific Advisory Committee for the 4th Congress on Ionic Liquids (COIL4)
2011, Washington D.C., USA

Member International Scientific Committee for the Faraday Discussions on Ionic Liquids
August 2011, Queens University, Belfast

Member Scientific Committee of the 2nd Iberian Meeting on Ionic Liquids
July 20-22, 2011, Corunha and Santiago de Compostela, Spain

Member of “Comissão Científica na área da Química-Física no XXII ENSPO”
3-6 June, 2011, Braga, Portugal

Member of Editorial Board Program Harvard Medical School Portugal

Member Scientific Committee, Basic Experimental Techniques in Biological Dynamics
September 2011, ITQB, Oeiras, Portugal

Manuel J. T. Carrondo
Member of the Scientific Committee of Clinigene Network of Excellence.
Member of the Advisory Board of PBS Biotech (California 2010)

Manuela Oliveira
Member Scientific Committee of workshop “Present and Future of Cork Oak in Portugal”
21 October 2011, ITQB, Oeiras, Portugal

Member Scientific Committee of Congress “XXXVI Jornadas Portuguesas de Genética”, 30 May - 1 June, 2011, University of Coimbra, Coimbra, Portugal

Member Scientific Committee of XII Congreso Hispano-Luso de Fisiologia Vegetal, 21-24 June, 2011, Universidad Jaume I de Castellón, Spain

Paula M. Alves
Member of Scientific Board, PEACE Protein Expression in Animal Cells (PEACE) Conference
Member of Scientific Board, RPP Conference on Recombinant Protein Expression organized by the Section on Microbial Physiology of the European Federation of Biotechnology

Pedro Fevereiro
Member Scientific Committee of Model Legume Congress
15 – 19 May, 2011, Sainte Maxime, France

Raquel Sá Leão
Invited member of the Technical Advisory Group for Systematic Review to Assess Pneumococcal Serotype Replacement of World Health Organization (WHO)

Vanessa J. Pereira
Member of Programme Committee of the International Conference Micropol & Ecohazard 2010-2011 - the 7th International Water Association specialist conference on assessment and control of micropollutants/hazardous substances in water
11-13 July 2011, Sydney, NSW, Australia
Bioorganic Chemistry
Rita Ventura rventura@itqb.unl.pt

Bacterial populations use cell-cell communication in order to coordinate their behaviour and function in such a way that they can adapt to changing environments. Chemical communication among bacteria is called “quorum sensing”. Autoinducer-2 (AI-2) regulates inter-species quorum sensing. Because AI-2 regulates behaviours of human pathogens such as Vibrio cholerae, there is great interest in the discovery of non-natural quorum sensing modulators for applications in the treatment of bacterial infections.

In 2011, our group synthesised new DPD analogs with a new stereo-center at C-5 (4,5-dihydroxyhexanediones (DHDs)), using the same synthetic strategy developed to synthesise DPD,2 but starting from (R)- and (S)-methyl lactate instead of methyl glycolate. (S)-4,5-dihydroxypentane-2,3-dione (DHD) is the uncyclized precursor of AI-2. The biological activity of the new analogues was tested by the Bacterial Signaling group in two bacteria with different AI-2 receptors. (4S,5R)-DHD was a synergistic agonist in E. coli while it was an agonist in Vibrio harveyi, displaying the strongest agonistic activity reported so far (EC50 = 0.65 μM) in this organism. Thus, introduction of a substituent at C-5 has an influence on biological activity, the configuration of the newly created stereocenter was very important as shown by the (5R)-isomer being more active than the (5S)-compound. These results open the way to developing novel methods to manipulate quorum sensing for controlling bacteria.

Rui F. et al. (2012) Bioorg Med Chem, 20, 249
Ascenso O.S.(2011) Bioorg Med Chem, 19, 1236

Colloids Polymers and Surfaces
António Lopes alopes@itqb.unl.pt

Recently, controlled release from biocompatible materials has received much attention for biomedical applications. Due to their biocompatibility and biodegradability dextrans appear as promising polymeric materials if one is able to regulate their rheological properties and encapsulation efficiency. In 2011 we developed and characterized graft polymer temperature responsive hydrogels from dextran and N-isopropylacrylamide (NIPAAm).

The medium swelling ratio obtained (correlated with the gel degree of substitution) is of crucial importance for any material to be applied as biomaterial. Moreover, the surface energy values obtained suggest that adhesive forces between the gel and the skin will prevail against the intermolecular forces of the gel, resulting in the adherence of the films to the epidermis.

The gels obtained possess a thermosensitive behavior at temperatures close to physiological temperature (the so called LCST, a thermal transition occurring at 32.5°C). This property is mainly due to changes in the balance between hydrophilic/hydrophobic forces with the surrounding medium molecules and the break of hydrogen bonds between PNIPAAm and water molecules. This is also the driving force for the fine tuning of the release pattern of an antiemetic drug (used to treat nausea and vomiting, frequently following chemotherapy) - Ondansetron® - which was entrapped in the final gel and which exhibits a huge differentiation on the release profile at 25 and 37°C.
**Coordination and Supramolecular Chemistry**

**Rita Delgado**  delgado@itqb.unl.pt

Trinuclear copper clusters play a central role in biological catalysis by ubiquitous multicopper oxidases. The study of model complexes of these systems should provide better understanding of the biological molecules and assist in the development of new catalysts and new types of magnetic materials.

With this in mind we have studied a macrobicyclic hexaamine with pyridyl spacers (pyr) which is able to coordinate three copper(II) ions within its cavity. Our results showed that the trinuclear species predominate in solution from pH 5.0, and that the hydroxo complexes start forming at unusually low pH values in order to minimize the electrostatic repulsions arising from the build up of positive charge in the macrobicyclic cavity.

X-ray diffraction determination of crystals of the trinuclear copper complex grown at pH ≈ 6, revealed the presence of carbonate (formed by spontaneous CO2 uptake from air) bridging the three copper centres, see Figure. CO2 fixation derives from the nucleophilic attack of the hydroxo group of the [Cu3pyrOH]5+ complex on the electrophilic carbon of CO2. Apparently, the ability of pyr to bring into close proximity three metal ions plays a crucial role in lowering the pKa of coordinated water molecules, which permits CO2 fixation to occur without need for high pH. In addition the architecture of pyr allows a perfect fit of the carbonate anion between the copper centres promoting its encapsulation.


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**Homogeneous Catalysis**

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In 2011, we were exploring the use of chiral oxo-molybdenum complexes as catalysts for the asymmetric epoxidation of olefins. Catalytic olefin epoxidation is a major industrial technology. During the last decade, considerable effort has been directed towards the development of enantioselective epoxidation protocols using chiral molybdenum catalysts. However, little success has been achieved up to now. The weak coordination of ligands to molybdenum center is probably the main reason why all attempts to develop enantioselective epoxidations have failed.

In our group, we have prepared new cis-dioxomolybdenum complexes containing non-labile chiral oxazoline ligands in order to obtain robust catalysts. We have investigated the catalytic efficiency of these novel species in the epoxidation reaction using conventional solvents and ionic liquids (ILs) as reaction medium. Our oxazoline-based catalysts exhibited excellent activity and chemoselectivity when the epoxidation reaction was carried out in a pyrrolidium-based IL; epoxidation of (R)-limonene exclusively gave trans (R)-limonene 1,2-epoxide.

In addition, we have disclosed a synthetic pathway for the preparation of pure chiral cyclopentadienyl-functionalised ligands bearing N-heterocyclic carbens and oxazoline ligands. Coordination of these ligands to Ir, Rh, and Mo allowed the preparation of enantiomerically pure metal complexes. Preliminary catalytic studies showed the promising potential of these novel species in catalysis.

da Costa A.P. et al. (2011) Organometallics, 30(16), 4437
Research Highlights

Our work in 2011 continued the current research line in structural properties of lipid assemblies. Along this year we studied the lateral thermal expansion of lipid bilayers and the structure of the stacking of ceramides and ceramide-containing mixtures.

The lateral thermal expansion of bilayers was, until our work last year, a very difficult parameter to determine and the only measurements made were done in systems far from the conditions found in the membranes of living organisms. Another key value in lipid research unknown until now, the equilibrium lamellar repeat distance, was also determined as a function of temperature for POPC, the main constituent of most biological membranes [1].

In mammals the main barrier against transepidermal water loss and external xenobiotic aggression is the lipid-filled extracellular space of the cornified part of the epidermis, the stratum corneum, which is mainly composed of ceramides, cholesterol and fatty acids. The way in which the lipids are organized seems to be the key to the stratum corneum protective properties but is still a question of debate. The work developed this year intends to prove that the supramolecular lipid organization is a consequence of the presence of fatty acids and of their state of ionization.

Valério J. et al. J Phys Chem B, 166(1)168

Micro-heterogeneous Systems

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Our work in 2011 continued the current research line in structural properties of lipid assemblies. Along this year we studied the lateral thermal expansion of lipid bilayers and the structure of the stacking of ceramides and ceramide-containing mixtures.

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Valério J. et al. J Phys Chem B, 166(1)168

Organic Synthesis

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Small nitrogen containing molecules have been shown to be good candidates for screening for kinase inhibition and possible treatments for tumor control. A great deal of effort has been expended on the formation of diarylamines and arylated amines in general.

The formation of the amino-aromatic (C-N) bond has been the subject of many research papers but most methods use expensive metal catalysts. Aliphatic ketones of cyclohexene in principle could serve as precursors to aromatic (phenyl) rings. During the acid catalysed ring opening of strained nitrogen containing containing the bicycloheptane system, arylamines were formed albeit in small quantities. By adjusting the acidity of the medium we were able to obtain N-phenylated amines in good yield from the bicyclic aziridines.

Using mechanistic logic we were able to find a one pot method to carry out this transformation starting from the corresponding cyclohexenone and a primary amine in the presence of a catalyst. This gave very good yields of arylamines. Changing the substitution patterns we have been able to make a very wide range of compounds in a very simple way thus demonstrating the scope of the method. Using parallel reaction technology it will be possible to generate large libraries of new compounds for biological screening.
Carbon Monoxide (CO) is a feared poisonous gas formed by incomplete combustion of fuels. Being colourless, tasteless and odourless its concentrations rise unnoticed to toxic levels that cause a large number of casualties every year, worldwide. Surprisingly, CO is constantly produced in our body, and even more surprisingly, it plays a large number of physiological roles. Its anti-inflammatory and anti-apoptotic properties, among others, are extremely useful for therapeutic purposes, and exposing sick animals to a CO containing atmosphere cures many diseases. However, for many reasons CO inhalation is not an adequate practical therapy. Instead, CO-Releasing Molecules (CO-RM) have been developed. These prodrugs survive in circulation and reach the diseased tissues where some specific stimulus triggers their decomposition, and delivers CO where it is needed. In this way, sub-toxic CO levels are enough to achieve therapeutic efficacy. Organometallic compounds containing CO are the best CO-RMs so far. Our group and Alfama Lda. have led this research since its inception in 2002. The main hurdle is to design biocompatible, stable, non-toxic CO-RMs that only decompose where CO is needed. This implies the understanding of the reactions of organometallic CO-RMs with biomolecules. In 2011 we obtained the first structure of a CO-RM fragment attached to a protein \([\text{Ru(CO)}_2(\text{H}_2\text{O})_3(\text{his})]@\text{lysozyme}\); see picture), and patented the first drug-like CO-RMs for the treatment of liver diseases.


The BEM lab studies energy metabolism in environmentally important organisms with the aim to exploit their biotechnological potential. We have focused on a widespread group of organisms that breathe sulfur compounds, in particular sulfate reducing prokaryotes, which play a key role in the biogeochemical cycles of sulfur and carbon in anaerobic habitats, and are important players in Environmental Biotechnology. This group comprises organisms from quite different phylogenetic backgrounds including members of Archaea, Proteobacteria, Gram-positive organisms and thermophilic bacteria. In 2011 we carried out a comparative study of energy metabolism genes in 25 sequenced genomes of sulfate reducing prokaryotes. By comparing phylogenetically distinct organisms we identified the proteins that may comprise the minimal set required for this metabolic activity. In addition, this analysis revealed a higher diversity of possible energy conserving pathways than classically believed to be present in these organisms, and permitted the identification of new proteins not previously recognized in this group. This study allows a deeper understanding of the physiology of this group of organisms and provides a roadmap for future engineering of the organisms to enhance their technological applications.

Pereira, I. A. C. et al. (2011) Frontiers in Microbiology 2, 69
Energy transduction is the basis of life. Cells use different forms of energy, ATP or electrochemical membrane potentials, for solute import, building of their components, and motility. In living cells most energy is transduced by membrane proteins of the electron transfer chains during the processes of cellular respiration or photosynthesis. Complex I of respiratory chains catalyses NADH:quinone oxidoreduction, coupled to cation translocation across the membrane, thereby contributing to the establishment of the electrochemical potential. Complex I deficiencies have been implicated in several pathologies, namely neurodegenerative diseases such as Parkinson disorder. Although structural and functional data have been gathered for more than half a century, the mechanisms of energy transduction by complex I are still unknown. We made a major contribution to this subject by developing an original approach using \(^{23}\)Na-NMR spectroscopy, which allowed monitoring Na\(^+\) transport in membrane vesicles. We observed that Rhodothermus marinus complex I has two H\(^+\) translocating sites, one operating independently of the presence of Na\(^+\) and the other working as a Na\(^+\)/H\(^+\) antiporter. Further studies showed that this observation extended to complex I from E. coli but not to that from P. denitrificans. We hypothesized a correlation between the type of quinone used as substrate and the presence of the antiporter activity. Furthermore, based on results using a typical inhibitor of Na\(^+\)/H\(^+\) antiporters, we suggest that energy coupling in complex I occurs through an indirect mechanism.

Batista A.P. and Pereira M. M. (2011) BBA - Bioenergetics, 1807(3) 286

Our group is focusing on the structural and functional studies of proteins in solution using NMR. We have recently solved two protein structures by NMR in collaboration with the groups of Microbial Development and Cell Physiology and NMR. The first, RodZ, is a multi-domain protein, involved in morphogenesis and is widely conserved in both gram negative and gram positive bacteria. Its N-terminal domain (RodZ-N), located in the cytoplasm, has been shown to interact with Actin by functional and crystallographic studies in Thermotoga maritima. The Bacillus subtilis RodZ-N, has low homology (<30%) compared to its Thermotoga maritima homologue. Recent data on Bacillus subtilis suggest a potentially different cellular function for it possibly being involved in DNA organization. Our structural studies have revealed that the region of RodZ-N that is potentially interacting with DNA is more flexible than usual, a feature that is consistent with the potential for interaction.

The second study was on the structure of a triple mutant of the staphylococcal nuclease, a protein that has been used as a model for protein folding and stability by many groups. However the specific mutant that is of particular interest was not characterized in solution at high temperatures. The structure of that mutant was used as a basis for an extensive study of the dynamics behavior of the protein and the influence of compatible solutes on the mobility of the protein.

Arsenic (As) is an environmental pollutant thought to be a serious worldwide health threat. Chronic arsenic exposure is a cause of immense health distress as it accounts for the increased risk of various disorders including cancer. In spite of its toxic effects, this metalloid was first used to treat periodic fever and malaria, and actually is used as a potent agent against Acute Promyelocytic Leukaemia. The cellular As metabolism has been extensively studied by our group in order to understand its mechanisms of function. We have performed the genome-wide response of yeast to As having found the upregulation of genes encoding the anti-oxidant defenses as well as genes involved in the cellular iron (Fe) homeostasis. The mRNAs levels encoding genes collectively known as the Fe regulon are significantly induced with the exception of the FET3 and FTR1, of the high affinity iron uptake complex. FET3 mRNA destabilization under conditions of As stress is independent of ROS generation and is mediated by the major pathway for mRNA decay via the 5’-3’ exonuclease Xrn1. Moreover phenotypic analyses show that a fet3 mutant is more tolerant to As compared to the wildtype or xrn1 mutant, suggesting that Fet3, the mammalian ceruloplasmin ortholog, plays a role in As toxicity. In addition we also show that As specifically disrupts Fe homeostasis in mammalian cells, by decreasing the ferritin levels. Our work highlights a connection between arsenic and iron homeostasis, which could be relevant for clinical applications.


Extremophiles are microorganisms that can thrive under extreme environmental conditions (e.g., salinity, temperature, pH). Their resistance is due to the fact that they can synthesize a wide array of small molecular compounds (compatible solutes) which protect their cells against the deleterious environment. These substances have potential applications in biotechnology.

One of those substances is α-mannosylglycerate (MG), produced by the combined action of two enzymes: mannosyl-3-phosphoglycerate synthase, that catalyzes the transfer of a sugar ring from GDP-mannose to 3-phosphoglycerate, yielding mannosyl-3-phosphoglycerate; and mannosyl-3-phosphoglycerate phosphatase (MgpP) that removes the extra phosphate to produce the final product. A metal ion (Mg2+) is essential to the activity of these enzymes.

In 2011 we completed the structural elucidation of the two enzymes from the thermophilic bacterium Thermus thermophilus HB28, with the publication of the MgpP structure 1. This work was a collaboration with the Cell Physiology and NMR Laboratory (Helena Santos) and was funded by an FCT grant.

During catalysis, the enzyme oscillates between an open and a closed state and the enzyme activation results from binding of Mg2+.

In addition, we uncovered structural evidence for the formation of a short-lived PO3- intermediate, which is attacked by a nucleophilic water molecule to complete the catalytic reaction.

Gonçalves et al. (2011) Biochemistry 50(44) 9551
Inorganic Biochemistry and NMR
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The Inorganic and Biochemistry and NMR group is currently engaged in the study of the molecular bases for coupling exchange of electrons with exogenous solid substrates to energy conservation in several anaerobic organisms. These phenomena are at the basis of extracellular respiration or ore based anoxic photosynthesis carried out by sediment organisms, and it was shown that several multiheme cytochromes (MHCs) are responsible for the electron transfer between the cell and the solid substrate. However, although several of these proteins have been identified, the molecular details of the electron transfer process remains to be elucidated in most cases. In the IBN group this issue is being tackled by integrating structural, thermodynamic and kinetic data on the proteins of these bioenergetic networks. NMR spectroscopy is uniquely suited for collecting structural and functional information from several MHCs. However, in order to fully elucidate the role of MHCs in the biotechnological applications of these organisms for bioremediation and energy production, new approaches have to be developed to analyze cytochromes that are larger and contain more hemes. In 2011, a new strategy to produce recombinant MHCs in E. coli with isotopically labeled hemes was developed. This allows the ‘illumination’ of specific atoms in the hemes facilitating the spectral analysis and extraction of the functional and structural information.

Alves A. S. et al. (2011) Metallomics, 3(4) 349
Qian Y. F. et al. (2011) Biochemistry, 50(28) 6217

Macromolecular Crystallography Unit
Membrane Protein Crystallography
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We have been working on the structural and functional characterization of enzymes involved in dissimilatory sulfate reduction. This work is developed in collaboration with the Bacterial Energy Metabolism Laboratory at ITQB. Sulfate reduction is one of the earliest types of energy metabolism used by ancestral organisms to sustain life. Despite extensive studies, many questions remain about the way respiratory sulfate reduction is associated with energy conservation. A crucial enzyme in this process is the dissimilatory sulfate reductase (dSIR), which contains a unique siroheme-[4Fe4S] coupled cofactor. We have determined, by X-ray Crystallography, the first three-dimensional structure of a dissimilatory sulfate reductase isolated from a sulfate-reducing bacteria Desulfovibrio vulgaris. dSIR DsrAB subunits are bound to the DsrC protein forming an αβγγ assembly (see figure). A sulfite molecule, coordinating the siroheme, is found at the active site. The DsrC protein is bound in a cleft between DsrA and DsrB with its conserved C-terminal cysteine reaching the distal side of the siroheme. We proposed a novel mechanism for the process of sulfite reduction involving DsrAB, DsrC and a membrane complex. In light of this mechanism, a reassessment may be required for the models used to date ancient sulfur metabolism on geological samples based on sulfur isotope fractionations. A more detailed understanding of the steps involved in sulfate and sulfite reduction is requested.

Oliveira T.F. et al. (2008) J Biol Chem, 283(49) 34141
Oliveira T.F. et al. (2011) Frontiers Microbiol, 2, 71
Although oxygen is essential for many life forms, its presence in the cell leads inevitably to the formation of toxic products, such as hydrogen peroxide and the superoxide anionic radical (the so-called oxygen paradox). This occurs both in aerobes (namely at the level of the respiratory chain), and anaerobes, upon transient exposure to oxygen. Due to their toxicity, these Reactive Oxygen Species (ROS) are used by the innate immune system to combat invading pathogens. We have been studying enzymes that detoxify these species, in particular the superoxide reductases, to establish their catalytic mechanisms and the underlying principles of action. This has been accomplished by a combination of approaches – the study of site directed mutants and “natural variants” to elucidate the catalytic function of specific aminoacids, and the study of enzymes from different microbial sources. In 2011, we have studied the first example of a superoxide reductase from a eukaryotic human pathogen, the protozoan Giardia intestinalis, acquired from a prokaryote through horizontal gene transfer. We have determined that it is quite similar to the prokaryotic homologues, and that the reduction of superoxide by this enzyme occurs through an apparent two-steps process, resulting from a particular combination of the several microscopic rate constants. Its 3D structure was also determined, together with those from other organisms, enabling us to obtain structures of analogues of the catalytic states, i.e., to establish a firm ground for the proposed catalytic mechanism.

Testa F et al. (2011) Free Radical Bio Med, 51(8) 1567

Azo dyes are the major group of synthetic colourants used in industry and are serious environmental pollutants. The bacterial strain Pseudomonas putida MET94 was selected on the basis of its superior ability to degrade a wide range of structurally diverse azo dyes. Furthermore, by in silico screening, we have identified, cloned and characterized the enzyme involved in the decolourisation process of P. putida MET94: the azoreductase PpAzoR, shown to be a FMN dependent NADPH:quinone oxidoreductase. A bacterial system co-expressing the reductase ppazoR and the oxidase cotA-laccase was constructed and the utilization of this engineered strain for the treatment of model dye-containing wastewater resulted in up to 60-80% decolourisation and detoxification levels. Therefore this is a promising candidate for the biological treatment of industrial dye containing effluents.

Flavin-dependent azoreductases, such as PpAzoR, share strong similarities with regard to sequence, structure, and reaction mechanism with the larger family of quinone reductases, which are assumed to take part in the organism’s detoxification systems. Future studies with PpAzoR for which a crystal structure is already available provides a rich opportunity to probe structure-function relationships that are determinants of substrate specificity and mechanisms of promiscuity among the family of flavoproteins. Understanding the relative contributions of substrate binding vs. chemistry will enrich our understanding of enzyme evolution and ligand-protein interaction with important biotechnological implications.
Modified tetrapyrroles such as chlorophyll, heme, siroheme, vitamin B(12), coenzyme F(430), and heme d(1) perform essential biological functions in all domains of life. In 2011, we unraveled a new biosynthetic pathway of the prosthetic heme group, formed by an atom of iron contained in the center of an organic cyclic compound named porphyrin, a non-protein chemical compound required for the function of several essential proteins. Earlier studies suggested that heme biosynthesis in the sulfate reducing bacteria Desulfovibrio was different from the typical pathway known in other microorganisms. In fact, analysis of the Desulfovibrio genome showed the absence of the canonical genes involved in key steps of the tetrapyrrole biosynthesis. In the search for alternative enzymes, the biosynthetic pathway was in vitro stepwise reconstructed. By analyzing the several intermediate products it was possible to show that in Desulfovibrio the classical pathway branches and that siroheme is instead used for synthesizing heme. This pathway, designated as alternative pathway, is predicted to be also active in archaea.

Romão C.V. et al. (2011) PNAS, 108(1) 97
Bali S. et al. (2011) PNAS, 108(45) 8260

The MI-NMR lab uses DOSY methods to study molecules that have NMR spectra: proteins, DNA, polymers, detergents, ionic liquids, etc. We collaborate with a large number of labs.

Diffusion NMR (DOSY) provides a technique to measure the size of a molecule. This means DOSY can tell us if a molecule is singular (monomer) or interacts with itself to form a discrete complex (dimer, tetramer etc.). DOSY is also sensitive to some changes in molecular shape. In paper 1, DOSY is used to show that the association of a steroid with a RNA structure results in a more compact structure. This data agrees with other experimental data collected in Australia and Canada.

We also used DOSY to study the physical properties of ionic liquids that were correlated with their crystallization properties (paper 2).

Reinstein O. et al. (2011) Biochemistry. 50(43) 9368
Molecular Simulation
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Our group used computational simulation methods to perform the first extensive structural characterization of peptide dendrimers, which are tree-like synthetic molecules composed of standard and bifurcated amino acids. Often used as agents for catalysis, binding and drug delivery, their bio-compatibility and proteolytic resistance makes them promising biomedical targets. Their behavior should be largely determined by their three-dimensional structure, but all experimental attempts were unable to reveal any structural details, thus hindering their truly rational design.

Our simulations indicated that, unlike globular proteins, none of the studied dendrimers favors a preferential folded structure, displaying instead a very high conformational diversity. Despite this lack of a folded structure, two clearly distinct behaviors were observed in terms of compactness. The analysis of conformational clusters indicated that the energy landscapes depicting their structural preferences are mostly flat, markedly contrasting with the funnel-like landscapes of proteins.

This study shows that peptide dendrimers have a complex conformational behavior that cannot be easily inferred from their chemical formula. Together with available experimental data, molecular simulation studies can help to reveal the function-structure determinants of these molecules and lead to a more rational design.


Protein Biochemistry Folding & Stability
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The laboratory investigates the biology and biophysics of protein folding, an essential cellular process through which proteins acquire a functional conformation. Protein misfolding is a hallmark in several human diseases, and in recent years we have been investigating this process from different perspectives: protein aggregation mechanisms in neurodegeneration (toxic gain of function) and protein misfolding and destabilization in metabolic disease (loss of function). The latter include defects in fatty acid oxidation, a group of rare diseases in which genetic mutations inactivate key metabolic enzymes by affecting their biogenesis, stability and degradation. In these cases, small molecules with the ability to raise functional levels of the affected protein above the disease threshold have proven valuable tools for effective drug design.

In 2011 we published a pioneer study showing that cell metabolites such as cofactors and substrates are stabilizers of enzymes affected in these folding disorders. We found that physiological concentrations of these small molecules resulted in a spectacular enhancement of enzyme stabilities and prevented inactivation during conditions simulating in vitro fever episodes. The relevance of these findings is two-fold. First, it contributes to understanding how proteins behave under conditions near those of cell physiology. Secondly, it points that substrate analogs and cofactor precursors (e.g. Vit B2) which recover proteins with inherited folding difficulties have the potential to become lead compounds for drug development.

Lucas T.G. et al. (2011) BBA - Mol Basis Dis, 1812(12) 658
Research Highlights

Protein Modeling
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Living cells must exchange products with their surroundings. Some of these changes require specific membrane proteins, which at the expense of energy, transport substances into out of the cell. ITQB researchers from the Protein Modeling and Molecular Simulation Labs set out to see how energy promotes transport and by computer simulation obtained a picture of the protein structural changes occurring in the process. The findings, published in the journal Proteins, provide new clues to the mechanism of the so called ABC transporters. The cellular energy currency is ATP: when ATP molecules are broken down, the released energy can be used. ATP binding cassette (ABC) transporters are able to break down ATP – in their catalytic domain - for unidirectional transport of solutes across the membrane – through their transmembrane domain. In their work, researchers compared the structure of an ABC transporter before and after ATP hydrolysis and observed that the structural changes at the catalytic sites are propagated throughout the transporter, leading to the opening of the channel. This observation suggests that the ATP energy is only required for the gate opening. Researchers believe that these computational results provide further details about the transport process that may now be tested experimentally.


Raman Spectroscopy of Metalloproteins
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We have employed a combination of recently developed experimental and computational methods in the studies of caa3 oxygen reductase and its truncated subunit II (Cyt-D) in the presence /absence of the physiological electron donor, HiPIP. The main experimental technique was time-resolved surface-enhanced resonance Raman (TR-SERR) spectroscopy under Q-band excitation, which is capable of providing simultaneous information on the structure of the adsorbed protein, electron transfer (ET) kinetics and orientational dynamics. The results reveal the domains of Cyt-D that are most likely involved in binding to HiPIP and to the CuA-containing domain of subunit II. In addition, we have identified the optimal electron transfer pathways in terms of electronic couplings, both for electron entry and exit, and determined the ET reorganization energy of Cyt-D. This work represents a first step towards disentangling the inter- and intra-protein ET mechanisms in a complex multi-subunit protein using a novel strategy that is likely to be effective in assessing redox properties in similar systems.

Macromolecular Crystallography Unit
Structural Biology
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We have been using X-ray diffraction to determine 3D pictures of minute biological reactors, aiming to understand their working mechanisms. Numerous microorganisms oxidize sulfur for energy conservation and contribute to the global biogeochemical sulfur cycle. *Acidianus ambivalens*, a thermoacidophilic archaeon found in volcanic vents, transforms inorganic sulphur with assistance of oxygen into sulphur metabolites. The reaction occurs within nano-reactors built up by 24 sulphur oxygenase reductase molecules. Their surface contains 6 hydrophobic chimney-like protrusions that work as elemental sulphur entry portals. Reactors include 24 catalytic centres composed of iron sites and cysteine persulphides, at positively charged inner compartments accessible only from the inside.

In order to map sulfur internal pathways and to highlight catalytic residues, several point mutations and inhibition procedures were constructed, and corresponding 3D structures determined. Surface “chimneys” are not essential for the reactor activity, they presumably control the access of hydrophobic sulphur to the inner hollow. Products exit might occur via hydrophilic channels, with 8 outlets at 3-fold symmetry axes. Enlargement of both openings increased enzyme activity by several-fold. In contrast, the inner passage to the catalytic centre cannot be opened without decreasing the specific enzyme activity. Further studies are under way.

Urich T. et al. (2006) Science, 311(5763) 996
Veith A. et al. (2011) Frontiers Microbiol, 2, 37

Macromolecular Crystallography Unit
Structural Genomics
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RuvBL1 and its homolog RuvBL2 are evolutionarily highly conserved AAA+ ATPases essential cellular activities. They play an important role in chromatin remodeling, transcriptional regulation and DNA damage repair. RuvBL1 and RuvBL2 are overexpressed in different types of cancer and interact with major oncogenic factors, such as β-catenin and c-myc, regulating their function. We solved first three-dimensional crystal structure of the human RuvBL complex with a truncated domain II and showed that this complex is competent for helicase activity. The complex is a dodecamer consisting of two heterohexameric rings with alternating RuvBL1 and RuvBL2 monomers bound to ADP/ATP, that interact with each other via the retained part of domain II. Interestingly, the truncation of domain II led to a substantial increase in ATP consumption of RuvBL1, RuvBL2 and their complex. In addition, we gathered experimental data to demonstrate that DNA unwinding of the human RuvBL proteins can be autoinhibited by domain II. Our data give new insights into the molecular arrangement of RuvBL1 and RuvBL2 and strongly suggest that the in vivo activities of these highly interesting therapeutic drug targets are regulated by cofactors inducing conformational changes via domain II in order to modulate the enzyme complex into its active state.

Gorynia S. et al. (2011) J Struct Biol, 176(3) 279
In the laboratory of Bacterial Cell Biology we study cell division and antibiotic resistance, using as a model organism the Gram positive pathogen Staphylococcus aureus, one of the major causes of antibiotic resistant hospital-acquired infections worldwide. Besides its clinical relevance, S. aureus is also a very interesting model to study cell division because it has a different shape and mode of division from the traditional, widely used, model organisms Escherichia coli and Bacillus subtilis: it has spherical cells and, more interestingly, it divides in three consecutive perpendicular division planes over three division cycles, similarly to the first divisions of a fertilized egg. We are very interested in understanding how staphylococcal cells “remember” previous division planes so that they keep dividing in orthogonal planes. We have recently discovered that the direction of chromosome segregation determines the plane of division in S. aureus. The information regarding the space occupied by the chromosome is transmitted to the division apparatus via a protein, called Noc, which binds to specific regions of the DNA, more abundant near the origin of replication. As Noc is an inhibitor of the initiation of the formation of the division septum, its presence close to DNA origin of replication prevents the formation of the septum in that region of the cell, therefore determining the localization of the division plane. Understanding how bacterial cells divide is of major importance for the development of new strategies to prevent bacterial division, which constitutes the ultimate aim of antibiotics.

Henriques M.X. et al. (2011) Mol Microbiol, 82(2) 515
Atilano M.L. et al. (2011) PLoS Path, 7(12) e1002421

We recently reported two observations that highlight how the highly organized cell surface of bacteria may reduce the ability of the infected host to detect an invading bacterial pathogen. Streptococcus pneumoniae are encapsulated bacteria normally found encircled by one of the more than 90 different capsule types. These polysaccharides can reduce the deposition of complement host proteins and prevent trapping of the bacteria by the host immune defenses. We have shown that pneumococcal bacteria rely on two proteins, Wzd and Wze, expressed by almost all the different serotypes, to guarantee their full encapsulation. These proteins localize at the bacterial division septum and coordinate, through a yet unknown mechanism, the synthesis of capsule with the synthesis of the other components of the cell surface. Staphylococcus aureus is a proficient bacterial pathogen, known for its ability to cause lethal infections and resist different classes of antibiotics. We reported that the absence of wall teichoic acids, phosphate rich glycopolymers that are attached to peptidoglycan, can lead to increased binding of a peptidoglycan receptor produced by Drosophila flies. Lack of teichoic acids can also result in a reduction of the host susceptibility to infection by S. aureus bacteria. We have proposed that wall teichoic acids limit the access of innate immune receptors to peptidoglycan at the bacterial surface allowing the bacteria to evade detection by the host.

Henriques M.X. et al. (2011) Mol Microbiol, 82(2) 515
Atilano M.L. et al. (2011) PLoS Path, 7(12) e1002421
**Bacterial Signaling**

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In 2011 our laboratory and the “Centro de Ressonância Magnética António Xavier” at ITQB, in collaboration with the Swarthmore College in Pennsylvania, have revealed, how Escherichia coli catabolises the signal molecule used by several species of microorganisms to count their numbers. Many bacteria regulate gene expression as a function of the density of the population in a process called quorum sensing, which enables these organisms to coordinate important bacterial behaviours such as biofilm formation and the production of virulence factors. Quorum sensing is mediated by signal molecules called autoinducers. One autoinducer, Autoinducer-2 (AI-2), is produced by many species and can facilitate inter-species bacterial communication. The way the production of AI-2 is regulated has been known for some time, but its degradation was still not clear. Using in vivo and in vitro NMR, we have identified the key metabolites involved in the first step of AI-2 processing which involves the isomerisation of the phosphorylated signal molecule into an unstable intermediate (3,4,4-trihydroxy-2-pentanona-5-phosphate). The X-ray structure of this new isomerase allowed us to determine its active site, which was confirmed by site-directed mutagenesis. This discovery is important for new methodologies of quenching the interspecies signalling mechanisms, which are expected to be of great utility in the development of therapies to control bacterial behaviour as new alternatives to traditional antibiotics.

Marques J.C. et al. (2011) J Biol Chem, 286(20) 18331

**Cell Physiology and NMR**

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*Lactococcus lactis*, a fermentative bacterium used worldwide in the manufacture of dairy products, is among the best characterized species of Lactic Acid Bacteria. The wealth of knowledge in the fields of lactococcal genetics and physiology, combined with a “generally recognized as safe” status, a relatively simple metabolism, and a small genome, rendered *L. lactis* an attractive model to implement metabolic engineering strategies.

For the last decade our team has invested in the development of *L. lactis* strains with improved traits, such as higher acid resistance, or ability to produce useful chemicals. This goal involves an iterative optimization step in which strain characterization by *in vivo* NMR provides useful guidelines for further strain improvement. In 2011 our team constructed *L. lactis* strains able to produce high yields of 2,3-butanediol, a valuable bulk chemical, and mannitol, a natural sweetener with nutraceutical properties. The engineering strategy involved the overexpression of the pathways for the synthesis of these two polyols in a background with deficient lactate dehydrogenase activity.

Moreover, capitalizing on our earlier studies on acid stress response of Propionibacteria, we decided to introduce in *L. lactis* the missing genes for the synthesis of trehalose. This strategy led to de novo accumulation of trehalose by a strain that showed improved resistance to acid stress, a beneficial trait in the industrial and clinical applications of this bacterium.

Cell Signaling in Drosophila

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The aim of our research is to understand the molecular mechanisms that regulate degeneration of the photoreceptors, the cells that sense light in the visual system, using Drosophila as our biological model. Our most recent work focuses on the role of the Unfolded Protein Response (UPR), a cellular signaling pathway activated by the presence of unfolded proteins in the Endoplasmic Reticulum (ER), during photoreceptor degeneration in a Drosophila model for Autosomal Dominant Retinitis Pigmentosa. We use the tools of modern genetics, cell biology and imaging to pursue the signaling mechanisms that regulate cell death/cell protection in our biological model system.

We are performing a screen to identify modulators of UPR induced cell death in the Drosophila eye. The normal Drosophila eye is composed of around 800 clusters with 8 photoreceptors each. Over activation of the UPR induces a “glossy” eye phenotype, caused by the death of the exterior cell types of the eye. This “glossy” eye phenotype is used as an assay to identify suppressors or enhancers of UPR-induced cell death.

Control of Gene Expression

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Bacteria have intricate strategies to cope with changes in the outside world. For instance, the expression of the main outer membrane proteins is regulated by small RNA molecules, which do not encode for proteins. These small RNAs are in turn regulated by the activity of RNA-degrading enzymes. Our group has uncovered this regulation in the pathogenic bacterium Salmonella typhimurium, pointing to a gene silencing mechanism similar to that of higher organisms. Small RNAs bind specifically to messenger RNAs (the ones encoding proteins) and can trigger their degradation and thus control protein expression. One of the stories in which our group was involved in 2011 focuses on MicA, a small non-coding RNA (70nt), implicated in the regulation of the bacterial envelope composition. We discovered that the fine tuning of MicA requires mainly two ribonucleases; RNase E which degrades isolated MicA molecules, and RNase III which degrades MicA bound to its target.

Proteins similar to RNase III are major actors in RNA regulation in eukaryotes (higher organisms). In a process known as RNA interference or gene silencing, small RNAs bind to the RNA of specific target genes, promoting their degradation and impeding the production of the respective protein. The fact that, in Salmonella, MicA is cleaved by RNase III in a target-dependent fashion, with the concomitant decay of the mRNA target, strengthens the RNase III role in the regulation of gene expression, also in the bacteria.

Glycobiology

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Glycosylation is a common post-translational modification of proteins with more than 50% of glycoproteins being glycosylated in eukaryotes. It involves more than 500 glycosyltransferases in vertebrates. Since the glycosyltransferases that are expressed vary between cell types and under different conditions, the glycomes are characteristic of a certain cell or organism in specific conditions (physiological, pathological, etc.). A hallmark of tumor cell phenotype consists of changes in glycosylation of cell surface glycoproteins.

In 2011, we have used glycomics technology to characterize protein N-glycosylation from ovarian carcinoma cells. N-glycans from total proteins, secreted proteins, cellular fractions and secreted vesicles, also known as exosomes, have been analysed by lectin blotting, high performance anion exchange chromatography with pulsed amperometric detection and MALDI-TOF mass spectrometry. Most striking was the identification of the LacdiNAc structure (GalNAcβ4GlcNAc) in specific secreted proteins from the SKOV3 ovarian carcinoma cell line. Furthermore, secreted vesicles showed characteristic glycoprotein and N-glycosylation profiles. This work contributed to the knowledge about protein glycosylation in ovarian carcinoma cells and derived exosomes. The results may provide the basis for future identification of cancer markers.

Machado E. et al. (2011) Glycobiology, 21(3) 376
Escrevente C. et al. (2011) BMC Can, 11, 108

Infection Biology Head

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We study molecular and cellular mechanisms underlying bacterial virulence, focusing on intracellular bacterial pathogens that multiply within host cells in unique pathogen-containing vacuoles. We aim to understand the mechanisms by which these pathogens manipulate mammalian host cells. As experimental models we use Chlamydia trachomatis, which belong to a large group of highly related obligate intracellular bacteria (Chlamydiae) and cause genital and ocular infections in humans, and Salmonella enterica, which are facultative intracellular bacteria that cause gastrointestinal and systemic diseases in humans. Like other bacterial pathogens, Chlamydia and Salmonella employ specialised secretion systems to inject mammalian host cells with effector proteins, which subvert host cell functions to benefit the bacteria. Ongoing research includes: i) identification and characterisation of novel C. trachomatis effectors and of effector-chaperone pairs (effector secretion frequently involves characteristic chaperones - with a low MW, an acidic pl, and which do not bind or hydrolyze ATP); ii) functional analyses of Inc proteins of C. trachomatis (Incs are a group of Chlamydiae-specific effectors, representing ~5% of the coding capacity of chlamydial genomes); and iii) function of Salmonella effectors that subvert host cell membrane transport trafficking, a theme about which we co-authored a review article in 2011.

Streptococcus pneumoniae is a major human pathogen that causes a multitude of diseases. Given this, the majority of pneumococcal studies have focused on factors related to host-pathogen interactions. Thus, the knowledge of basic physiology is limited, even though the ability to cause disease relies largely on the metabolism of nutrients.

In Gram-positive bacteria, the transcriptional regulator CcpA is at the core of catabolite control mechanisms. In S. pneumoniae, links between CcpA and virulence have been established, but the role of CcpA in life-style has not been studied. In 2011 we were involved in a project that investigated the impact of CcpA on pneumococcal physiology by combining genome-wide transcriptomics with metabolite analysis. This work was performed in collaboration with the team of Prof. Kuipers (RUG, NL).

We showed that CcpA is a global regulator influencing multiple cellular processes including virulence, regulatory networks and central metabolism. Our results support the view that S. pneumoniae optimizes basic metabolic processes, likely enhancing in vivo fitness, in a CcpA-mediated manner. We found that CcpA modulates the expression of virulence factors and unveiled an unforeseen link between CcpA and the association of surface macromolecules, generally key players during the infectious process, to the cell wall. The insights gained from this comprehensive analysis foresee CcpA as a key factor in the interaction between S. pneumoniae and its host.

Positive auto-regulation of a transcriptional activator during cell differentiation or development often allows the rapid and robust deployment of cell- and stage-specific genes and the routing of the differentiating cell down a specific path. Positive auto-regulation, however, raises the potential for inappropriate activity of the transcription factor. We have unraveled the role of an anti-sigma factor, CsfB, in a negative feedback loop that prevents ectopic expression of the cell type-specific sigma factor $\sigma_G$ of Bacillus subtilis. Normally, $\sigma_G$ is activated in the forespore, one of the two chambers of the developing cell, at an intermediate stage in spore development. Once active, a positive feedback loop allows the rapid accumulation of $\sigma_G$, and the robust expression of a large gene regulon. The study of the ITQB team now shows that activation of this positive feedback loop is prevented in non-sporulating (vegetative) cells, through the $\sigma_G$-dependent production of CsfB. The negative feedback loop thus established, effectively counteracts the positive loop involving $\sigma_G$, thereby limiting the ectopic activation of the sigma factor across the cell population. The study also identifies an asparagine residue conserved among $\sigma_G$ orthologues, which is critical for the binding and inhibition of $\sigma_G$ by CsfB, and whose substitution is sufficient to confer immunity to the anti-sigma factor.

Serrano M. et al. (2011) PLoS Genet, 7(8) e1002220
Research Highlights
Annual Report 2011

**Microbiology of Human Pathogens Unit**

**Molecular Genetics**

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The genetic determinants and enzymes that catalyze the multiple steps in the assembly of bacterial cell wall peptidoglycan have been known for some time. However, the mechanism by which the glutamic acid residues of this structure undergo modification to glutamine has remained unknown. In 2011, our laboratory has identified the two genetic determinants, widespread among gram-positive bacteria, murT and gatD, that are responsible for the completion of the chemical structure of the cell wall of the important human pathogen *Staphylococcus aureus*. The MurT and GatD proteins have sequence similarity to the substrate-binding domains of Mur ligases (MurT) and to the catalytic domain of CobB/CobQ-like glutamine amidotransferases (GatD), respectively. We observed that the reaction of amidation of the stem peptide of *S. aureus* peptidoglycan takes place in the lipid phase of biosynthesis and is totally dependent on the activity of both proteins which operate as an enzymatic complex. The availability of a conditional mutant allowed us to modulate this system and thus recognize the importance of glutamine residues for growth rate, *β*-lactam antibiotic resistance and sensitivity of the staphylococcal cell wall to the host defense factor lysozyme. In summary, the MurT/GatD enzymatic complex is responsible for catalyzing a secondary modification of *S. aureus* peptidoglycan, suggested to be an essential factor for bacterial survival and at the same time, an important virulence factor.

Figueiredo T.A. et al. (2012) PLoS Pathog, 8(1) e1002508

**Microbiology of Human Pathogens Unit**

**Molecular Microbiology of Human Pathogens**

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In our group we are studying the nasopharyngeal ecosystem, a niche frequently inhabited by potentially pathogenic bacteria such as *Streptococcus pneumoniae* (or pneumococcus). Colonization by pneumococci, which is typically asymptomatic, is frequent among young children. Although disease, per se, is incidental in the lifestyle of these bacteria, the overall burden is substantial worldwide. In recent years, multivalent pneumococcal conjugate vaccines, targeting a limited subset of the circulating capsular types, have been introduced in several countries. As the capsular types targeted by these vaccines are the ones most frequently associated with antibiotic resistance, widespread use of conjugate vaccines has been postulated to result in a decline of antibiotic resistance rates. In Portugal, although use of these vaccines has been high, surveillance studies showed that no changes in antibiotic resistance rates have occurred among pneumococci colonizing young children. In 2011, we conducted a study aimed to elucidate the mechanisms underlying this surprising observation. By using a combination of molecular typing techniques, we were able to demonstrate that, in the vaccine era, maintenance of antibiotic resistance levels has resulted mainly from the expansion of antibiotic resistance lineages that are not covered by the vaccine and that were already circulating in the country – in low abundance – in the pre-vaccine era.
**Research Highlights**

**Disease and Stress Biology**

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In 2011 we were involved in a project that disclosed blackberries as a promising dietary approach to degenerative disease prevention, functional food development and new breeding programmes targeted on specific bioactivities. This project was conducted in collaboration with Animal Cell Technology Unit, Biology of Cytoprotection laboratory at CEDOC and The James Hutton Institute (Dundee, UK). Initially, we demonstrated the need to reproduce physiological conditions when using human cell models. Ascertaining the beneficial health effects of berries requires taking into account their journey through the body once eaten, which includes metabolite alterations as well as their physiological concentrations in human plasma. We found that digestion altered the phenolic chemical profile and antioxidant capacity of blackberry extract. Digestion also potentiated the neuroprotective effect: digested extracts were more effective than non-digested extracts in protecting brain cells from oxidation in vitro. Furthermore, this protection was not related to the antioxidant ability.

In a second stage of our study, we showed that digested extracts of wild blackberries native to the Portuguese flora (*Rubus brigantinus* and *R. vagabundus*) had a stronger neuroprotective effect than commercially available varieties. Further molecular analysis showed that the observed neuroprotection results from cellular adaptive responses that go beyond simple antioxidant effects. These findings also open a window for the protection of Portuguese native flora.


**Forest Biotech**

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Although a routine procedure to detect mutagenesis by DNA strand breakage in animal cells, the single-cell gel electrophoresis (“comet”) assay, is difficult to apply in plant material due to difficulties in obtaining suitable nucleoids (formed by DNA trapped in the agarose matrix after the cell lysis process) in either quality or quantity. A suitable protocol is described for the first time to perform the comet assay in conifer somatic embryogenic cultures by determining total DNA strand breakage in protoplasts, after having failed to acquire nuclei by standard mechanical techniques. The results show that protoplasts obtained from embryogenic cultures of the Norway spruce (*Picea abies*) are suitable to be lysed and surveyed for DNA damage through the standard alkaline version of the comet assay. Several common comet metrics were compared and all were found suitable for analysis, with the percentage of DNA in the comets’ tail (constituted by DNA fragments that migrated during electrophoresis), calculated by the proportion between tail fluorescence intensity and total nucleoid intensity, being simplest and the most sensitive to compare between control and hydrogen peroxide-treated cells. The established procedures may be useful, for instance, for a comparative evaluation of somatic embryogenesis protocols and the selection of less damaging treatments for clonal propagation or for mutagenesis-related studies with conifer cell cultures.

Costa P.M. (2012) Tree Genet Genomes, 8(2) 425
Genomics of Plant Stress (GPlantS)
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Over 2011, we have focused on the transcriptional regulation of the rice gene OsDREB1B that we showed to be highly induced by cold and also regulated by light. To identify novel TFs that bind to its promoter, a Yeast One-Hybrid system was used to screen a cold-induced cDNA expression library. Thus seven novel Zn Finger TFs were identified as binding to the promoter of OsDREB1B. Among them, there were four Zn Finger Homeodomain (ZF-HD) and three C2H2-type Zn Finger TFs. Protein-protein interaction studies revealed the formation of homo and heterodimers among the identified ZF-HD TFs, but not for the C2H2-type. The transactivation assays in Arabidopsis proplasts, showed that all these TFs repressed the expression of OsDREB1B and that the dimerization observed between the ZF-HD TFs may play a role on their transactivation activity. Our results suggest a prominent role of Zn Finger TFs in the regulation of OsDREB1B.

In addition, we have shown that the inducible expression of the OsDREB1B gene in response to both cold stress and light strictly correlates to an enrichment of specific histone modification marks related to a higher chromatin competency for transcription, e.g. acetylation and methylation of histone 3, namely H3K4me2, H3K9ac, H3K3me2, and H3K27me3. A huge network of transcription and epigenetic factors was identified. However, their interaction and functional meaning on the transcription regulation of stress-responsive genes must still be further investigated.

Santos A.P. et al. (2011) OMICS, 15(12) 839

Plant Biochemistry
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Water deficit (WD) accounts for high plant productivity losses. Physiological effects of WD are widely investigated but the early stages (2-4 days) of a slowly imposed plant WD have received less attention. Also, an integrated metabolic picture of the several plant organs is usually lacking. In a lupin drought study, water was withheld up to 13 days (13 DAW) and we daily monitored the soil water content (SWC) and measured the plant water status, the leaf gas-exchange, water-soluble carbohydrates, starch and hormones (1).

Principal component analysis (PCA) of the data shows all sampling dates as separate entities (figure). At 3 DAW, SWC had decreased by 12%, metabolic alterations had taken place and leaf conductance was affected, but plant water status and CO2 assimilation rate remained unaltered.

The initial soil WD effect on hormone balance does not seem to be explained just by long-distance transport effects, since transpiration was not significantly affected until 6 DAW.

We conclude that metabolic balances (hormone/hormone, hormone/sugar) of roots and leaves are responsible for triggering initial adjustment mechanisms not previously reported.

In 2011 we continued our focus on the production of recombinant proteins in plant based systems. We had shown earlier that Medicago truncatula cell suspension cultures are a good platform for production of recombinant proteins attaining high yields of the production at low cost with easy purification schemes. For this we used phytase, a glycosylated enzyme of fungal origin, as a model protein. We then moved to the more challenging production of human proteins and at the same time tested two other plant cell systems, Arabidopsis thaliana and Nicotiana tabacum. We expressed erythropoietin and prostaglandin D syntase of the lipocalin type (also known as ß-trace). Erythropoietin is a glycoprotein hormone that controls erythropoiesis and is used in the treatment of chronic anaemia. The current treatment for this condition is recombinant erythropoietin produced in mammalian cells which is an expensive system. ß-trace is the major protein in the human cerebrospinal fluid and is known to be involved in several physiological processes and disease onset. Given the high number of potential applications for this enzyme, the recombinant production of ß-trace can be a new and important research path for the putative use of this protein in therapeutics and diagnostics. So far we were able to produce both human proteins in our different plant cell systems and we are now optimizing production and purification processes. We also studied the subcellular deposition of the recombinant products in the plant cells, using immunolocalization and fluorescence and electron microscopy, in order to understand the subcellular trafficking of the proteins and better characterize our production platforms. In this figure we can observe the deposition pattern of ß-trace in the apoplast of transgenic Medicago truncatula leaves.
Environmental pollution is a critical concern worldwide and fungal bioremediation constitutes an elegant and environment-friendly solution. In 2011, we conducted studies which unravelled the degradation pathway of pentachlorophenol by Mucor plumbeus. This fungus efficiently transforms the xenobiotic to less toxic compounds through a series of oxidative–reductive dechlorinations and taking advantage of phase II conjugation reactions to keep low toxic intracellular levels. For the first time, sulfate–glucose conjugates were identified in fungi. Mucor plumbeus might play an important role in the protection of less tolerant strains in pentachlorophenol contaminated environments.

In the context of the remedial potential of filamentous fungi, we have identified several fungal strains from extreme soil biotypes, able to survive high concentrations of ionic liquids. This capacity might be related to the environmental pressure caused by high petroleum hydrocarbon load and, secondarily, by high salinity in soil. Our aspiration is to develop novel technologies, exploiting ionic liquids’ ability to augment fungal bioremediation. Ionic liquids’ rapid advance towards applications requires a comprehensive determination of their environmental, health and safety impact. Inspired by this, we have compiled an extensive and critical review focusing on ionic liquid environmental acceptability.

Carvalho M.B. et al. (2011) J Haz Mat, 198, 133
Deive F.J. et al. (2011) Green Chem, 13(3) 687

Grapevine varieties exhibiting differences in stomatal response to water deficit. Vitis vinifera has large genetic variation and knowledge of genotype/variety traits and related physiological responses to abiotic stress is still scarce. This limits the optimization of irrigation and breeding strategies for higher water use efficiency. Thermal imaging is a feasible technique to remotely measure plant’s temperature, and indirectly, assess plant’s transpiration and water status. The physiology behind this lies in the fact that when leaf stomata close, transpiration is reduced, leading to higher leaf temperatures as compared to leaves with open stomata. In field trials, we characterized five varieties by using thermal imaging and leaf gas-exchange: Aragonez, Trincadeira, Cabernet-Sauvignon, Syrah and Touriga Nacional.

Leaf temperature (Tleaf) determined by thermal imaging correlated negatively with stomatal conductance to water vapour (gs) in both trials. The inverse relationship between gs and Tleaf was highly significant in the afternoon. When comparing the five genotypes, they showed different Tleaf for similar water status (Ψpd). Leaf stomatal density did not correlate with gs suggesting that varieties have different stomatal control. Our results also show that combined measurements of canopy temperature and Ψpd can lead to better understanding of stomatal regulation in different grapevine varieties. Such variation in stomatal regulation should be taken into account in determining irrigation strategies.

Biomolecular Diagnostics
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The Biomolecular Diagnostic laboratory is a multidisciplinary research group specialized in the development of diagnostic tools applied in veterinary and biotechnology process. The group is collaborating with the Organic Chemistry lab in the development of nanoparticles (Quantum dots) towards application in veterinary or plant studies. The synthesis of CdS/ZnS nanoparticles, by an optimized laboratory protocol, has been achieved. The functionalization towards making it water soluble for application in biological experiments has been optimized and the conjugation of the functionalized nanoparticles with sugars or larger molecules like antibodies or antigenic proteins has been achieved. These highly stable fluorescence nanoparticles can be size-tuned for specific fluorescence emission. In a collaborative work with the CIN2 (Centre D’Investigació en Nanociencia) of the University of Barcelona, we achieved the deposition of the QDs onto surfaces using a ultra-violet matrix-assisted pulsed laser evaporation (UV-MAPLE) onto SiO2 glass substrates covered by silica thin films. The immobilized materials form self-organized 2D arrays constituted by complex CdSe/ZnS core_shell QDs preserving the functional properties of the base material used for the preparation of the MAPLE targets, which allows us to explore the nanoparticle-coated surface for key applications such as biosensors, lasers, or high performance electronic devices.

Animal Cell Technology Unit
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Human liver cell spheroids in extended perfusion bioreactor culture for repeated dose drug testing.

Primary cultures of human hepatocyte spheroids are a promising in vitro model for studies of hepatic metabolism and cytotoxicity. The lack of robust methods to culture cell spheroids, a poor characterization of the human hepatocyte spheroids architecture and of the liver-specific functionality has hampered the widespread adoption of this 3D culture format. At the Animal Cell Technology Unit, we developed long-term automated perfusion bioreactor cultures of primary human hepatocyte spheroids that maintain liver-specific activity. These cultures are suitable for drug testing in a long term, repeated dose format. The spheroids cultured for 3-4 weeks in serum-free conditions sustained phase I enzyme expression and permitted repeated induction cycles; the rate of albumin and urea synthesis, as well as phase I and II drug metabolizing enzymes’ gene expression and activity presented reproducible profiles, despite the basal inter-donor variability. Immunofluorescence microscopy after 3-4 weeks of culture confirmed the presence of liver-specific markers and suggested that the spheroids spontaneously assemble bile canalicular networks extending from the surface to the interior of the spheroids (Figure). Moreover, the excretion of a fluorescent dye by phase III membrane transporter activity was observed by live imaging, proving the functionality of the bile canalicular networks.

One of the most striking characteristics of echinoderms is their outstanding capacity for regeneration. Regeneration in echinoderms serves a wide range of biological purposes, the reconstruction of internal and external organs that are often subject to predation or amputation, allowing the complete functional regrowth of lost parts. Although echinoderms were the preferred animal models of the pioneer regenerationists, recently most areas of echinoderm research have been severely neglected. In our laboratory we aim to demonstrate that echinoderms are valuable and tractable animal models in different research areas. We do this by using different proteomic and mass spectrometry tools that allow us to characterize and relatively quantify the proteins being expressed in echinoderm tissues. In 2011 we brought new evidences to an old discussion concerning the similarity of echinoderms’ and vertebrates’ nervous systems. Sea stars lack a centralized brain. Instead, five radial nerve cords derive from a circular nerve ring that surrounds the mouth. The high throughput protein analysis of the radial nerve cord of the sea star *Marthasterias glacialis* revealed that many echinoderms’ nervous system proteins are similar to those of the rat’s spinal cord. Because the echinoderms and the vertebrates are actually more related than their appearance would suggest the work published was a significant contribution to understanding how the central nervous system has evolved.


In 2011, we were involved in projects that focused on testing and combining different water treatment processes - nanofiltration, direct photolysis and advanced oxidation processes - as a multi-barrier approach to guaranteeing the production of water with high microbiological and chemical quality.

Experimental and model fluency, and time-based direct and indirect rate constants were obtained and the model used to predict how the degradation of different compounds could be improved under different experimental setups. Several parameters that influence photolysis were determined and photolysis by-products were identified by mass spectrometry. The formation of photolysis by-products was found to be highly dependent on the source waters. The integration of nanofiltration previously to low pressure ultraviolet direct or indirect photolysis reduces the level of turbidity as well as the micropollutant contamination levels in drinking water supplies, due to rejection based on size exclusion and molecular interactions with the nanofiltration membrane surface.

The integrated process is extremely efficient at removing all the target microorganisms and chemical pollutants from real water matrices and guarantees the production of water of extremely high quality, able to cope with future more stringent regulations. This multi-barrier approach will also reduce the amount of final disinfection needed and thus the level of disinfection by-products in the water.

Sanches S. et al. (2011) J Haz Mat, 192(3)1458
Pereira V.J. et al. (2012) Sep Purif Technol, 95, 89
Molecular Thermodynamics
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Increasing concern about environmental issues, as well as the establishment of new regulations, has recently directed the attention of the scientific community to novel processes based on greener technologies. Ionic liquids have been seen as a possible alternative in an uncommonly broad range of research areas.

In 2011 we published our first results on the use of ionic liquids to tune crystallization of inorganic salt solutions. A systematic dependence between the size of the precipitating crystalline particles and the limiting molar conductivity of ILs has been found. The response of the crystal formation process to the presence of specific ILs has been used to extract information about some particular properties of ILs that modify the crystal hydration environment.

In parallel, a successful process to extract lipolytic enzymes based on an aqueous biphasic system, which uses both ILs and a high charge-density inorganic salt, was revealed. In the proposed methodology, ILs are exploited both as withdrawal solvents and as media for catalytic applications.

Another example of our current research includes the use of NMR studies to reveal the dissolution mechanism of nucleic acid bases in ILs. The results show that hydrogen bonds dictate the dissolution mechanism and that both cations and anions participate in the solvation process.

Lastly, studies of the thermophysical properties of ILs and mixtures over broad ranges of temperatures and pressures have been measured. For the first time an extensive assessment of viscosity was reported.

Deive F.J. et al. (2011) Green Chem, 13(2) 390
Tariq M. et al. (2011) Fluid Phase Equilib, 301(1) 22

Nutraceuticals and Delivery
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In 2011, the team of the Nutraceuticals and Controlled Delivery lab was awarded the 1st prize of the second edition of the “Nutrition Awards”, in the category of “Innovation and Development of Products and Services”.

The awarded project on “Cherry extract obtained from supercritical technology — a natural chemotherapeutical agent against colon cancer” aimed at developing functional ingredients with applications in the pharmaceutical and food industries. The project follows a sustainability strategy. On the one hand, it makes use of waste from processing cherries of the Portuguese variety, “Saco da Cova da Beira”. On the other hand, it applies supercritical fluids, a clean technology, that allows the extraction of pure compounds of increased value, with high pressure gas (e.g., CO2) leaving no trace of solvents, a downfall of traditional methodologies. The cherry extract contains a powerful anticancer compound, namely perillyl alcohol, and has been shown to inhibit the proliferation of human colon cancer cells. Additionally, it induced cell cycle arrest at a different checkpoint than doxorubicin (a well-known anticancer active principle) suggesting that it can be used in combination with this drug to enhance the inhibition of tumor survival.

Pharmacokinetics and Biopharmaceutical Analysis

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In 2011, we initiated a project for studying carboxylesterase 2 (CES2), which is an enzyme that is responsible for the metabolism of certain ester drugs in the intestine. Most people are interested in studying liver metabolism. In our group, we believe that a deeper insight into what happens prior and during drug absorption in the intestine is at least as relevant in pre-clinical development of orally administrated drugs as what happens in the liver. Currently available in vitro methods for human intestinal metabolism still lack some biological relevance and, therefore, one of our research interests lies in the development of improved cell lines for metabolism. We came across some difficulties with the distinction between the activity of different esterases and this has motivated us to develop a capillary electrophoresis method to solve this problem. We have therefore devised a rationale involving specific substrates and inhibitors which do not interfere with the detection of the product, the capillary electrophoresis method. The method is successfully and routinely applied to the evaluation of cells overexpressing human CES2 and to several mammalian sera, using extremely small amounts of sample in comparison with traditional spectrophotometric methods.


Stress by Antibiotics and Virulence of Enterococci

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Have you ever wondered how bacteria realize they are inside the host? And once there, where in the host? These questions are particularly important for bacteria, such as Enterococcus faecalis, that are both part of our body’s commensal microbes and able to cause serious infections in hospitalized patients. In an attempt find answers, we together with Jan Kok (University of Groningen, NL) analyzed the E. faecalis response to three metal ions that could help bacteria discriminate between different environments. When entering the body, both via mouth or through the skin, E. faecalis come across different tissues and barriers. Since their behavior is different in different organs, tissues or body fluids, bacteria must be able to modulate gene expression according to the environment. Metal ions, such as zinc, copper and manganese, have different concentrations in different fluids and are thus likely candidates for discrimination. By comparing E. faecalis subject to low and high concentrations of ions, we were able to identify genes that behave differently, more or less active, under different circumstances. Further analysis revealed that metal ions trigger, or tone down, the expression of genes necessary for E. faecalis colonization and virulence and might thus be important for the outcome of the interaction between bacteria and host.

Abrantes M.C., Lopes M.D. and Kok J. (2011) PLoS ONE, 6(10) e26519
In 2011, the Systems Biodynamics Group, in close collaboration with the Bioinformatics and Computational Biology Unit of the Instituto Gulbenkian de Ciências, concluded the development of the bioinformatics platform CorkOakDB.

This platform consists of a database which harbors so called Expressed Sequence Tags (ESTs) of the Portuguese national tree, the cork oak (Quercus suber), which were obtained from RNA samples taken by the member laboratories of the Cork Oak ESTs Consortium (http://coec.fc.ul.pt) from diverse tissues of cork oaks growing under a variety of environmental conditions.

In order to extract this biological knowledge from the pool of ESTs, a computational workflow, or pipeline, was deployed to the CorkOakDB platform. This pipeline assembles the ESTs into longer sequences, which are then annotated, i.e. compared with genomic information obtained in other organisms, in pre-established association with proteins, metabolic pathways etc. These annotations can be accessed through the platform’s web-interface and are used in studies related to the physiology, ecology and biotechnology of cork oaks.

A specific feature of the CorkOakDB is its highly transparent workflow, which allows us to understand exactly how the output of the pipeline was generated; thus it fosters its reuse in future cork oak research projects.

Two publications describing the functionality and obtained sequence information are currently in preparation.
Appendix

Full List of Staff iii

Research Output xiv
Projects and publications by group
Internationalization
Publications
Running Projects
Participation in Scientific Meetings

Education Output xliv
PhD Theses
Master Theses
University Extensions Courses

Other activities xlv
Editorial Boards
Seminars at ITQB
Science and Society
Full List of Staff
as per December 31st 2011

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Human Resources
Head: Maria Cristina Pinto
Ana Luísa Cruz
Goretti Rocha
Maria Madalena Pereira

Mailing and Archives
Artur Freitas

R&D Planning and Management
Head: Maria de Lurdes Conceição
Cristina Amaral
Cristina Lopes
Cristina Oliveira
Isabel Murta

Legal Advisor
Anabela Simões

Academics
Ana Portocarrero
Fátima Madeira
Scientific, Technological and Teaching Support

Scientific Services

**Nuclear Magnetic Resonance CERMAX**  
Coordinator: Helena Santos  
Manager: Pedro Miguel Lamosa  
Helena Pereira Matias  
João Pires

**Analytical Services Unit**  
Coordinator: Teresa Crespo  
Vice-coordinator: Rosário Bronze  
Quality Assurance Unit: Ana Luísa Simplício

**Analytical Team**  
Ana Maria Varela Coelho  
Elizabete Pires  
Maria da Conceição Almeida  
Camila Kocci  
Renata Soares  
Rui Palhinhas  
António Ferreira  
Sandra Silva  
Mário Patrício  
Paula Chicau  
António Pires  
Fernanda Spinola Rodrigues  
Cristina Pereira  
Ana Fulgêncio  
Paula Isabel Alves

**Archive**  
Paula Neves  
Isabel Ribeiro

**Small Molecule X-Ray Crystallography**  
Isabel Bento

**Fermentation Unit**  
Coordinator: Miguel S. Teixeira  
João Carita

**Lab Manager**  
Cláudia Almeida

**Teaching Laboratory**  
Coordinator: Adriano O. Henriques  
Teresa Baptista da Silva

Library

Librarian: Susana Lopes  
Library Advisory Committee  
Chairman: Miguel Teixeira  
Carlos C. Romão  
Adriano O. Henriques  
Margarida Oliveira

Washrooms

Coordinator: Teresa B. da Silva  
Ana Cristina Barreiros  
Carmen Fernandes  
Helena Vilaranda  
Lúcia David  
Maria Alice Ferreira  
Maria Eugénia Santos  
Pilar Campos  
Sónia Serrano  
Sónia Moita

Workshop and Maintenance

Head: Henrique Campas Nunes  
Alexandre Maia  
Aníbal Ribeiro  
António Ramalho  
Miguel Rodrigues  
João Carlos Zanão Simões  
José Luís Liberato  
Luís Gonçalves  
Nuno Soares  
Nuno Monteiro  
Rómulo Correia  
Tiago Escóbar

Computer Systems Support

Coordinator: Carlos Frazão  
Executive coord.: Daniel F. Branco  
Carlos Manuel Cordeiro  
Hugo Gonçalo Cordeiro  
José Miguel Loureiro  
Maria Manuel Rato  
Rui Miguel Alves
Research Divisions

Chemistry

Bioinorganic Chemistry and Peptide Design

Olga Iranzo, Investigador Auxiliar
Kotha Laxma Reddy
Íris Cristina da Luz Batalha
Ana Margarida Carvalho Dias
Sara Raquel Rato Pires
Ana Filipa Pereira Fragoso

Post Doc
PhD Student
PhD Student
BI

Organic Synthesis

Christopher Maycock, Professor Associado FCUL
Suvenud Sekhar Dey
Ana Sofia da Cunha Miguel
Paula Alexandra Carvalho Rodrigues
Vanessa Alexandra Miranda
Osvaldo Santiago Ascenso
Saul Alves Graça da Silva

Post Doc
PhD Student
PhD Student
BI

Bioorganic Chemistry

Rita Ventura, Investigador Auxiliar
Fábio Rui
Eva Correia Lourenço
Osvaldo Ascenso

Post Doc
PhD Student
BI

Organometallic Chemistry

Carlos C. Romão, Professor Catedrático
Carla Alexandre Gamelas Reis
Ana Catarina Martins Coelho
Ana Isabel Carita Valente Melato
Patricia Matias Reis Francisco

Invited Researcher
PhD Student
Post Doc
Post Doc
Post Doc

Colloids Polymers & Surfaces

António Lopes, Professor Associado U. Lusófona
João Cortez
Lstvan Joakim Balogh
Carla Teresa Ribeiro Antunes

Investigador Auxiliar
Post Doc
PhD Student

Single Molecule Processes

Yann Astier, Investigador Auxiliar
João Carlos de Sá Nogueira Sousa Dias
James Yates
Elisa Campos

Post Doc
Post Doc
PhD Student

Coordination and Supramolecular Chemistry

Rita Delgado, Professor Associado com Agregação IST
Pedro Miguel Veríssimo Mateus
Luís Miguel Barroso Pereira Lima
Catarina Alexandra Veríssimo Esteves
Judite da Conceição Nunes Costa

Post Doc
Post Doc
BI
Invited Researcher

Homogeneous Catalysis

Beatriz Royo Cantabrana, Investigador Auxiliar
André Filipe Pontes da Costa
Lorena Postigo Galindo
Srinivas Pottabathula
João Martinho Silva Ramalho Cardoso
Rita Isabel Lourenço da Silva Lopes

PhD Student
Post Doc
Post Doc
PhD Student
BI

Micro-Heterogeneous Systems

Eurico de Melo, Professor Auxiliar IST
Maria Helena Lopes Lameiro
Sofia Cristina Leite de Souza
Joana Rita Ripado Valério

PhD Student
PhD Student
BI
Biological Chemistry

Bacterial Energy Metabolism

Inês Cardoso Pereira, Investigador Principal
Mónica Sofia Martins Neves Post Doc
Fabian Grein Post Doc
Sofia Cristina dos Santos Venceslau PhD Student
Ana Raquel Martinho Ramos PhD Student
Marta Coimbra Marques PhD Student
André Fernando Anastácio dos Santos BI

Metalloproteins and Bioenergetics Unit

Biological Energy Transduction

Manuela M. Pereira, Investigador Auxiliar
Ana Paula Batista (cosup. Miguel Teixeira) Post Doc
Filipa L. Sousa (cosup. Miguel Teixeira) PhD Student
Lara Paulo BI
Bruno Marreiros BI
Mariana Gameiro Trainee
Rute Isabel Correia Trainee

Biomolecular NMR

Manolis Matzapetakis, Investigador Auxiliar
Meire Coelho de Almeida PhD Student
Ana Catarina Silva Pereira Trainee
Vanessa Cristina Carvalho Vieira Trainee

Genomics and Stress

Claudina Rodrigues-Pousada, Prof. Catedrático Convidado
Tracy Laura Nevitt Gonçalves Post Doc
Regina Andrade Menezes Post Doc
Catarina Isabel Ribeiro Pimentel Post Doc
Catarina Sá Almeida Amaral PhD Student
Sofia Isabel Marques da Silva PhD Student
Fábio de Oliveira PhD Student
Liliana Sofia Batista Nascimento PhD Student
Ana Rita Tomé Ferreira PhD Student
Ana Rita Ladeira Courelas da Silva BI
Ana Catarina Varela Raposo BI
Soraia Cristina Marques Caetano BI
Cátia Inês Baptista Santos BI
Cristina Maria Teixeira Vicente BI
Marina Lobato de Oliveira BI
Ana Filipa Nunes Leitão Alegre BI
Raquel Sofia Santos Silva BI
André Nunes Nascimento BI

Macromolecular Crystallography Unit

Industry and Medicine Applied Crystallography

Pedro Manuel Marques Matias, Investigador Principal
Susana Margarida Pires Gonçalves PhD Student
Micael Correia Freitas BI
Ana Rita Grito Barradas BI
Sara Teresa Silva BI

Inorganic Biochemistry and NMR

Ricardo Saraiva L. Oliveira Louro, Investigador Auxiliar
Catarina Morais Vaz Paquete PhD Student
Bruno Miguel Oliveira Maia da Fonseca PhD Student
Ivo Miguel Henriques Saraiva PhD Student
Maria Alexandra Alves BI
Nelson Andrade Pestana BI
Nazua Lima Costa BI
Sónia Estevão Neto BI

Macromolecular Crystallography Unit

Membrane Protein Crystallography

Margarida Archer Frazão, Investigador Auxiliar
Miguel Pedro Januário Pessanha Post Doc
Pik Yee Ma Post Doc
José Artur Alves de Brito Post Doc
Tânia Pais PhD Student
Przemyslaw Nogly PhD Student
Ana Lúcia Rebelo do Rosário BI
Filipa Alexandra Varela BI
Malgorzata Magoch BI

Metalloproteins and Bioenergetics Unit

Metalloenzymes and Molecular Bioenergetics

Miguel Teixeira, Professor Catedrático
Célia Romão (colab. Mª Arménia Carrondo) Investigador Auxiliar
Ana Patricia Refojo (cosup. Manuela Pereira) Post Doc
Ana Filipa Carapinha Pinto PhD Student
Pedro Miguel de Sousa PhD Student
Vera Lúcia Gonçalves PhD Student
Filipa L. Sousa (cosup. Manuela Pereira) PhD Student
Liliana Carreira Pinto BTI
Mafalda Rodrigues BI
Sandra Isabel dos Santos BI
Miguel Ribeiro BI
Cecília Sá de Miranda BI
Cristina Isabel Oliveira BI
Joana Lúcia Carrilho Trainee
Microbial & Enzyme Technology
Lígia O. Martins, Professor Auxiliar Convidado
Vânia Sofia Brissos Post Doc
Zhenjia Chen Post Doc
Bruno Patrick Reynolds Post Doc
Sónia Alexandra Gonçalves Mendes BI
Pedro Ribeiro Bernardo BI
Nadia Gonçalves Trainee
Ana Filipa dos Santos Trainee

Molecular Genetics of Microbial Resistance
Lígia M. Saraiva, Investigador Principal
Marta Sofia Guedes de Campos Justino Post Doc
Susana André Lima Lobo Post Doc
Lígia Isabel Santos Nobre Post Doc
Joana Morais Baptista PhD Student
Ana Filipa Nogueira Tavares PhD Student
Mafalda Cristina de Oliveira Figueiredo PhD Student
André Filipe Grácio Fernandes PhD Student
Adelina Margarida Lima Pereira R. Parente BI
Fábio Pereira Trainee
Luís Miguel Sobral Trainee
Catarina Godinho Trainee

Molecular Interactions and NMR
Patrick Groves, Investigador Auxiliar
Małgorzata Palczewska-Groves, Post Doc
Magdalena Komiazek BI

Molecular Simulation
António M. Baptista, Investigador Auxiliar
Dragana Popovic de Barros Post Doc
Sara Isabel Rasteiro Campos Post Doc
Pedro Rafael Silva Álvaro Magalhães PhD Student
Luís Carlos Santos Filipe BI
Catarina Azevedo Carvalheda dos Santos BI

Mössbauer Spectroscopy
Filipe Tiago de Oliveira, Professor Auxiliar FCT-UNL
Américo José Duarte BI

Protein Biochemistry Folding & Stability
Cláudio M. Gomes, Investigador Auxiliar
Sónia Cristina Alves Dickson Leal Solano Post Doc
João Vieira Rodrigues Post Doc
Bárbara Joana de Almeida Henriques Post Doc
Hugo Miguel Raposo Correia Botelho PhD Student
Lara da Luz Paulo PhD Student
Tânia Gomes Lucas PhD Student
Joana Margarida Cristovão PhD Student
Sofia Baptista de Carvalho PhD Student

Protein Modelling
Cláudio M. Soares, Professor Associado
Bruno Lourenço da Silva Victor Post Doc
Maria Luísa Rodrigues Post Doc
Ana Sofia Fernandes de Oliveira PhD Student
Diana Andreia Pereira Lousa PhD Student
João Miguel Marques Martins Damas PhD Student
Carla Baltazar PhD Student
Jorge Miguel Antunes PhD Student
Marcelo David da Silva BI

Raman Spectroscopy
Smilja Todorovic, Investigador Auxiliar
Zélia Licínia Ferreira Gouveia PhD Student
Murat Sezer BI
Amit Koul BI
Tânia Isabel Genebra BI

Macromolecular Crystallography Unit
Structural Biology
Carlos Maria Franco Frazão, Investigador Principal
Patrícia Alexandra Teixeira Borges BI

Macromolecular Crystallography Unit
Structural Genomics
Maria Arménia Carrondo, Professor Catedrático
Investigator Auxiliar
Isabel Maria Almeida de Jesus Bento
Investigator Auxiliary
Colin Edward McVey
Investigator Auxiliary
Célia Romão (collab. Miguel Teixeira)
Investigator Auxiliary
Tiago Bandeiras Technician
Ricardo Emanuel Sirgado Miranda Coelho PhD Student
Investigator Auxiliary
Catarina Isabel Simões Pires da Silva PhD Student
Investigator Auxiliary
Ana Teresa da Silva Gonçalves PhD Student
Investigator Auxiliary
Bruno Manuel Castelões Gonçalves Correia PhD Student
Investigator Auxiliary
Ana Maria Gonçalves PhD Student
Appendix

Biology

Bacterial Cell Biology
Mariana G. Pinho, Investigador Auxiliar
Patrícia Reed
Ana Maria Rodrigues Jorge
Helena Maria Pinto Veiga
Pedro Matos Pereira
João Miguel da Silva Queiroga Monteiro
Ana Raquel Ramos Pereira
Maria Teresa Ferreira (col. Ana Rute Neves)
Vanessa Fernandes Correia
Pedro Escada Fernandes

Mariana G. Pinho, Investigador Auxiliar
Patrícia Reed
Ana Maria Rodrigues Jorge
Helena Maria Pinto Veiga
Pedro Matos Pereira
João Miguel da Silva Queiroga Monteiro
Ana Raquel Ramos Pereira
Maria Teresa Ferreira (col. Ana Rute Neves)
Vanessa Fernandes Correia
Pedro Escada Fernandes

Bacterial Cell Surfaces and Pathogenesis
Sérgio R. Filipe, Investigador Auxiliar
James Yates
Maria João Catalão
Mafalda Soeiro Xavier Henriques
Magda Luciana Dias Pereira Atliano
Filipa Baltazar da Costa Vaz
Tatiana Justo Machado Rodrigues
Joana Silva Figueiredo
Catarina Andreia Gouveia

Bacterial Signaling
Karina B. Xavier, Investigador Auxiliar
Michal Bejerano-Sagie - IGC
Catarina Sim-Sim Pereira - IGC
João Carlos Bento Marques
Jorge André Pereira
Paulo José Correia

Cell Physiology and NMR
Helena Santos, Professor Catedrático
Teresa Catarino
Nuno Miguel Formiga Borges
Pedro Miguel Lamosa António
Luís Pedro Gafeira Gonçalves
Carla Jorge
Luís Lopes da Fonseca
Marco António Saraiva
Marta Viseu Rodrigues
Tiago Vasconcelos Duarte Moreira Pais
Ana Carvalho (cosup. Ana Rute Neves)
Ana Maria da Silva Esteves
Pedro Oliveira Quintas

Nádia Luísa Castanheira
Marta Alexandra Silva
Dusica Rados
Cristiana da Silva Faria
Andrea Filipa Cepeda
Ana Isabel Mingote
Marta Raquel Marques

Cell Signaling in Drosophila
Pedro Domingos, Investigador Auxiliar
Maria de Fátima Afonso Cairrão
Vanya Ivanova Rasheva
Dina Coelho
Gonçalo Poças
Nadine Simone Schweizer
Rita Cristina Esperto Costa

Control of Gene Expression
Cecília M. Arraiano, Investigador Principal com Agregação
Sandra Cristina de Oliveira Viegas
Susana Margarida L. Martins Domingues
José Eduardo Marques Andrade
Clémentine Dressaire
Michal Malecki
Ana Filipa de Melo Tadeu Pereira dos Reis
Inês de Jesus de Almeida e Silva
Inês Gabriel e Silva Batista e Guinote
Rute Margarida Gonçalves Matos
Vânia Sofia Fidalgo Pobre
Ricardo António Neves Moreira
Ana Margarida Teixeira Saramago
Joana da Silva Pissarra
Andrea Aires
Cátia Claudia Bárria da Silva

Glycobiology
Júlia Costa, Investigador Principal
Adriana Gomes

Professor Auxiliar
Investigador Auxiliar
Investigador Auxiliar
Post Doc
Post Doc
Post Doc
Post Doc
Post Doc
PhD Student
PhD Student
PhD Student
PhD Student
Infection Biology
Luis Jaime Mota, Investigador Auxiliar
Maria Raposo da Cunha
Lia Dora David Domingues
Filipe Manuel Baeta da Silva Almeida
Sara Raquel Vilela Pais
Ana Catarina Milho

Lactic Acid Bacteria & In Vivo NMR
Ana Rute Ramos Neves, Investigador Auxiliar
Paula Gaspar
Ana Carvalho Machado
Sandra Costa Carvalho
Ana Laura M. dos Santos Seara Paixão
João Manuel Pereira Jorge
Ricardo Manuel Sequeira
Ana Mafalda de Almeida Cavaleiro
Joana Rita Oliveira
Anabela Carvalho Vieira

Microbial Development
Adriano O. Henriques, Professor Associado
Mónica Paula Fernandes Serrano Miranda
Teresa Parente M. Vasconcelos Costa
Tiago Joel Vultos Santos
Catarina Alexandra Gonçalves Fernandes
Cátia Alexandrino dos Reis Serra
Filipa Andreia Portugal Nunes
Maria de Fátima Cardoso Pereira
Maria Luísa Gouveia e Freitas Corré
Wilson David Antunes
João Pedro Vieira Bota
Ana Margarida Oliveira Paiva
Maria Teresa Maio
Carolina Piçarra Cassona
Gabriela Pires Drabek

Microbiology of Human Pathogens Unit
Molecular Genetics
Hermínia de Lencastre, Professor Catedrático
Ana Madalena de Drummond Ludovice
Maria Leopoldina Amorim Miragaia Ryder
Rosario Mato Labajos
Susana Maria Lavado de Oliveira Gardete
Catarina Isabel Catarino Milheiro
Nuno Alexandre Gomes Faria
Nelson Emanuel da Silva Frazão
Teresa Margarida Gomes da Conceição
Ana Lopes Tavares
Teresa Carla de Almeida Figueiredo
Maria Inês Ramos Grilo
Joana Rita Gonçalves Araújo Roló
Célia de Carneiro Coelho
Diana Sofia Pereira E. de Oliveira Costa
Ons Bouchami
Raquel Pereira Portela

Microbiology of Human Pathogens Unit
Molecular Microbiology of Human Pathogens
Raquel de Sá Leão, Investigador Auxiliar
Ana Cristina Almeida Paulo
Alexandra Sofia Oliveira Simões
Débora Tavares
Carina Alexandra Pereira Valente
Sônia Nunes
Sofia Félix Fernandes
Sônia Margarida Tavares Matos Almeida
Plant Sciences

Disease and Stress Biology

Ricardo Boavida Ferreira, Professor Catedrático ISA-UTL
Maria Paula Marinho Pinto
Maria Cláudia Godinho Nunes Santos
Marta Alexandra Marques Alves
Lucélia Rodrigues Tavares
Paula Cristina Branco Cabrita Cunha
Alexandre Filipe Guerreiro Borges
Rui Carlos Soares Pimpão
Diana Leonor Constantino Macedo
Sofia Isabel Almeida Fortalezas
Catarina Isabel Freitas da Fonseca
Andréia Filipa Gomes
Inês Margarida Lourenço Figueira
Carolina Emanuel Jardim

Maria Paula Marinho Pinto, Invited Researcher
Post Doc
Post Doc
Post Doc
PhD Student
PhD Student
PhD Student
PhD Student
PhD Student
BI
BI
BI
Trainee

Plant Cell Biology

Rita Abranches, Investigador Auxiliar
Ana Sofia Pires
Silvia Andrea Godinho Barquinha Tavares
Ana Isabel Braz Opinião
Ana Cláudia Nogueira
Ana Rita Basílio Santos
Helena Sofia da Silva

Maria Paula Marinho Pinto Invited Researcher
Post Doc
Post Doc
Master’s Student
Master’s Student
Master’s Student
Trainee

Plant Cell Biotechnology

Pedro Fevereiro, Professor Auxiliar FCUL com Agregação ITQB
Maria Carlota Morais Cunha Vaz Patto
Jorge Almiro Caldeira Pinto Paiva
Susana de Sousa Araújo
Changhe-He Zhang
Susana Maria Neves
Ana Sofia Amaral Duque
Rita de Sousa Caré
Cátia Maria de Jesus Nunes
Inês Garcia de Oliveira Trindade
Matilde Cordeiro
Nuno Felipe Alves de Almeida
Pedro Manuel Reis Mendes Moreira
Victor João Taveira Carocha
Susana Rodrigues Ribeiro
Mara Lisa Vieira Alves
Susana Murtinho da Trindade Leitão
Marco André Dinis
Ana Rita Morgado
Clara Susana Marques Graça
Maria Joana Teixeira Pinto
Beatriz Margarida Moço
Tomás Viana Carvalho

Célia Miguel, Investigador Auxiliar
Post Doc
Post Doc
Post Doc
PhD Student
PhD Student
PhD Student
PhD Student
PhD Student
BI
BI
BI
Trainee

Post Doc
Science Com. (CiB)
PhD Student
PhD Student
PhD Student
PhD Student
PhD Student
Master’s Student
BI
BI
BI
Trainee

Plant Cell Wall

Philip Jackson, Investigador Auxiliar
Luís Filipe Sanches Goulão
Ada Doroteia Vatulescu
Samarrita Lahiri

Joana Lisete Galego Dias Invited Researcher
PhD Student
BI

Plant Developmental Genetics

Jorge Almeida, Professor Associado ISA-UTL
Maria Lisete Galego Dias

Investigador Auxiliar

Beatriz Margarida Moço Trainee

Investigador Auxiliar

Forest Biotech

Célia Miguel, Investigador Auxiliar
Liliana Maria Bota Marum
José Javier de Vega-Bartol
Mariagrazia Tonelli
Inês Chaves (coll. C. Pinto Ricardo)
Andréia Miguel
Ana Filipa Gonçalves Milhinhos
Marta Andreia Horta Simões
Diogo Nuno Silva
Tânia Raquel Almeida (coll. M. Oliveira)
Ana Maria Vieira Oliveira
Raquel Raissa Santos
Andréia Patrícia Valentim de Matos
Andréia Sofia Santos Rodrigues

Carla Maria Alexandre Pinheiro
José António Pires Passarinho
Ana Isabel Faria Ribeiro
Ana Sofia Fortunato
Inês Chaves (collab. Célia Miguel)
Vagner Tebaldi de Queiroz
Isa Catarina Monteiro Brás Ribeiro
Ana Cristina Magalhães Vieira
João Miguel Vitorino Bento
Adelaide João Machado

Candido Pinto Ricardo, Prof. Catedrático Jubilado ISA-UTL

Investigador Auxiliar
Investigador INRB
Invest. Auxiliar ICT
Post Doc ICT
Post Doc
Post Doc
PhD Student
PhD Student
BTI
BI

Investigador Auxiliar

Plant Biochemistry

Candido Pinto Ricardo, Prof. Catedratico Jubilado ISA-UTL

Investigador Auxiliar
Genomics of Plant Stress

Margarida Oliveira, Professor Associado com Agregação
Isabel Alexandra Aguiar de Abreu
Nelson José Madeira Saibo
Ana Paula Leitão dos Santos
Ana Paula Farinha Resende
Sónia Sandra Cabrita Negrão
Tiago Filipe dos Santos Lourenço
Subhash Chander
Ana Margarida Sarrilho Ferro
Duarte Dionísio Figueiredo
Inês Silva Pires
Pedro Miguel Rodrigues de Barros
Tânia Sofia Lobato Paulo Serra
Liliana de Jesus Duarte Ferreira
Maria Cecilia Almadanim Pina
Tânia Raquel Almeida (col. Célia Miguel)
André Miguel Henriques Cordeiro
Diego Melo Almeida
Nuno Gonçalves
João Guilherme Cortes
Helena Pires Sapeta
Ana Margarida Azevedo
Moumita Gangopadhyay
Alicja Marta Góvská
João Manuel Fradique

Analytical Chemistry

Luís Filipe Silva Castro Vilas Boas, Professor Associado IST
Maria do Rosário Beja F. G. Bronze, Professor Auxiliar FFUL
Antero Augusto Ramos
Carla Alexandra Lopes Graça
Elsa Velez Mecha

Stress by Antibiotics and Virulence of Enterococci

Fátima Lopes, Investigador Auxiliar
Paulo Emanuel de Oliveira Marujo
Marta Maria Coelho dos Santos Abrantes
Renata Filipa Cruz de Matos
Neuza Prazeres Teixeira

Applied and Environmental Mycology

Cristina Silva Pereira, Investigador Auxiliar
Tiago Lopes Martins
Marina Boavida Lopes Carvalho
Isabel Martins (cosup. Luís Paulo N. Rebelo)
Adélia Varela Castro
Helga Garcia (cosup. Luís Paulo N. Rebelo)
Paula Cristina de Azevedo Alves
Diego de Oliveira Hartmann
Joana Pinto Magalhães de Medeiros
Rafael Hartmann

Biomolecular Diagnostic

Abel Oliva, Investigador Auxiliar
Ana Raquel da Silva Santos
Joana Monteiro de Campos
Iracema Campos Martinho
Ana Patricia Caeiros

Animal Cell Technology Unit

Cell Bioprocesses

Paula M. Alves, Investigador Principal
Ana Catarina Ataide Montes
Marco Patrone
Rute Almeida Ferreira Castro
Patricia Isabel Alves
Maria Margarida Negrão Serra
Ana Carina Santos Ferreira da Silva
Cláudia Queiroga
Nuno Eduardo Buxo Carinhas

Technology
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sofia Margarida Leite</td>
<td>PhD Student</td>
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<tr>
<td>Ricardo Perdigão Henriques</td>
<td>PhD Student</td>
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<td>Francisca Sarreira Simões Horta Monteiro</td>
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<td>Daniel Filipe Mestre Simão</td>
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<td>Cláudia Susana Pedreira Correia</td>
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<td>Marcos Filipe Quintino de Sousa</td>
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<td>Carina Vieira Brilha</td>
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<td>Ana Catarina Pinto</td>
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<tr>
<td>Inês Barros Ferreira da Costa</td>
<td>BTI</td>
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<td>Ana Sofia Cabral e Sousa de Almeida</td>
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<td>Tiago Martins Duarte</td>
<td>BI</td>
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<td>Raquel Maria Azeitaõ Atkes</td>
<td>BI Trainee</td>
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<td>Ana Paulo Terrasso</td>
<td>Trainee</td>
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</table>

**Animal Cell Technology Unit**

**Cell Line Development and Molecular Biology**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Ana Sofia Coroadinha</td>
<td>Investigador Auxiliar</td>
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<tr>
<td>Fabiana Carreira Fernandes</td>
<td>PhD Student</td>
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<td>Ana Filipa Rodrigues</td>
<td>PhD Student</td>
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<td>Hugo Ricardo Soares</td>
<td>PhD Student</td>
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<td>Miguel Ricardo Guerreiro</td>
<td>PhD Student</td>
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<tr>
<td>Vanessa Soício Lúcio Bandeira</td>
<td>BTI</td>
</tr>
<tr>
<td>Vanessa Isabel Ferreira Veríssimo</td>
<td>BI</td>
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**Food Microbial Technology**

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**Mass Spectrometry**

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<td>André Martinho de Almeida</td>
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<td>Kamila Koci</td>
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**Microbiology of Man-Made Environments**

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<td>Teresa Crespo, Investigador Principal IBET</td>
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**Animal Cell Technology Unit**

**Engineering Cellular Applications**

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<td>Piergiuseppe Nestola</td>
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**Microbiology of Man-Made Environments**

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Molecular Thermodynamics
Luís Paulo N. Rebelo, Professor Catedrático
Isabel Maria Delgado Jana M. Ferreira
José Manuel da Silva Simões Esperança
Mara Guadalupe Freire Martins
Mohammad Tariq
Magdalena Kowacz
Ana Belén Pereiro Estévez
João Miguel Mendes de Araújo
Helena Veiga
Marija Petkovic (cosup. Cristina S. Pereira)
Isabel Martins (cosup. Cristina S. Pereira)
Rui Ferreira
Sowmiah Subbiah
Diana Carolina Vaz Ruivo de Oliveira
Liliana Sofia Tomé
Filipe Serrão Santos Oliveira
Mário Rui Costa Soromenho
Anabela de Jesus Lobo da Costa
Filipa Cristina Alves
Marta Raquel Figueiredo
Catarina Isabe Florindo

Pharmacokinetics and Biopharmaceutical Analysis
Ana L. Simplicio, Investigador Auxiliar
Hugo Ortola de Abreu e Serra
Joana Catarina Rocha Lamego
Hélder João Vilareal
Pedro Garcia Ferreira
Bárbara Martins Paiva da Cunha

Physiology of Environmental Conditioned Microbiota
Vitória San Romão, Investigador Coordenador INRB
Ana Paula Gomes Marques
Maria do Carmo Barreto Baptista Basílio
Beatriz Reis Oliveira

Systems Biodynamics
Andreas Bohn, Investigador Auxiliar
Daniel Santa Cruz Damineli

Jonas Almeida* collaborators
Helen Andrade Arcuri
Cândida Filipa Delgado
* Invited Professor at ITQB

Nutraceuticals and Delivery
Catarina Duarte, Investigador Auxiliar
Ana Alexandra Figueiredo Matias
Ana Teresa de Carvalho Negrão Serra
Vanessa Santos Gonçalves
Catarina Amélia Miguel
Joana Silveira Cruz
Joana Margarida de Andrade Poejo
Sara Alexandra Luís Nunes
Ana Patrícia Correia de Almeida
Dora Alexandra dos Santos Pereira
Ana Nunes Nunes
Rita João Ramos
Ana Catarina Jorge Semedo
Daniel Deodato Lopes
Ana Sofia Joaquim
André Vieira das Neves
Institutional Projects

MIT - Bioengineering Systems
Ref. #1
Coordinator: Cláudio Soares

INTERBIO
Ref. #146
Coordinator: Miguel S. Teixeira

Rede Nacional Mass Spec
Ref. #14 (also included in group)
Coordinator: Ana Varela Coelho

Rede Nacional de NMR
Ref. #74 (also included in group)
Coordinator: Helena Santos

Research Projects by Division

Chemistry

Bioinorganic Chemistry and Peptide Design
Head: Olga Iranzo
Project Refs: 30; 92; 98; 136
Publications Refs: 111; 112

Bioorganic Chemistry
Head: Rita Ventura
Project Refs: 111
Publications Refs: 14; 115; 129; 130; 143

Colloids; Polymers and Surfaces
Head: António Lopes
Project Refs: --
Publications Refs: 6

Coordination and Supramolecular Chemistry
Head: Rita Delgado
Project Refs: 7; 16
Publications Refs: 26; 77; 124; 145; 146; 147

Homogeneous Catalysis
Head: Beatriz Royo
Project Refs: 32; 61; 103
Publications Refs: 33; 34; 59; 193

Microheterogeneous Systems
Head: Eurico Melo
Project Refs: 21; 119
Publications Refs: 238; 237

Organic Synthesis
Head: Christopher Maycock
Project Refs: 71
Publications Refs: 14; 106; 115; 143

Organometallic Chemistry
Head: Carlos C. Romão
Project Refs: --
Publications Refs: 74; 80; 90; 110; 141; 163; 193; 214; 215; 241; 256

Single Molecule Processes
Head: Yann Astier
Project Refs: 33; 143
Publications Refs: 15

Biological Chemistry

Bacterial Energy Metabolism
Head: Inês A. Cardoso Pereira
Project Refs: 50; 82
Publications Refs: 18; 105; 228; 257

Biological Energy Transduction
Metalloproteins and Bioenergetics Unit
Head: Manuela M. Pereira
Project Refs: 37; 38
Publications Refs: 22; 23; 155; 234

Biomolecular NMR Laboratory
Head: Manolis Matzapetakis
Project Refs: --
Publications Refs: --

Genomics and Stress
Head: Claudina R. Pousada
Project Refs: 15; 93
Publications Refs: 24; 228

Industry and Medicine Applied Crystallography
Macromolecular Crystallography Unit
Head: Pedro Matias
Project Refs: --
Publications Refs: 18; 97; 98; 100; 178; 206

Inorganic Biochemistry and NMR
Head: Ricardo O. Louro
Project Refs: 23; 75
Publications Refs: 7; 64; 93; 182

Membrane Protein Crystallography
Macromolecular Crystallography Unit
Head: Margarida Archer
Project Refs: 49; 90; 128
Publications Refs: 32

Metalloenzymes and Molecular Bioenergetics
Metalloproteins and Bioenergetics Unit
Head: Miguel Teixeira
Project Refs: 36; 39; 48; 118; 121; 122
Publications Refs: 70; 78; 91; 99; 155; 178; 179; 206; 234; 241; 248

Microbial and Enzyme Technology
Head: Ligia O. Martins
Project Refs: 70; (5)
Publications Refs: 55; 78; 150; 151
Molecular Genetics of Microbial Resistance  
Head: Lígia M. Saraiva  
Project Refs: 27; 28  
Publications Refs: 17; 99; 206; 241; 248

Molecular Interactions and NMR  
Head: Patrick Groves  
Project Refs: 73; 114  
Publications Refs: 52; 116; 191

Molecular Simulation  
Head: António M. Baptista  
Project Refs: 40; 52; 55  
Publications Refs: 5; 63; 82; 132; 135; 165; 166

Mössbauer Spectroscopy  
Head: Filipe Tiago de Oliveira  
Project Refs: 86  
Publications Refs: --

Protein Biochemistry Folding and Stability  
Head: Cláudio M. Gomes  
Project Refs: 3  
Publications Refs: 28; 107; 133; 204

Protein Modelling Laboratory  
Head: Cláudio M. Soares  
Project Refs: 109; 112  
Publications Refs: 18; 63; 132; 165; 166; 253;

Raman spectroscopy of Metalloproteins  
Head: Smilja Todorovic  
Project Refs: 84  
Publications Refs: 155; 179; 185

Structural Biology  
Macromolecular Crystallography Unit  
Head: Carlos Frazão  
Project Refs: 57; 72; 101  
Publications Refs: 198

Structural Genomics  
Macromolecular Crystallography Unit  
Head: Maria Arménia Carrondo  
Project Refs: 36; 39; 108; 123; 135; (26; 38)  
Publications Refs: 55; 78; 100; 178; 179; 206

Biology  
Bacterial Cell Biology  
Head: Mariana G. Pinho  
Project Refs: 76; 77  
Publications Refs: 57; 95; 114; 190; 255

Bacterial Cell Surfaces and Pathogenesis  
Head: Sérgio R. Filipe  
Project Refs: 43; 106; 107  
Publications Refs: 16; 108

Bacterial Signalling  
Head: Karina Xavier  
Project Refs: --  
Publications Refs: 14; 143

Cell Physiology & NMR  
Head: Helena Santos  
Project Refs: 10; 17; 25; 74; 96; 97; 113; 147  
Publications Refs: 32; 45; 84; 85; 92; 97; 98; 115; 118; 143; 158; 159; 185; 210

Cell Signaling in Drosophila  
Head: Pedro Domingos  
Project Refs: 54; 91; 138  
Publications Refs: --

Control of Gene Expression Laboratory  
Head: Cecília M. Arraiano  
Project Refs: 41; 42; 46; 124; 134; 140; (3; 4; 27)  
Publications Refs: 103; 148; 154; 156; 224; 261

Glycobiology  
Head: Júlia Costa  
Project Refs: 22; 83  
Publications Refs: 40; 72; 115; 134

Infection Biology  
Head: Jaime Mota  
Project Refs: 80; 125; 137  
Publications Refs: 217

Lactic Acid Bacteria & in vivo NMR  
Head: Ana Rute Neves  
Project Refs: 35; 85; 110  
Publications Refs: 36; 45; 49; 92

Microbial Development  
Head: Adriano O. Henriques  
Project Refs: 20; 24; 31  
Publications Refs: 221

Molecular Genetics  
Microbiology of Human Pathogens Unit  
Head: Hermínia de Lencastre  
Project Refs: 5; 44; 126; 129; 130; 131  
Publications Refs: 29; 30; 53; 88; 71; 109; 122; 153; 167; 207; 230; 231; 232

Molecular Microbiology of Human Pathogens  
Microbiology of Human Pathogens Unit  
Head: Raquel Sa-Leão  
Project Refs: 19; 29; 144; 145  
Publications Refs: 71; 109; 207; 230; 231

Plant Sciences  
Disease and Stress Biology  
Head: Ricardo Ferreira  
Project Refs: 104; (38)  
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<td>Paula M. Alves</td>
<td>(Cell Bioprocesses + Cell Line Development and Molecular Biotechnology + Engineering Cellular Applications)</td>
<td>(8; 12; 15; 17; 18; 19; 21; 25; 29; 30; 31; 32; 33; 34; 39; 40;41)</td>
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<td>Andreas Bohn</td>
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## Internationalization

**International collaborations in 2011**

142 publications with international teams

**Countries with more than 20 papers**
- USA, Spain, Germany

**Between 10 and 20 papers**
- England, France, Italy, The Netherlands

**Between 3 and 9 papers**
- Denmark, Belgium, Switzerland, Brazil, Czech Republic, Egypt, Finland, Greece, Ireland, North Ireland

**With two papers or less**
- Argentina, Canada, Japan, Norway, Scotland, Slovakia, Sweden, Tunisia, Australia, Austria, Croatia, Israel, Luxembourg, Mexico, Philippines, Poland, Romania, Serbia, South Africa, Taiwan

148 international collaboration within projects

**Through FCT projects**
- Argentina (1), Austria (1), Brasil (1), France (7), Germany (7), Slovenia (1), Spain (6), The Netherlands (3), UK (2), USA (1)

**Through EU projects**
- Australia (1), Austria (4), Belgium (2), Bulgaria (1), Czech Republic (1), Denmark (5), Egypt (1), Ethiopia (1), Finland (1), France (15), Germany (15), Greece (1), Hungary (1), Hungary (2), Iceland (1), Ireland (1), Israel (1), Italy (8), Mali (1), Morocco (1), Netherlands (10), Norway (1), Poland (2), Spain (13), Sweden (2), Switzerland (8), Syria (2), Turkey (1), UK (14)

40 foreign PhD holder researchers

**EU countries:** 29
- Bulgaria, Czech Republic, France, Germany, Greece, Ireland, Italy, Poland, Spain, Sweden, UK

**Rest of the world:** 11
- Brazil, China, Egypt, India, Russia, Tunisia, Yugoslavia

## Publications

**Top 5 most cited papers (last 10 years)**
*(Times cited from Web of Science as per September 2012)*


**Highly cited papers**

*Papers included in the Highly Cited Papers list by Essential Science Indicators SM (Thompson Reuters): top 1% of articles by total citations in each annual cohort from each of the 22 disciplines (updated as of Jul 1, 2012 to cover a 10-year plus 4-month period, Jan 1, 2002-Apr 30, 2012)*


Publication Facts 2011

Top 10 journals: number of articles

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Top 10 journals: impact factor

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Distribution of papers (2005-2011) according to the journal impact factor

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Publication List 2011

Articles indexed in Web of Science


Annual Report 2011
Appendix


http://dx.doi.org/10.1371/journal.pcbi.1002128

http://dx.doi.org/10.1371/journal.pone.002287

http://dx.doi.org/10.1186/1471-2091-12-41

http://dx.doi.org/10.1186/1471-2164-12-137

http://dx.doi.org/10.1371/journal.pone.0024553


Articles not indexed in ISI-WoS


Book Chapters


Appendix


Annual Report 2011

Appendix


### Projects funded by the FCT

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<td>71 The Development and Rationalization of Stereoselective Reactions in Some Chiral Systems. A mixed experimental and theoretical approach</td>
<td>PTDC/QUI-QUI/104056/2008</td>
<td>Christopher Maycock</td>
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<td>72 BIOMYR: Towards the metabolic engineering of beta-myrcene pathway of Pseudomonas sp. MI: functional genomics and structural biochemistry approaches</td>
<td>PTDC/EBB-BIO/104980/2008</td>
<td>Carlos Frazão</td>
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<td>73 Mycobacterium Tuberculosis: bioinformatic and structural strategies towards treatment</td>
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<td>Patrick Groves</td>
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<td>74 Rede Nacional de Ressonância Magnética Nuclear</td>
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<td>Helena Santos</td>
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<td>75 Mind the gap: How extracellular respiration is linked across the periplasmic space to the cytoplasmic oxidation of substrates. A key step in bioenergy harvesting</td>
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<td>Ricardo Louro</td>
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<td>76 The cell wall synthetic machinery of Staphylococcus aureus and its response to the presence of antibiotics</td>
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<td>77 Single cell studies of the action of antibiotics</td>
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<td>78 Breeding for salinity tolerance in rice and identification of key genes/proteins affecting seed set under salt stress</td>
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<td>Sónia Negrão</td>
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<td>79 Exploiting antioxidants, flavours and aromas diversity on 'broa' bread maize breeding</td>
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<td>80 Functional analyses of inclusion membrane proteins of Chlamydia trachomatis</td>
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<td>81 Integration of transcriptomic, proteomic and metabolomic profiles to understand the role of TBP in the water deficit response and recovery in Medicago truncatula</td>
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<td>82 Study of an ancient mode of energy metabolism: the dissimilatory reduction of sulfite</td>
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<td>83 Glycosylation and Lewis X motif in neuronal tissue</td>
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<td>84 Disentangling single electron transfer steps in an enzyme: experimental and theoretical approach</td>
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<td>85 PneumoSyS - A systems biology approach to the role of pneumococcal carbon metabolism in colonization and invasive disease.</td>
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<td>F. Xavier Malcata</td>
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<td>IMPROVIRON: IMproved PROductivity and IRON nutrition in legume grains</td>
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<td>Cândido Pinto Ricardo</td>
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<td>Assessment of genetic and genomic resources of Cork Oak: the basis towards a prospective management</td>
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<td>The pathogen’s perspective of molecular plant-microbe-interactions: genes expressed during the infection process of coffee leaf rust - Hemileia vastatrix.</td>
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<td>Polyphenols as protective agents in cellular models of alpha-synucleinopathies, in particular Parkinson’s diseases.</td>
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<td>Ricardo B. Ferreira</td>
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<td>GRIM-19, a novel protein involved in cell apoptosis: struture-function characterization.</td>
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<td>Isabel Bento</td>
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<td>110 PhytoLac- Engineered Lactococcus lactis for the optimizes</td>
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<td>112 Membrane fusion mechanism of Influenza Hemagglutinin: a</td>
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<td>David Turner</td>
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<td>116 Search for candidate protein biomarkers of Coffea arabica</td>
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<td>123 Patogenia da protina LANA do herpesvírus do sarcoma de Kaposi</td>
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<td>Mª Armenia Carrondo</td>
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<td>124 Global analysis of antisense regulatory mechanisms in</td>
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<td>Susana Domingues</td>
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<td>125 Characterisation of host cell pathways altered by effectors of</td>
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<td>127 Sustainable water use Securing Food production in dry areas of</td>
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<td>Manuela Chaves</td>
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<td>Strategies for organic and low-input integrated breeding and management (SOLIBAM)</td>
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<td>Parliaments and Civil Society in Technology Assessment (PACTA)</td>
<td>Mara Almeida</td>
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<td>Standardization and orthogonalization of the gene expression flow for robust engineering of NTN (new-to-nature) biologival properties (ST-FLOW)</td>
<td>Cecilia Arraiano</td>
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<td>Transnational access and enhancement of integrated Biological Structure determination at synchrotron X-ray radiation facilities (BioStruct-X)</td>
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**Individual fellowships by European Commission**

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<td>Designing metallopeptides for the removal of superoxide radicals (MFRosPep)</td>
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<td>Analysis of the cellular function of type III secretion effectors of Chlamydia trachomatis (CHLTRT3E)</td>
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<td>ER Stress and Photoreceptor Degeneration in Drosophila (DROSOERSTRESS)</td>
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<td>Pedro Domingos</td>
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<td>Crystallization in ionic liquid solutions (CRYSTILS)</td>
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<td>Magdalena Kowacz</td>
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<td>Spatial organization and dynamics of Escherichia coli RNA degradation machinery (RNaseDYNAMICS)</td>
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<td>Michal Malacki</td>
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<td>Structure of herperviral cell access (SHerpA)</td>
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<td>New halogenated ionic liquids as a novel task-specific fluids (HALOGENLIS)</td>
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<td>Chemical and Biological Single Molecule Detection Roaming Robot (SENTINEL)</td>
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<td>Pneumo Y – Pneumococcal colonization patterns in young children living in urban and rural areas of Portugal in the era of the 13-valent conjugate vaccine</td>
<td>WS857151</td>
<td>Raquel Sá Leão</td>
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<td>Pneumococcal colonization patterns in the elderly living urban and rural areas of Portugal</td>
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<td>Approches Interdisciplinaires et strategies integrees pour les sciences du vivant et leurs applications</td>
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<td>Miguel Teixeira</td>
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**Subcontracting Parties – Georgia Institute of Technology (amounts USD)**

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<tbody>
<tr>
<td>Assessment of pathway design through multi-NSF level modeling and experiments</td>
<td>30,000,00</td>
<td>Helena Santos</td>
<td>30,000,00</td>
<td>2010-2012</td>
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## Projects funded by the FCT

<table>
<thead>
<tr>
<th>Title</th>
<th>Project reference</th>
<th>Principal Investigator</th>
<th>Amount €</th>
<th>Period</th>
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<tbody>
<tr>
<td>Remoção biológica de compostos xenobióticos de sistemas de tratamento de águas residuais</td>
<td>PTDC/AMB/65702/2006</td>
<td>Gilda Carvalho</td>
<td>156552</td>
<td>2007/2011</td>
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<td>Desenvolvimento e validação de processos de tratamento de águas de abastecimento por combinação de foto-catalise de dióxido de titânio e filtração por membranas</td>
<td>PTDC/AMB/66024/2006</td>
<td>Vanessa Pereira</td>
<td>126192</td>
<td>2007/2011</td>
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<tr>
<td>Integração de processos de expansão, diferenciação neuronal e criopreservação de células estamimais embrionarias humanas</td>
<td>PTDC/BIO/72755/2006</td>
<td>Paula Alves</td>
<td>123000</td>
<td>2009/2011</td>
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<tr>
<td>Beleza e significado da cor na iluminura medieval portuguesa</td>
<td>PTDC/EAT-EAT/104030/2008</td>
<td>Catarina Duarte</td>
<td>6000</td>
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<tr>
<td>Redes de regulação de expressão génica associadas à actividade do felogéneo</td>
<td>PTDC/AGR-GPL/098389/2008</td>
<td>Célia Miguel</td>
<td>115431</td>
<td>2010/2013</td>
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<tr>
<td>Precondicionamento induzido por monóxido de carbono: novas estratégias na prevenção de lesão cerebral devido à hipóxia-esquemia e reperfusão</td>
<td>PTDC/SAL-NEU/098747/2008</td>
<td>Helena Vieira</td>
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<td>Bioreactores de membranas para tratamento avançado de águas residuais: uma abordagem molecular</td>
<td>PTDC/EBB-EBI/098862/2008</td>
<td>Gilda Carvalho</td>
<td>94434</td>
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<td>Aplicação da genómica funcional no melhoramento de células de mamífero para a produção de biofármacos virais</td>
<td>PTDC/EBB-BIO/100491/2008</td>
<td>Ana Coroadinha</td>
<td>195000</td>
<td>2010/2013</td>
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<tr>
<td>Biofertilizantes fixadores de azoto para culturas de gramineas</td>
<td>PTDC/AGR-AAM/100577/2008</td>
<td>Teresa Crespo</td>
<td>61620</td>
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<tr>
<td>Melhoramento do potencial de partículas idênticas a retrovírus como vacinas para Hepatite C</td>
<td>PTDC/EBB-BIO/102649/2008</td>
<td>Manuel Carrondo</td>
<td>156000</td>
<td>2010/2013</td>
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<tr>
<td>Aplicação de Fluorimetria 2D para melhorar o desenvolvimento de bioprocessos de células de mamífero</td>
<td>PTDC/EBB-BIO/102750/2008</td>
<td>Ana Teixeira</td>
<td>140000</td>
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<td>Transcriptômica da embriogênese no pinheiro bravo</td>
<td>PTDC/AGR-GPL/102877/2008</td>
<td>Célia Miguel</td>
<td>111495</td>
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<td>Desenvolvimento de novos sistemas de libertação de fárparos a partir de biomateriais de gelatina utilizando tecnologia supercítica</td>
<td>PTDC/QUE-QUE/104552/2008</td>
<td>Ana Nunes</td>
<td>85428</td>
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<tr>
<td>Benefícios e desvantagens associados com a presença de fungos em captações de água para consumo humano</td>
<td>PTDC/AAC-AMB/108303/2008</td>
<td>Vanessa Pereira</td>
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<td>hCE1-2 - expressão e caracterização em modelos in vitro e in silico</td>
<td>PTDC/EBB-BIO/111530/2009</td>
<td>Ana Luisa Simplicio</td>
<td>89856</td>
<td>2011/2013</td>
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<tr>
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<tr>
<td>25 Desenvolvimento e manipulação de células estaminais usando a tecnologia de transferência génica mediada por nanoparticular para aplicação clínica de células modificadas geneticamente</td>
<td>ENMED/0001/2010</td>
<td>Manuel Carrondo</td>
<td>71600</td>
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<td>27 Estudos bioquímicos e funcionais de exoribonucleases focando no seu papel determinante no controlo da expressão génica</td>
<td>PTDC/QUI-BIQ/111757/2009</td>
<td>Cecília Araújo</td>
<td>130000</td>
<td>2011/2014</td>
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<td>28 Structural determinants of superoxide reduction - A detoxification system essential for life</td>
<td>PTDC/BIA-PRO/111940/2009</td>
<td>Tiago Bandeiras</td>
<td>88586</td>
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<tr>
<td>30 Análise do proteoma de Ehrlichia ruminantium: uma análise complementar à transcriptómica para o estudo da patogenese e desenvolvimento de vacinas para a Cowdriose</td>
<td>PTDC/CVT/114118/2009</td>
<td>Isabel Marcelino</td>
<td>155947</td>
<td>2011/2014</td>
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Projects funded by the European Commission

<table>
<thead>
<tr>
<th>Project</th>
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<tr>
<td>32 Nonhuman Adenovirus vectors for gene transfer to the brain</td>
<td>HEALTH-F5-2008-222992</td>
<td>Manuel Carrondo</td>
<td>379200</td>
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<td>33 High yield and performance stem cell lab</td>
<td>F5-2009-223011</td>
<td>Manuel Carrondo</td>
<td>532600</td>
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<td>34 Cardiac Repair European Multidisciplinary Initiative</td>
<td>HEALTH - F5-2010-242039</td>
<td>Manuel Carrondo</td>
<td>505120</td>
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<td>35 Ferramentas genómicas em pinheiro bravo para aumento da produção de biomassa e gestão florestal sustentável (SUSTAINPINE)</td>
<td>P-KBBE/AGR-GPL/0001/2010</td>
<td>Célia Miguel</td>
<td>198600</td>
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<td>36 Improvement of current and development of new vaccines for theileriosis and babesios of small ruminants</td>
<td>KBBE-3-245145-PIROVAC</td>
<td>Abel Oliva</td>
<td>173334</td>
<td>2010/2014</td>
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<tr>
<td>37 Towards a Latin America &amp; Caribbean Knowledge Based Bio-Economy (KBBE) in partnership with Europe</td>
<td>KBBE-2010-264266</td>
<td>Teresa Crespo</td>
<td>50290</td>
<td>2011/2013</td>
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<tr>
<td>38 The sustainable improvement of European berry production, quality and nutritional value in a changing environment: Strawberries, Currants, Blackberries, Blueberries and Raspberries</td>
<td>KBBE-2010-4-265942</td>
<td>Cláudia Santos</td>
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Projects funded by NATO

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<th>Period</th>
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<tr>
<td>42 Preventive and Remediation Strategies for Continuous Elimination of Poly-Chlorinated Phenols from forest soils and ground waters</td>
<td>ESP.MD.SFP 98 1674</td>
<td>Vitória San Romão</td>
<td>31620</td>
<td>2007/2011</td>
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Projects funded by QREN

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<tr>
<td>43 TyphiVac</td>
<td>QREN - 2009/3384 - Genibet</td>
<td>Teresa Crespo</td>
<td>104862</td>
<td>2008/2011</td>
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</tbody>
</table>

Additionally, ITQB researchers have established a number of contracts with national and international companies via IBET. In 2011 contracts were established with the following companies: Tecnimed, Compal, ABLOVFX - Ass. Benet, Leziria Grande V. F. Xira, Nutrigreen, Amorim, Sartorius, Merck Serono, Cirad, Bayer, MOVIS.
Participation in scientific meetings

ITQB researchers presented their work (about 300 communications) in the following meetings:

10th Conference on Protein Expression in Animal Cells, Cascais, Portugal
10th European Meeting on the Molecular Biology of the Pneumococcus, Amsterdam, The Netherlands
10th Symposium on Lactic Acid Bacteria, Egmond aan Zee, The Netherlands
11th Internacional Symposium on Advances in Synthetic and Medicinal Chemistry, St. Petersburg, Russia.
11th Young Scientist Forum and 36th FEBS Congress, Torino, Italy
12th International Conference on Systems Biology, Heidelberg/Mannheim, Germany
13th Annual EMBL International PhD Symposium, Heidelberg, Germany
1st Iberian Meeting on Natural Bioactives Entrapment for the Food Industry - Challenges and Perspectives, from nanotechnology to bioavailability, Lisbon, Portugal
1st International Conference on Ionic Liquids in Separation and Purification Technology, Sitges, Spain
20th Western Photosynthesis Conference, California, USA
21st European Congress of Clinical Microbiology and Infectious Diseases / 27th International Congress of Chemotherapy (21st ECCMID - 27th ICC), Milan, Italy
21st International Symposium on Glycoconjugates, Vienna, Austria.
22nd Drosophila Research Conference, Lisbon, Portugal
22nd European Society for Animal Cell Technology Meeting on Cell Based Technologies, Vienna, Austria
241st American Chemical Society National Meeting, California, USA
26th New Phytologist Symposium: Bioenergy Trees, Nancy, France
2nd Iberian Meeting on Ionic Liquids, Santiago de Compostela and A Coruña, Spain
2nd International Congress on Analytical Proteomics, Ourense, Spain.
2nd Workshop “Dynamical systems applied to biology and natural sciences”, Lisbon, Portugal
36th FEBS congress, Biochemistry for Tomorrow’s Medicine, Torino, Italy.
3rd Annual SBMP meeting, Utrecht, Netherlands
3rd EU/CCPN Conference, Oeiras, Portugal
3rd International Conference on Biodegradable and Biobased Polymers, Strasbourg, France
3rd International Seminar on Engineering Fluids, Tarragona, Spain
3rd Marie Curie Annual Meeting, Utrecht, Netherlands
47th Congress of the European Societies of Toxicology, Paris, France
4th Congress of the International Biolron Society / Biennial World Meeting - Biolron 2011, Vancouver, BC, Canada
4th Congress on Ionic Liquids (COIL-4), Washington, USA
4th FEMS Congress of European Microbiologists, Geneva, Switzerland
4th International Chemistry Conference, Riyadh, Saudi Arabia
51st International Conference on Antimicrobial Agents and Chemotherapy, Chicago, USA.
56th Annual Meeting of the German Society for Neuropathology and Neuroanatomy, Tübingen, Germany.
5th Biennial Meeting of the Chlamydia Basic Research Society, Redondo Beach, California, USA.
5th International Conference on Polyphenols and Health, Sitges - Barcelona, Spain
5th International Congress on Stress Response in Biology and Medicine, Quebec, Canada
5th International Symposium on Recent Advances in Food Analysis, Prague, Czech Republic
5th Theoretical Biophysics International Symposium, Madeira, Portugal
6th International Conference on Annexins, Barcelona, Spain
6th International Conference on Biogenesis of Iron Sulphur Proteins and Regulatory Functions, Cambridge, United Kingdom
6th International Conference on Gram-positive Microorganisms, Montecatini, Italy
6th Italian meeting of lignocellulosic chemistry “Science and Technology of Biomass: Advances and Challenges” / COST Action FP0602: Biotechnology for lignocellulose biorefineries – Final Workshop, Viterbo, Italy
7th Conference on New Frontiers in Microbiology and Infection: Helicobacter pylori from basic research to clinical aspects, Villars-sur-Ollon, Switzerland
7th European Workshop on Bacterial Respiratory Chain, Lund, Sweden.
7th International Congress of Systematics and Evolutionary Biology, Berlin, Germany
7th International Society for Computational Biology Student Council Symposium, Vienna, Austria.
7th International Symposium on In Vitro Culture and Horticultural Breeding, Biotechnological advances in In Vitro Horticultural Breeding, Ghent, Belgium
7th International Water Association specialist conference on assessment and control of micropollutants/hazardous substances in water, Sydney, Australia
8th European Biophysics Congress Budapest, Hungary
8th European Conference on Mathematical and Theoretical Biology, Cracow, Poland
8th IWA Leading Edge Conference and Exhibition on Water and Wastewater Technologies, Amsterdam, The Netherlands
9th Carbohydrate Bioengineering Meeting, Lisboa, Portugal.
9th International Meeting of the Portuguese Carbohydrate Chemistry Group/5th Iberian Carbohydrate Meeting, Vila Real, Portugal
9th International Symposium of Rice Functional Genomics, Taipei, Taiwan
9th Plant Genomics European Meeting, Istanbul, Turkey,
American Water Works Association, Phoenix, Arizona, USA
Biobanking for Health Research, Lisbon, Portugal
British Mycological Society Meeting: Fungal Development and Pathogenesis, Exeter, UK.
CCPN Europa 2011: Supporting best practices in Biomolecular NMR, Oeiras, Portugal.
Champalimaud Neurosciences Symposium, Lisbon, Portugal
CHEMPOr 2011, Lisboa, Portugal
COIL 4 – 4th Conference on Ionic Liquids, Washington, USA.
CONCORD–PILGRIM Symposium, Brussels, Belgium
COST Action – 871 CryoPlaNet (Final Meeting), Angers, France
COST ACTION FAI005: 2nd Management Committee & Working Group Meetings of, Le Croisic, France
COST Action Organocatalysis (ORCA): 1st Meeting, Berlin, Germany
DrosTuga 2011, Oeiras, Portugal
E3 Forum, Lisbon, Portugal
EMBO Practical Course -Mass Spectrometry and Proteomics, Odense, Denmark.
EMBO Practical Course: High-throughput methods for Protein Production and Crystallization, Marseille, France.
EPSO Workshop, Plant Pigments and Human Health, Gerona, Spain
Eurocereals 2011, Gloucestershire, UK
Appendix

**Education Output**

**PhD Theses 2011**

Tânia Marisa Catarino Ribeiro
“Studies on resistance and response to vancomycin in *Enterococcus faecalis: a last resort antibiotic*”
Supervisor: Mª Fátima Silva Lopes

João Daniel da Silva Seixas
“Development of CO-Releasing Molecules for the Treatment of Inflammatory Diseases”
Supervisor: Carlos Romão

Tânia Leal da Silva Barreto Vinagre
“Hox genes control the specification of global vertebral domains”
Supervisor: Moisés Mallo

Inês Gabriel e Silva Batista e Guinote
“Functional Studies on BoIA and related genes: increasing the understanding of a protein with pleiotropic effects”
Supervisor: Cecília Arraiano

André João Tavares Fernandes
“Insight over multicopper oxidases stability”
Supervisor: Lígia Martins

Maria Margarida de Carvalho Negrão Serra
“Process Engineering of Stem Cells for Clinical Application”
Supervisor: Paula Alves

Tânia Filipa Pais de Oliveira
“Crystallographic and Biochemical Studies on Dissimilatory Sulfite Reductases”
Supervisor: Margarida Archer

Maria Filipa Baltazar de Lima de Sousa
“Searching for the common denominator of heme-copper oxygen reductases: Evolution and thermodynamic characterization”
Supervisor: Miguel Teixeira

Raquel de Amaro Lourenço
“Symmetry-Out, Asymmetry-In: The role of dmrt2”
Supervisor: Moisés Mallo

Maria Helena Macieira Pires Futcher de Deus
“Improving discovery in the Life Sciences using Semantic Web Technologies and Linked Data: Design principles for Life Sciences Knowledge Organization Systems”
Supervisor: Jonas Almeida

Rui Miguel Tiago Peixoto (PGDB)
“Trans-Synaptic Signaling by Activity-Dependent Cleavage of Neuronalin-I”
Supervisor: Sukalyan Chatterjee

Silvana Coelho Cardoso Manuel
“Genetics of berry color and anthocyanin content variation in grapevine (Vitis vinifera L. subsp. vinifera)”
Supervisor: Pedro Fevereiro

Mafalda Pinto Baptista Lopes da Silva
“Dissecting the molecular interaction between hepatocytes and Plasmodium liver parasites”
Supervisor: Miguel Seabra

André Filipe Pontes da Costa
“Cp-Functionalised N-Heterocyclic Carbenes: Coordination to Mo, Ru, Rh and Ir and Catalytic Applications”
Supervisor: Beatriz Royo

Teresa Marina Fonseca de Almeida Santos Braga
“Enterococcus and biocides: mechanisms of tolerance and selection for vancomycin resistance”
Supervisor: Fátima Lopes

Rita Maria de Brito Francisco
“Biochemistry of Grape Berries: Post-genomics approaches to uncover the effects of water deficits on ripening”
Supervisor: Maria Manuela Chaves

Catarina Sim-Sim Pereira
“Bacterial inter-species communication mediated by the autoinducer-2 signal”
Supervisor: Karina Xavier

Raquel Alexandra Gaboleiro Antunes
“Neural mechanisms of stimulus generalization in auditory fear conditioning”
Supervisor: Marta Moita

Marta Viseu Rodrigues
“Heat Stress Adaptation in Hyperthermophiles: Biosynthesis of Inositol-Containing Compatible Solutes”
Supervisor: Helena Santos

Nuno Eduardo Buxo Carinhas
“Systems Biotechnology of baculovirus-producing insect cells”
Supervisor: Paula Alves

Sofia Isabel Marques da Silva
“Formate metabolism in sulfate reducing bacteria”
Supervisor: Inês Cardoso Pereira

Rute Margarida Gonçalves Matos
“Functional and Structural Characterization of the RNase II-family of enzymes”
Supervisor: Cecília Arraiano

Ana Rita Pimenta Falcão Marques
“Mitosis and Protein Nα–Terminal acetylation”
Supervisor: Rui Gonçalo Martinho

Martina Bradic
“The Genetic Basis of Morphological Change in Convergent Evolution of Natural Populations: “Identifying Candidate Genes Behind Convergent Evolution in Blind Cave Fish, Astyanax mexicanus”
Supervisor: Henrique Teotônio

José Ángel Brito Castro
“Oxo-molybdenum(VI) complexes containing chiral ligands: catalytic applications in selective epoxidations”
Supervisor: Beatriz Royo Cantabrana

José Artur Alves de Brito
“Crystallographic studies on two hyperthermophilic enzymes”
Supervisor: Margarida Archer

Marija Petkovic
“Revealing fungal activity in the presence of ionic liquids”
Supervisor: Luís Paulo N. Rebelo

Pedro Miguel Veríssimo Mateus
“Ditopic molecular architectures for the recognition of anionic species”
Supervisor: Rita Delgado
Cristina Isabel Caniço Escrevente
“Protein glycosylation of exosomes from ovarian carcinoma cells”
Supervisor: Júlia Costa

Ana Isabel Perópm Amaral
“Metabolic Flux Analysis of Neural Cell Metabolism in Primary Cultures”
Supervisor: Paula Alves

Stefanie Nunes Rosa
“Transgenic plants as models to study chromatin organization and regulation of gene expression”
Supervisor: Rita Abranches

Cátia Gisela Rebordelo Marques Feliciano (PGDB)
“Behavioral and synaptic circuit analysis in models of neuropsychiatric disorders: Dissecting the in vivo role of the postsynaptic density proteins nArgBP2 and Shank3 using genetically engineered mice”
Supervisor: Sukalyan Chatterjee

Cátia Cristina Moreira Proença (PGDB)
“Molecular modulation of brain development and function: Lessons from “old” and “new” protein families – Molecular mechanisms of neurotrophin and Slitrk protein families mediating development and function of central nervous system”
Supervisor: Moisés Mallo

Raquel Fonseca de Carvalho
“Functional and molecular characterization of SR45: a plant-specific splicing factor involved in sugar and stress signaling in Arabidopsis thaliana”
Supervisor: Paula Duque Magalhães

Alexandra Sofia Oliveira Simões
“Molecular nature, population biology and fitness of non-typeable Streptococcus pneumonia”
Supervisor: Raquel Sá-Leão

Maria do Carmo Barreto Baptista Basílio
“Dynamics of cycokbicis that stopper manufacturing process: from diversity to metabolite”
Supervisor: Vitória S. Romão/Teresa Crespo

Tiago Vasconcelos Duarte Moreira Pais
“Insights into the Molecular Mechanisms of Protein Stabilization by Osmolytes of Hyperthermophiles”
Supervisor: Helena Santos

Sofia Cristina dos Santos Venceslau
“Electron transfer chains in sulfate reducing bactéria”
Supervisor: Inês Cardoso Pereira

Catarina de Matos Ferraz Franco
“Proteomics based approach to understand tissue regeneration – starfish as a model organism”
Supervisor: Ana Varela Coelho

Ivo Marguti
“Immune response and tissue cytoprotection: two sides of the same coin in immunopathology”
Supervisor: Miguel Soares. deixou de ser a partir de Set 2011 passou a ser Thiago Carvalho (IGC)

Ana Inês da Cunha Ferreira
“Regulation of PLK4 levels and activity to ensure centriole number control”
Supervisor: Mónica Bettencourt Dias

Ricardo António Neves Moreira
“Studies on BolA and Ribonuclease R: Two Important Factors in the Control of Bacterial Gene Expression”
Supervisor: Cecília Arraiano

Óscar Leandro da Silva Ramos
“Development and characterization of bioactive, edible whey protein films and coatings to improve quality and safety of food products”
Supervisor: Francisco Xavier Malcata

Tânia Sofia Granja Tavares
“Production and characterization of the biological activity of peptides obtained via hydrolysis from whey proteins by cardosins”
Supervisor: Francisco Xavier Malcata

Fabrizio Testa
“Mechanisms of NO and O2 scavenging in microorganisms and human pathogens”
Supervisor: Miguel Teixeira

Master Theses
No degrees awarded at ITQB in 2011.
Six Master Theses awarded by other institutions whose work was conducted at ITQB.

University Extension Courses
Bethania Garcia Cassani
University Extension Courses/Scientific Research Training C
Macromolecular Crystallography Lab; Supervisor: Tiago Bandeiras

Carla Sofia Arrifes Baltazar
Post-Graduation Course/Scientific Research Training A
Modelação de Proteínas Lab; Supervisor: Cláudio M. Soares

Clara Susana Marques Graça
Post-Graduation Course/Scientific Research Training A
Plant Cell Biotechnology Lab; Supervisor: Jorge Paiva

Jane Bruun Frederiksen
University Extension Courses/Scientific Research TrainingD
Protein Biochemistry Folding & Stability Lab; Supervisor: Claudio Gomes

Luis Carlos Santos Filipe
Post-Graduation Course/Scientific Research Training A
Simulação Molecular Lab; Supervisor: António Baptista

Sofia Vargas Nobre de Gusmão
University Extension Courses/Research Integration
Infection Biology Lab; Supervisor: Jaime Mota
Other Activities

Presence in Editorial Boards

In 2011, ITQB researchers sat on the editorial boards of the following international journals.

**FEMS Microbiological Reviews**
Cecília Arraiano

**WIREs RNA- Wiley INterdisciplinary Reviews on RNA**
Cecília Arraiano is an editor

**Microbial Drug Resistance**
Hermínia de Lencastre

**European Journal of Clinical Microbiology & Infectious Diseases**
Hermínia de Lencastre

**PLos One**
Hermínia de Lencastre

**Journal of Berry Research, IOS Press**
Ricardo Boavida Ferreira, since 2009

**Tree Physiology**
Célia Miguel is member of the Editorial Review Board

**Plant Cell Tissue and Organ Culture (Elsevier Journal)**
Margarida Oliveira is Associated Editor since Jan. 2006

**Journal of Integrated Omics**
Cândido Pinto Ricardo and Carla Pinheiro are members of the editorial board

**Functional Plant Biology**
Manuela Chaves is Associate Editor

**Journal of Experimental Botany**
Manuela Chaves is Advisory Board Member

**Open source journal PloS One**
Yann Astier is an academic editor since 2008

**Frontiers in Microbial Physiology and Metabolism**
Inês Cardoso Pereira, Associate Editor

**YEAST, Comptes Rendus de l’ Académie des Sciences**
Cláudia Rodrigues-Pousada member of the Editorial Board

**Journal of Mycology (The Open Mycology Journal)**
Cláudia Rodrigues-Pousada

**Chemistry Open**
Pedro Matias, Editorial Advisory Board

**FEBS Letters**
Ricardo O. Louro

**Acta Crystallographica Section F**
Margarida Archer is Member of review panel

**Pool of Reviewers**
Margarida Archer is Member of the ESF (European Science Foundation)

**Postdoctoral grants Assessment**
Margarida Archer is Panel Member for IRCSET (Irish Research Council for Science, Engineering and Technology), Dublin (April/2011)

**Assesment of bilateral cooperation proposals (Fundação para Ciência e Tecnologia, FCT)**
Margarida Archer

**Bioinorganic Chemistry and Applications**
Claudio M. Gomes

**Fatty Acid and Lipid Physiology**
Claudio M. Gomes

**Journal of Biomedicine and Biotechnology**
Claudio M. Soares, Associate Editor

**Journal of Biological Inorganic Chemistry**
Maria Arménia Carrondo, Editor

**Journal of Chemical Engineering Data**
Luís Paulo N. Rebelo, member of the Editorial Advisory Board

**International Journal of Molecular Science**
Luís Paulo N. Rebelo, Editorial Advisor

**BMC Biotechnology**
Paula M. Alves, member of the Editorial Board

**Journal of Biotechnology**
Paula M. Alves

**Journal of Biotechnology**
Manuel J. T. Carrondo, Associate Editor

**Biotechnology and Bioengineering**
Manuel J. T. Carrondo

**Biotechnology Letters**
Manuel J. T. Carrondo

**Current Gene Therapy**
Manuel J. T. Carrondo

**The Scientific World Journal**
Ana Sofia Coroadinha, member of the Editorial Board (Biotechnology panel)

**Food Safety Magazine**
Alexandra Veiga, member of the Editorial Advisory Board
Seminars at ITQB 2011

Frontier Leaders Seminars

Cyclic-di-GMP signaling in bacterial ‘life-style’ switching
Regine Hengge, Freie Universität Berlin, Germany

Antiviral and anticancer metal complexes
Peter Sadler, University of Warwick, United Kingdom

Maternal pathways controlling plant embryogenesis
Ueli Grossniklaus, Universität Zürich, Switzerland

Computer simulation in the life sciences: where do we go?
Wilfred E. van Gunsteren, Swiss Federal Institute of Technology, Zurich, Switzerland

Microbes inside
Willem M. de Vos, Helsinki & Wageningen University, Netherlands

Metal Ions and Metal Ion Complexes Guiding Folding and Function of Single RNA Molecules
Roland Sigel, University of Zurich, Switzerland

AVX Seminars

Peter pan ‘s syndrome or the search for the permanent youth
Pedro Moradas Ferreira, Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Portugal

Chromogenic compounds for smart materials
Fernando Pina, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal

Differential remodelling of chromatin topology in small and large genomes
Wanda Viegas, Instituto Superior de Agronomia, Universidade Técnica de Lisboa, Portugal

Brain biophysics
Eduardo Ducla Soares, Faculdade de Ciências, Universidade de Lisboa, Portugal

Cell-Biomaterial Interactions at the Nanoscale
Mário Barbosa, Faculdade de Engenharia e INEB, Universidade do Porto, Portugal

Science journalism is dead. Now what?
António Granado, Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa, Portugal

Light and water games with porous silicates and metal organic frameworks
João Rocha, Centro de Investigação em Materiais Cerâmicos e Compostos - CICEC, Universidade de Aveiro, Portugal

What Surprises can Crystallography (still) Reveal in the Active Sites of Metalloenzymes?
Maria João Romão, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal

Micro and Nano engineering of biosensing and cell microenvironment using lab-on-a-chip devices
João Pedro Conde, Instituto Superior Técnico, Universidade Técnica de Lisboa, Portugal

Human Enhancement
Alexandre Quintanilha, Instituto de Biologia Molecular e Celular, Universidade do Porto, Portugal

Interbio Seminar

Aptamers: clever oligonucleotides for bio- and nanotechnology
Jean Jacques Toulmé, European Institute of Chemistry and Biology, Bordeaux, France

SCAN

Bioinformatics Training: The GTPB Programme
Pedro Fernandes-GTPB Organizer IGC- Oeiras

Tick born diseases in Portugal farms: prevalence and diagnosis
Abel G. Oliva Head of Biomolecular Diagnostic Laboratory

Novel catalysts based on N-heterocyclic carbene metal complexes
Beatriz Royo Head of Homogeneous Catalysis Laboratory

Studies on the post-transcriptional regulation of the small non-coding RNA MicA
Sandra Cristina Viegas-Post-Doc Fellow Control of Gene Expression Laboratory

Studying biomedically relevant systems by molecular simulation
Antonio M. Baptista Head of Molecular Simulation Laboratory

Expression, purification and activities of sensor histidine kinases of Enterococcus faecalis
Pik Yee Ma, Post-Doc Membrane Protein Crystallography Laboratory

Identification of structural regulators for substrate selectivity in different Flavodiiron proteins
Bruno L. Victor Protein Modeling Group-ITQB

A sweet twist in Streptococcaceae: ways that sugar metabolism shape virulence and metabolic traits
Ana Rute Neves Head Of Lactic Acid Bacteria & In Vivo NMR

Subcellular organization in bacteria that divide in orthogonal planes
Mariana Pinho Head of Bacterial Cell Biology Laboratory
Crossing the bridge: the role of an E3-ubiquitin ligase in the modulation
Tiago Lourenço Post-Doc-Genomics of Plant Stress Laboratory

Ionic liquids under common and sometimes not-so-common conditions: Recent experimental results
José Esperança Assistant Researcher at Molecular Thermodynamics Laboratory

Reductive elimination of Reactive Oxygen Species: Structural and Functional Insights
Miguel Sepúlveda Teixeira Head of Metalloenzymes and Molecular Bioenergetics Laboratory

Copper(II) cryptates as receptors for anions and potential radiopharmaceutical use
Rita Delgado Head of Coordination and Supramolecular Chemistry Laboratory

Therapy with CO: where are we?
Carlos C. Romão Head of Organometallic Chemistry Laboratory

A brief journey into the nanoworld of proteins
Margarida Archer Head of Membrane Protein Crystallography Laboratory

Good and bad lipids
Eurico Melo Head of Microheterogeneous Systems

Photoprotection systems in Quercus ilex L. and the application of the Near-Infrared Reflectance Spectroscopy (NIRS) as an ecophysiological tool to detect oxidative stress
Marta Pintó-Marijuan Post-Doctoral

Monofunctional transglycosylases are not essential for Staphylococcus aureus cell wall synthesis
Patricia Reed Post-Doctoral at Bacterial Cell Biology Laboratory

Biochemical Systems Analysis of the trehalose cycle in Saccharomyces cerevisiae
Luís L. Fonseca Post-Doctoral fellow at Cell Physiology and NMR Laboratory

A Structural Biology approach to study protein function
Isabel Bento Auxiliary Investigator at Structural genomics Laboratory

Population genomics of Medicago truncatula to identify mechanisms of salinity adaptation
Matilde Cordeiro PhD student at Plant Cell Biotechnology Laboratory

Deciphering energy metabolism in the earliest life forms: the dissimilatory reduction of sulfur compounds
Inês Cardoso Pereira

Biological Energy Transduction
Manuela M. Pereira, Biological Energy Transduction Laboratory

Primary Cultures and Stem Cells for Drug Discovery and Cell Therapy: Bioprocessing Challenges
Paula M. Alves Head of Cell Bioprocesses Laboratory

Using Drosophila to study the Unfolded Protein Response
Pedro Domingos Head of Laboratory of Cell Signaling in Drosophila

Role, evolution, and biosynthesis of di-myo-inositol-phosphate
Nuno Borges Assistant Researcher Cell Physiology and NMR Laboratory

Applications of Proteomics in Veterinary and Agricultural Sciences
André Martinho de Almeida Researcher of the Instituto de Investigação Científica Tropical | Invited Researcher of the Mass Spectrometry Laboratory of the ITQB

Other Seminars

Oxidative stress and killing mechanism of bactericidal antibiotics: direct or indirect connection?
Axel Hartke Caen University, France

Partnership and Cooperation in Health R&D and Innovation
Protocol between Universidade Nova de Lisboa and Eurotrials

FCT R&D Projects in all Scientific Domains 2010. How to apply
Informative work session by the Research Funding Affairs team, IGC

From Cyanobacterial Hydrogenases to BioModularH2
Paula Tamagnini, IBMC, Universidade do Porto, Portugal

Towards Pharmacetically Acceptable CO-RMs
Fabio Zobia Zurich University, Switzerland

Exploiting the human immune response for the development of vaccines and therapeutic antibodies against infectious diseases
Andreas Meinke - Intercell

Overview of Vaccine Process Development at RIVM
Leo van der Pol Vaccine Institute, Netherlands

Development and Technology Transfer for Viral Vaccines
Wilfried Bakker Vaccine Institute, Netherlands

Corynebacterium glutamicum tailored for efficient isobutanol production
Bastian Blombach - University of Ulm, Germany
Appendix

Non-canonical polyadenylation and uridylation in RNA degradation: the Arabidopsis perspective
Dominique Gagliardi, Institut de Biologie Moléculaire des Plantes, CNRS, France

Monolithic chromatography supports
Aleš Štrancar, BIA Separations

A little semantics can go a long way
Helena F. Deus, ITQB and Digital Enterprise Research Institute, Ireland

Mixing Methodologies in Single-use Bioreactors - A Comparative Analysis of Consistency Across Scale
Brian Lee MD PhD President, PBS Biotech, Inc

Linkage disequilibrium mapping: novel insights into the genetics of human complex diseases
Nikolas Maniatis University College of London, United Kingdom

What would you ask a Nobel Prize winner?
Discussion Session with Ada Yonath

Bioprocess Integrated Solutions
Christian Manzke & Etienne Evrard

Targeting bacterial membrane sensory proteins for future drug discovery
Mary K. Phillips-Jones University of Leeds, United Kingdom

How cells adapt to Fe deficiency through targeted messenger RNA degradation
Dennis Thiele Duke University Medical Center

Improving photosynthetic efficiency of plants - a genetic approach
Baishnab Tripathy, Jawaharlal Nehru University, India

Electron tunneling and coupled proton transfer reactions in respiratory enzymes
Alexei A. Stuchebrukhov University of California, USA

The importance of peeing earnest: urine derived cells as model systems in biology and biomedicine
Regina Grillari University of Natural Resources and Life Sciences Vienna, Austria

From cellular ageing to recombinant protein production: Spotlight on small RNA
Johannes Grillari BOKU-University of Natural Resources and Life Sciences Vienna, Austria

Role of formate in syntrophic methanogenic communities
Alfons Stams, Wageningen University

Genome assessments of cis-elements in the promoter regions of related genes
António Costa de Oliveira, Universidade Federal de Pelotas, Rio Grande do Sul, Brazil

Bioprocess development activities at Institut Pasteur of Tunis
Héla Kallel Head, Bioprocess Development Unit Institut Pasteur of Tunis, Tunis

Cervarix: first human vaccine manufactured with baculovirus expression system
Isabelle Knott Director, Head of Cell Culture Development GlaxoSmithKline Biologicals S.A.

Health benefits of dietary polyphenols: new ideas linking bioavailability and efficacy
Gary Williamson University of Leeds, United Kingdom

Vascularized multi-organ systems – the next level of engineering human biology in vitro
Uwe Marx & Mark Rosowski Technische Universität Berlin, Institute of Biotechnology

Ccml protein acts as an apocytochrome c chaperone during cytochrome
Andrea F. Verissimo Department of Biology, University of Pennsylvania, Philadelphia (Andrea Verissimo is a former ITQB PhD student).

High resolution gel-based proteomics for the analysis of molecular mechanisms
Jens R. Coorssen University of Western Sydney, Australia

Challenges and Opportunities in Structure Determination of Membrane Proteins.
Isabel de Moraes Imperial College London and Diamond Light Source (honorary)

Cysteine-containing peptides and pseudopeptides as efficient Cu(I) chelators
Pascale Delangle CEA Grenoble Institut Nanosciences et Cryogénie

Insights into initial stages of bacterial cell division: Looking at dynamic FTSZ polymers on surfaces at the nanoscale
Marisel a Veléz, Instituto de Catálisis y Petroleoquímica CSIC, Madrid, Spain

2-D DIGE: Best Practice in 2-D Electrophoresis
Bruno Bacher GE Healthcare Europe GmbH

Marrying Qual and Qual Aspects in - Omics World
Michaela Scigelova, Thermo Fisher Scientific, Bremen, Germany

Emerging techniques for mass spectrometry
Robert Tongue, Waters, Manchester, United Kingdom

Recepta Biopharma and its Innovation Model
José Fernando Perez, Recepta Biopharma, Brazil

Some Perspectives on Vaccines, Biologicals, and the Pharmaceutical Industry
John G. Aunins Merck Sharp & Dohme, West Point, New Jersey, USA
Fields of Application – Research and Development at the Fraunhofer IGB
Kai Sohn - Fraunhofer Institute for Interfacial Engineering and Biotechnology Stuttgart, Germany

Bacterial cytochrome bd and nitrosative stress
Alessandro Giuffrè - CNR Institute of Molecular Biology and Pathology; Sapienza University of Rome; ITQB Invited Professor

Programa COHITEC
Sessão de Apresentação

Evolution of pneumococcal serotypes in invasive diseases in Italy in the conjugate vaccine era
Annalisa Pantosti, National Health Institute, Rome, Italy

Using deep sequencing to discover new modes of gene regulation
Gordon Carmichael University of Connecticut Health Center Farmington, USA

Understanding the adaptation of L. lactis by Integrative biology
Muriel Cocaign-Bousquet LISBP, Toulouse, France

Deciphering the role of the microRNA-200c in breast cancer metastasis
Ricardo Perdigão Henriques PhD Student at Engineering Cellular Applications Laboratory

Growth and regeneration in an ever changing ocean
Sam T Dupont, The Sven Lovén Centre for Marine Sciences, Sweden

Transporting Folded Proteins Across Membranes
Ben Berks, University of Oxford, United Kingdom
Science and Society

School Visits
20 visits | 620 students

Schools
EB2.3/S de Celorico de Basto
Escola Profissional Amar Terra Verde
Escola Sec. Alvide
Escola Secundária Augusto Cabrita (Barreiro)
Escola Secundária de S.João do Estoril
Escola Secundária Fernando Lopes-Graça - Parede
Escola Secundária José Cardoso Pires.
Escola Secundária Sebastião e Silva
Escola Secundária/3 Padre Alberto Neto (3 visitas)
Secundária de S. Lourenço - Portalegre
Vila Pouca de Aguiar

Labs
Analytical Chemistry
Analytical Services
Animal Cell Technology Unit
Applied and Environmental Mycology
Bacterial Cell Surfaces and Pathogenesis (2x)
Biological Energy Transduction
Biomolecular Diagnostic
Biomolecular NMR
Cell Bioprocesses Laboratory (2x)
Cell Physiology & NMR
Cell Signaling in Drosophila
Control of Gene Expression
Disease and Stress Biology
Forest Biotech
Genomics and Stress
Genomics of Plant Stress
Glycobiology
Industry and Medicine Applied Crystallography
Infection Biology
Inorganic Biochemistry and NMR
Lactic Acid Bacteria & In Vivo NMR
Membrane Protein Kristallography
Microbial & Enzyme Technology
Microbial Development
Microbiology of Man-made Environments (3x)
Molecular Genetics
Molecular Genetics of Microbial Resistance
Molecular Thermodynamics
Nutraceuticals and Delivery
Pharmacological and Biopharmaceutical Analysis and Pharmacokinetics
Plant Cell Biology (2x)
Plant Cell Biotechnology (2x)
Plant Molecular Ecophysiology
Protein Biochemistry Folding & Stability
Systems Biodynamics

Open Day
Organizing Committee
Ana Luísa Simplício
Ana Sanchez
Carlos Romão
Collin Mcvey
Helena Vieira
Liste Galego
Mannolis Matzapetakis
Miguel Costa
Pedro Domingos
Sérgio Filipe
Yann Astier

Summer Training
Genes e Proteínas Que Não Estão de Férias
Lígia M. Saraiva

Introdução ao meio laboratorial
Célia Romão

Síntese de novas moléculas
Beatriz Royo

Science and Technology Week
Researchers
Ana Oliveira
Catarina Brito
Inês Cardoso Pereira
José Brito
José Esperança
Pedro Fevereiro
Pedro Matias
Rita Abranches
Vanessa Pereira

Schools
EB 2,3 Carlos Lopes - Amadora
AMRT-Associação de Melhoramentos e Recreativo do Talude
Dr. Joaquim de Barros - Paço de Arcos
Escola EB 2,3 Piscinas - Lisboa
Escola sec. Quinta do marquês
Escola Secundária de Ferreira Dias - Cacém
Escola Secundária Padre Alberto Neto - Queluz
Secundária Sebastião e Silva - Oeiras
Dear All,

We have officially concluded our internal fundraising campaign. Throughout November, we received almost 350 donations, collecting circa 70,000 Euros. These are extraordinary numbers by all accounts; they will cover a significant part of the expenses to replace the so-called chillers as well as those to renew the building’s energy control system. I would like to publicly thank all of those who have anonymously contributed to this cause. I am also taking this opportunity to appraise this unprecedented initiative in a public Portuguese institution.

We are living, we all know that, very harsh times, severe times for each and every one of us, unkind for institutions that are facing a growing number of financial and human difficulties.

In this atmosphere of adversity, I was constantly surprised by the generosity of those who approached me with ideas of solidarity campaigns to overcome specific obstacles, such as purchasing new scientific equipment or supporting human resources. At the same time, I was struggling with the eminent failure of several infrastructural devices, which had only outlived their lifetime due to the dedication and competence of our maintenance services. I knew how difficult it had been to include this expense in our annual budget over the years. I also knew of the good will of our funding institutions; however, I was also aware of their own financial constraints at this point.

And this is when two ideas became one. The replacement of these apparatus would benefit all; rather than focusing on particular research area equipment, this was something so fundamental that it could indeed unite us all in a common effort. So, our internal fundraising campaign was born: a challenge to all – researchers, staff, students and alumni contributing anonymously and voluntarily with as much as they could to help replacing the building’s energy control system.

Knowing for so long the special character of the people in this institution, I believed in the success of this campaign from the start. But, as often happens, reality surpassed the best expectations. Not only in regards to numbers, which are truly exceptional, but by the number of ideas and initiatives that have flourished during the past month at ITQB, a demonstration of the distinctive spirit of this institution. I doubt any other director has ever felt as proud of its institution as I do right now.

I wish to heartedly thank you for all your support and I assure you that this initiative will never be forgotten. An annual award will be created to celebrate our esprit de corps. As you know, replacing the chillers will also impact our energy savings. This money will be converted to science, as it should be. So the benefit is doubled; not only have you assured that ITQB continues to function at its best but you are also contributing to our future success.

Meanwhile, we have extended this campaign to those outside. Our internal commitment has convinced others to contribute as well. We believe we have set a new standard for companies and institutions, and, who knows, for individuals, to support research at ITQB. There will be other, more important measures needed in order to solve our financial hurdles – some of those are already under study – but encouraging external donations is a project we should nurture.

I wish to finish by thanking Professor Manuela Chaves for the way she has led and monitored the whole process and for the immense dedication and professionalism of Ana Freire in managing all the donations.

With my sincere gratitude to you all

Luís Paulo

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Installation of the “chillers”, March 2012
2011 Curiosities

- Research groups: 63
- % Female PhD students: 73
- Invited speakers: 66
- % Female PhD holders: 64
- % articles with international teams: 52
- % Foreign PhD holders: 21
- M€ in Research Projects: 3,5