

EUROPEAN ACADEMY OF SCIENCES IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

EurASc 2017 SYMPOSIUM THE FUTURE OF SCIENCE IN THE 21<sup>ST</sup> CENTURY: SCIENCE & TECHNOLOGY FOR THE BETTER FUTURE OF HUMANKIND

October 26<sup>th</sup> & 27<sup>th</sup>, 2017 Venue: Lisbon Academy of Sciences – Lisbon, Portugal

www.eurasc.wixsite.com/eurasc2017

### **ORGANIZING COMMITTEE:**

Chairman : Rodrigo Martins; Co-Chairman: Alain Tressaud

### MEMBERS OF THE ORGANIZING COMMITTEE:

Hélène de Rode (Permanent Secretary of EurASc); Elvira Fortunato (FCT-UNL/i3N, Portugal); João Rocha and Artur Silva (U. Aveiro, CICECO); Salomé Pais (Secretary-General of Lisbon Academy of Sciences); Carlos Salema (Vice President of the Lisbon Academy of Sciences); Fernando Santana (President of the Portuguese Academy of Engineering); Jean Etourneau (U. Bordeaux, France)

















CENTRO

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## THE FUTURE OF SCIENCE IN THE 21<sup>ST</sup> CENTURY: SCIENCE & TECHNOLOGY FOR THE BETTER FUTURE OF HUMANKIND

October 26<sup>TH</sup> & 27<sup>TH</sup>, 2017 LISBON ACADEMY OF SCIENCES - LISBON, PORTUGAL

#### About EurASc

The European Academy of Sciences (EurASc) is a non-profit non-governmental, independent organization of the most distinguished scholars and engineers performing forefront research in the development of advanced technologies, united by a commitment to promoting science and technology and their essential roles in fostering social and economic development.

The European Academy of Sciences (EurASc) is a fully independent international association of distinguished scholars that aims to recognize and elect to its membership the best European scientists with a vision for Europe as a whole, transcending national borders both in elections and in actions. The aim is to strengthen European science and scientific cooperation and to use the expertise of its members in advising other European bodies in the betterment of European research, technological application and social development.

For the purpose of EurASc, "Europe" and "European" is taken to include both holders of citizenship of a country within Europe and persons of any nationality who reside and intend to continue to reside within Europe.

EurASc is completely independent of any national entity, in its membership, election processes, deliberations and actions.

#### The Objectives of the present Symposium

Science and Technology are momentous forces that have shaped the world and promoted the progress of Humankind. They have fostered the transition to an industrial society and to the information age, and have played a dominant role in economic and social development, transforming our daily-life.

The aim of this event is to discuss the challenges of the future of Science and Technology where citizens will increasingly play a key role in defining the roads that scientists should follow, while ensuring comfort and welfare for all. This will impact on our lives and how science will have to be considered in years to come.

In the modern era, Science and Technology are fundamental to address global challenges, such as food, resources and energy shortage, pollution, climate change, overpopulation, poverty, disease and economic crisis. They will be decisive in assisting the change from the traditional model of development, grounded on the consumption of colossal amounts of resources, to the sustainable management of our planet.

International cooperation and openness will be key ingredients in enabling Science and Technology to promote a less unbalanced world and a better future for Humankind.



#### EUROPEAN ACADEMY OF SCIENCES IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

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### THURSDAY, OCTOBER 26<sup>TH</sup>, 2017

PRUGRAMME	
08.00 - 08.30 am	Registration
08.30 - 08.55 am	Welcome speeches - Introducing the Symposium: <b>Prof. Rodrigo Martins</b> ; <b>Prof. Alain Tressaud</b> and <b>Prof. Ana Sanchez</b> , Member of the Board of Directors of the Portuguese Foundation for Science and Technology (FCT)
08.55 - 09.25 am	<b>Prof. Alexandre Quintanilha</b> , (Head of Science and Education Committee for the Portuguese Parliament, Lisbon, Portugal) Introductory lecture: "Searching and sharing knowledge"
Session 1 - Sustainable management of natural resources Session Chair: Prof. Artur Silva, EurASc, University of Aveiro (Portugal)	
09.25 - 09.55 am	<b>Prof. Arnold Tukker (Leiden University, Netherlands)</b> "The transition to a circular economy – some (in)convenient truths"
09.55 - 10.25 am	Prof. Eric Gaffet (CNRS, France) "Nano - Solutions for sustainable materials management"
SESSION 2 - ECO-EFF SESSION CHAIR: PROF JEA	ICIENT TRANSPORT AND MODERN ENERGY SOLUTIONS

- 10.25 10.55 am Prof. Sigurd Wagner (Princeton University, USA) "Challenges to realizing an energy economy powered exclusively by sun and wind"
- 10.55 11.25 am Prof. Adélio Mendes (FEUP, Porto, Portugal) "Electricity from renewable sunlight: cheaper and cleaner"
- 11.25 11.40 am Coffee Break

#### Session 3 – Health and New Technologies in Life Sciences

SESSION CHAIR: PROF. SALOMÉ PAIS, SECRETARY-GENERAL OF LISBON ACADEMY OF SCIENCES

11.40 - 12.10 pm	Prof. Ernst Wagner (LMU Munich, Germany) "Chemical evolution of carriers for use in nanomedicine"
12.10 - 12.40 pm	<b>Prof. Daniel Scherman (INSERM Paris, France)</b> "Genetic pharmacology and gene therapy, the new revolutionary frontiers of innovative medicine"
12.40 - 01:00 pm	Round table with moderator: <b>Prof. João Rocha (CICECO)</b> "Science and Citizens"

01:00 - 02.00 pm Lunch

#### Session 4 - Potential and challenges of Internet & Robot Ethics

SESSION CHAIR: PROF. CARLOS SALEMA, LISBON ACADEMY OF SCIENCES

Prof. Asunción Gómez-Pérez (Universidad Politécnica de Madrid, Spain) "Automated Data Markets"
Prof. Margherita Venturi (Bologna University, Italy) "Artificial molecular-level devices and machines"
<b>Prof. Raja Chatila (ISIR Paris, France)</b> "Ethical Considerations in Artificial Intelligence Robotics and Autonomous Systems"
<b>Prof. Arlindo Oliveira (IST, Lisboa, Portugal)</b> "Digital Minds: Science Fiction or Near Future Reality?"

04.00 - 04.30 pm Coffee Break

#### SESSION 5 - SCIENCE POLICY, COMMUNICATION, AND GLOBAL NETWORKING

Session Chair: Prof. Fernando Santana, Portuguese Academy of Engineering and Prof. Elvira Fortunato, EurASc

04.30 - 05.00 pm	Prof. Sierd Cloetingh (Psdt A.E, Cost Association, University Utrecht, Netherlands) "Spreading research excellence in Europe: perspectives from Academia Europaea"
05.00 - 05.30 pm	Prof. Maria da Graça Carvalho (EP, Brussels, Belgium) Concluding lecture: "Reducing inequalities: the role of social innovation"
05.30 - 06.15 pm	Final round table with moderators: <b>Prof. Jean Etourneau</b> (University of Bordeaux, EurASc) <b>Prof. Hélène de Rode</b> (Perpetual Secretary of EurASc) "Ethics on Science"
06.15 - 07.00 pm	General Assembly, EurASc members
08.00 pm	Banquet at Centro Cultural de Cascais

### FRIDAY, OCTOBER 27<sup>TH</sup>, 2017

### 10<sup>TH</sup> ANNIVERSARY OF EUROPEAN RESEARCH COUNCIL SESSIONS

LISBON ACADEMY OF SCIENCES

MORNING SESSION CHAIRS: PROF. JOSE LABASTIDA, ERC EA; PROF. ELVIRA FORTUNATO AND PROF. JOÃO ROCHA, MEMBERS OF EURASC

09.00 - 09.15 am	Introduction to the ERC 10th Anniversary by <b>Prof. Jose Labastida</b> , Head of the Scientific Management Department of the European Research Council "The role of ERC in boosting Science in Europe"
09.15 - 09.45 am	Prof. Yvette van Kooyk (ERC Advanced Grant, Amsterdam,Netherlands) "Will nanovaccines be the new generation of cancer vaccines?"
09.45 - 10.15 am	<b>Prof. Tim P. Vogel (FENS-Kavli Network Oxford Univ., UK)</b> "Innovating funding for innovation: An early-career perspective on European Grants"
10.15 - 10.35 am	Prof. Luís Pereira (ERC Starting Grant, CENIMAT/FCTINOVA, Portugal) "A new era of electronics and photonics on paper"
10.35 - 10.55 am	Coffee Break
10.55 - 11.15 am	<b>Prof. Pedro Barquinha (ERC Starting Grant, CENIMAT-FCTINOVA, Portugal)</b> "Transparent and flexible electronics with embedded energy harvesting based on oxide nanowire devices (TREND)"
1.15 - 11.35 am	Prof. Mara G. Freire (ERC Starting Grant, CICECO, Portugal) "Design of Effective Purification Platforms for Biopharmaceuticals"
11.35 - 12.25 pm	Round table with moderator: <b>Prof. Carlos Ribeiro</b> (Champalimaud Foundation) "The role of European Research Council in the research career and groundbreaking work"
12.25 - 01.45 pm	Lunch

### AWARDS CEREMONY

LISBON ACADEMY OF SCIENCES

CHAIRMEN OF THE AFTERNOON SESSION: PROF. ALAIN TRESSAUD, PRESIDENT OF EURASC; PROF. HÉLÈNE DE RODE, PERPETUAL SECRETARY OF EURASC; PROF. ANA SANCHEZ, MEMBER OF THE BOARD OF DIRECTORS OF THE PORTUGUESE FOUNDATION FOR SCIENCE AND TECHNOLOGY (FCT); PROF. JOSE LABASTIDA, ERC EA

01:45 - 02.15 pm	Presentation of diplomas to new members, Leonardo da Vinci Awardee and Blaise Pascal Medalists
02.15 - 02.45 pm	<b>Prof. Vincenzo Balzani (Bologna, Italy), Leonardo da Vinci Award</b> Presented by Prof. Nick Serpone, Head of the Materials Science Division "Chemistry and creativity"
02.45 - 03.15 pm	<b>Prof. Michael Mingos (Oxford, UK), Blaise Pascal Medal in Chemistry</b> Presented by Prof. Pierre Braunstein, Head of the Chemistry Division "Structural and Bonding Patterns in Molecular Clusters"
03.15 - 03.45 pm	<b>Prof. Nikita Morozov (RAS, Moscow, Russia), Blaise Pascal Medal in Engineering</b> Presented by Prof. Hélène de Rode, Perpetual Secretary of EurASc "Mechanics and nanomechanics"
03.45 - 04.00 pm	Coffee Break
04.00 - 04.30 pm	Prof. Luis M. Liz-Marzan (San Sebastiam, Spain), Blaise Pascal Medal in Materials Science Presented by Prof. Nick Serpone, Head of the Materials Science Division "Colloidal Nanoplasmonics"
04.30 - 05.00 pm	<b>Prof. Felix Otto ( Leipzig, Germany), Blaise Pascal Medal in Mathematics</b> Presented by Prof. Luis Vega, Representative of the Mathematics Division "Randomness in Partial Differential Equations"
05.00 - 05.30 pm	Prof. Francisco J. Ayala (UC-Irvine, USA), Blaise Pascal Medal in Life Sciences Presented by Prof. Daniel Scherman, Head of the Medicine and Life Sciences Division "Two Revolutions: Copernicus and Darwin"
05.30 - 06.00 pm	Conclusion of the Awards Ceremony

UROPEAN ACADEMY OF SCIENCES IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

### **ORGANIZING COMMITTEE**

### RODRIGO MARTINS | PORTUGAL

CHAIRMAN



Rodrigo Martins is Full Professor and Head of the Materials Science Department at FCT/NOVA; Director of the Centre of Excellence in Microelectronics and Optoelectronics Processes of the Institute of New Technologies, CEMOP/UNINOVA; Head of Materials for Electronics, Optoelectronics and Nanotechnologies Group of Research Materials Center of the Institute for Nanostructures, Nanomodeling and Nanofabrication, CENIMAT/i3N; Member of the Advisory Board of H2020 on DG R&I (Adv. Materials, Nanotechnology, Biotechnology and Manufacturing); Chair of The European Committee Affairs of European Materials Research Society, E-MRS; Chair of The Global Leadership and Service Award Committee of the Int. Union of Materials Research

Societies, IUMRS; Vice-Chair of Energy, Materials Industry Research Initiative, EMIRI. Honoris Causa by Gallati Un., he is a fellow of the Portuguese Engineering Academy. Centred is main activity in the field of Advanced Functional Materials for Electronics, Energy and Health purposes, pioneering work in the area of thin films for solar cells, transparent electronics and one of the inventors of paper electronics, named for that by the European Patent Office as one of the inventors of the year 2016. He holds 50 patents, published more than 850 papers, being awarded more than 25 times, the last was the innovation prize 2016, given by "Imprensa Nacional-Casa da Moeda" by the work secret paper.

### ALAIN TRESSAUD | FRANCE

CO-CHAIRMAN



Alain Tressaud is Emeritus Research Director of the CNRS at Bordeaux (France). He founded and chaired until 2008 the French Network on Fluorine Chemistry, sponsored by CNRS. He received several awards, including the Atomic Centre Agency Award of French Academy of Sciences (2008), Fluorine Award of the American Chemical Society (2011), and International Henri Moissan Prize (2013). His majorresearch fields are Solid State Chemistry & Materials Science, Fluorine chemistry, and Modification of the surface properties of materials. His scientific production includes more than 360 papers in international journals, 20 chapter's contributions in books and 12 internationalized patents. In addition, he edited 6 books, including the

Editorship of several book series at Elsevier: "Advances in Fluorine Science" (2006) and "Progress in Fluorine Science" (2015). In 2011 his book on "Le fluor: histoire, applications & paradoxes" appeared at CNRS-Editions, Paris.

#### EUROPEAN ACADEMY OF SCIENCES In support of excellence in science and technology

### **HONOURED GUESTS**

### ANA SANCHEZ | PORTUGAL

MEMBER OF THE BOARD OF DIRECTORS OF THE PORTUGUESE FOUNDATION FOR SCIENCE AND TECHNOLOGY (FCT)



Ana Sanchez is Member of the Board of Directors of Fundação para a Ciência e a Tecnologia (FCT).

Before joining FCT, she was head of the Communications and Science Awareness Office at the Instituto de Tecnologia Química e Biológica (ITQB) of the Universidade NOVA de Lisboa and a member of the Mostmicro research unit. With a degree in Biology (Universidade de Lisboa, 1996) and a PhD in Biology (Nijmegen, 2001), she worked as a post-doctoral researcher in plant reproduction at ITQB, before accepting in 2005 the challenge to set up the ITQB's communications office. In this role, she developed ITQB's institutional

communications, established its science communication programme and was an advisor to the Board in several areas. She also implemented different types of Science Communication courses within Universidade NOVA de Lisboa, including the Masters in Science Communication, which operates since 2011.

### JOSE LABASTIDA | BELGIUM

HEAD OF THE SCIENTIFIC MANAGEMENT DEPARTMENT OF THE EUROPEAN RESEARCH COUNTCIL



Professor Jose Labastida is the Head of the Scientific Management Department of the European Research Council since February 2011. Before joining the European Research Council he was Secretary General for Science and Technology Policy and Director General for Research of the Ministry of Science and Innovation of Spain (2008-2011). Previously he was Vice-president for Research of CSIC, the Spanish National Research Council (2004-2008).

Formerly, he was a Researcher and Professor of Theoretical Physics occupying positions at the Institute for Advanced Study in Princeton, CERN, CSIC and the University of Santiago de Compostela.

He holds a Ph.D. in Physics from Stony Brook University.

### SIERD CLOETINGH | NETHERLANDS

PRESIDENT OF THE ACADEMIA EUROPAEA



Sierd Cloetingh is Utrecht University Distinguished Professor. His research field is Earth Sciences. He published more than 335 papers in international peer-reviewed journals (11560 citations, h-index 59) and has been promotor of more than 75 PhD students of 18 different nationalities.

Currently he serves as President of the Academia Europaea and President of the COST Association.

In addition, he is Editor-in-Chief of the international journal "Global and Planetary Change" and Chairman of the TOPO-EUROPE collaborative research program.

Past functions include Membership of the Scientific Council (2009–2015) and Vice-President of the European Research Council (ERC), President of the International Lithosphere Program (2004–2017), President of the European Geophysical Society (1998–2000) and Professor of the Royal Netherlands Academy for Arts and Sciences (KNAW, 2006–2015).

Sierd Cloetingh received honorary doctorates from five European universities and numerous medals and awards. He is member of the Royal Netherlands Academy of Sciences, the Royal Norwegian Academy, the Royal Danish Academy, the German national Academy for Technical Sciences, the Heidelberg Academy, the Bavarian Academy of Sciences and honorary member of the Hungarian Academy of Sciences. He was distinguished in 2006 as Chevalier de Legion d'Honneur and in 2014 as Knight of the Royal Order of the Netherlands Lion for his contributions to science and European scientific cooperation in research and education.

### **SESSIONS CHAIRS**

### ARTUR SILVA | PORTUGAL

UROPEAN ACADEMY

EurASc



Artur M. S. Silva is a Full Professor of organic chemistry in the University of Aveiro. He studied chemistry at the University of Aveiro (Portugal), where he graduated in chemistry physics in 1987 and received his PhD in chemistry in 1993. He began his independent career at Aveiro University as an Assistant Professor in 1994. He was appointed to Associate Professor with tenure in 1998 and Full Professor in 2001. He published over 524 papers and 39 book chapters (h index 41). His research interests range over the chemistry of polyphenolic and nitrogen hetero cvclic compounds. with special emphasis on the development of new synthetic routes

and also on organocatalytic and metal-catalysed transformations. However, the second line of his research is centred on the isolation and structural characterization of natural products from diverse terrestrial and marine sources.

He makes research in the Organic Chemistry, Natural Products and Food Stuffs research Unit (QOPNA), where he is the head of the Organic Chemistry and Natural Products research group. QOPNA is a Unit with three main areas: Biochemistry, Organic chemistry and Mass Spectrometry, which is well known for the research made.

He is fellow of the European Academy of Sciences since January 2017.

### JEAN ETOURNEAU | FRANCE

UNIVERSITY BORDEAUX



Jean Etourneau is Emeritus Professor of Materials Chemistry at the University of Bordeaux. He is member of the European Academy of Sciences, Fellow of the Royal Society of Chemistry (UK), Corresponding Member of the Royal Academy of Sciences and Arts of Barcelona, Dr Honoris Causa of the Technical University of Darmstadt (one of the leading Universities of Technologies in Germany). He got his PhD in Physical Sciences in 1970 at the University of Bordeaux. He became the head of the Solid State Chemistry Laboratory in 1986 (CNRS Unit) and he founded in 1995 the Institute of Condensed Matter Chemistry of Bordeaux (ICMCB, one

the most important CNRS Unit in Materials Science in France). He was Scientific Advisor of several international research institutions (e.g. NIMS in Tsukuba, Japan), member of bi-national organisations (e.g. CEFIPRA, Indo-French Center) and President of French national committees in Research and Higher Education. He created in 2008 the European Multifunctional Materials Institute (EMMI), a tool to integrate Research and Education through European actions in the FP6, FP7 & Horizon 2020 programmes. He has published more than 350 papers in the field Solid State Chemistry and Materials Science devoted to the chemical and physical properties of borides, intermetallics and high Tc superconductors. Both collective and integrative activities carried out by Jean Etourneau at local, national and international levels have been recognized by the French government through following distinctions: Chevalier de l'Ordre National du Mérite, Commandeur des Palmes Académiques & amp; Chevalier de la Légion d'Honneur.

### MARIA SALOMÉ SOARES PAIS | PORTUGAL

LISBON ACADEMY OF SCIENCES



Was Full Professor at the Department of Plant Biology of the Faculty of Sciences, Lisbon University, Head of the Centre of Biological Engineering, Founder and Professor in charge of the Centre of Electron Microscopy, Head of the Department of Plant Biology, Founder and Head of the Plant Biotechnology Centre, Founder and Head of Laboratory of Plant Molecular Biology and Biotechnology of ICAT (Institute for Applied Science and Technology) and Founder and Head of Plant Systems Biology Laboratory – BioFIG – FCUL. Research Interests include Plant Molecular Biology, Plant

Biotechnology (Crop improvement - Genetic manipulation) and Plant

Cell Biology. Is author/co- author of more than 400 papers published in peer reviewed journals and 10 patents (6 international – 4 national). Supervisor of 51 PhD thesis, 34 Master Thesis and

47 Scientific Research trainings (Graduation in Applied Plant Biology). Received as Research Training PhD and Post-Doc students from different Public and Private Portuguese Institutions and from abroad (particularly from Angola, Brazil, Check Republic, China, Germany, Greece, Guinea, Italy, Poland, Slovakia, Slovenia, Spain and United Kingdom). Member of the Editorial board of 2 international journals and Referee of 15 international journals.

Special distinctions include "Chevalier dans l'ordre des Palmes Académiques" from the French Government (1979), Who is whom in the World (1997), Prize of the best Conference in the scientific meeting on Gametic Embryogenesis held in Finland 1998, Outstanding Professional Award – ABI – USA 2001, American Order of Merit (Representing Portugal) – ABI – USA 2009, Woman of the Year (Representing Portugal) – ABI – USA 2009, Prize Corticeira Amorim (Best Science) – 2010, Commander of the Order of Infante D. Henrique – 2015 and Honorary Member of the Order of Biologists – 2016.

Permanent Member of the Academy of Sciences of Lisbon (ACL), member of the direction of Institute for High Studies o ACL. Is Secretary-General of ACL, Director of the Institute of Academic Studies for Elders from ACL.

Represents the Academy of Sciences of Lisbon in EASAC (European Academies' Science Advisory Council) and in the EASAC – Biosciences Steering Panel.

Among other activities, was member of the New York Academy of Sciences, Representative and Member of several international advisory boards, executive boards, Inter-Ministerial commissions and evaluation panels in European Union Programs in the Life Sciences.

### JOÃO ROCHA | PORTUGAL

EurASc



João Rocha is Full Professor at the University of Aveiro, member of the European Academy of Sciences (EuRASc) and of the Lisbon Academy of Sciences, and Fellow of both the Royal Society of Chemistry and ChemPubSoc Europe, and Director of the Aveiro Institute of Materials-CICECO. He was member (2012-15) of the National Science and Technology Council (headed by the Prime Minister). He has received several honors including the prizes Scientific Excellence (Portuguese Science Foundation), Ferreira da Silva (Portuguese Chemical Society) and Madinabeitia-Lourenço (Spanish Chemical Society). He Chaired the Commission on Inorganic and Mineral

Structures of the International Union of Crystallography, and is Royal Society of Chemistry Nanoscience and Nanotechnology Book Series Editor. He got his PhD in 1990 from the Department of Chemistry, Cambridge University, UK. He has published ca. 500 papers and 4 patents, which have received ca. 14,000 citations (h-index 56), and mentored 38 post-docs and 24 PhD students.

### CARLOS SALEMA | PORTUGAL

LISBON ACADEMY OF SCIENCES



Graduated in Electrical Engineering from Instituto Superior Técnico, Universidade Técnica de Lisboa in 1965, received a PhD in Electrical Engineering In 1972, from the University of London, Queen Mary College. In 1978 he was awarded the degree of Aggregate by Instituto Superior Técnico, Universidade Técnica de Lisboa. Full Professor in 1979 at Instituto Superior Técnico, supervised 10 Master and PhD students. He was twice distinguished by the students as the best professor in Electrical Engineering. He is currently Professor Emeritus at IST.

His main research interests have been the calculation and measurement of radiation patterns of microwave aperture antennas, the effects of propagation in the performance of analogue and digital radio links, redundancy reduction in coding of still and moving images and dielectric horn antennas. He is author/co-author of 30 communications to scientific meetings, 16 papers and five textbooks. In 1974 he was awarded the Marconi prize by the Institute of Electrical and Electronic Engineers (IEE).

From 1966 and until 1986 he acted also as consultant engineer in the fields of Computers and Telecommunications. As Chairman of the IST Computer Centre (1983–85), and Chairman of the National Foundation for Scientific Computing (1986–89), he was responsible for major improvements in the computer facilities in many Portuguese Universities and for the initial deployment of the Portuguese scientific data network (RCCN).

From 1989 and until 1992 he was President of the Portuguese National Science and Technology Research Council (JNICT). Since 1993 he has served as Chairman of the Board of Directors of "Instituto de Telecomunicações" a private non-profit R&D association of six Universities, one Polytechnic Institute and two companies (Altice and Nokia) that includes 320 Ph.D holding researchers and supports the activities of 230 Ph.D. and 200 M.Sc. students.

He is a Counsellor Member of the Portuguese Institute of Engineers (Ordem dos Engenheiros), Senior Member of the IEEE, Fellow and Vice-Chairman of the Lisbon Academy of Sciences and Fellow and former President of the Portuguese Academy of Engineering.

### FERNANDO SANTANA | PORTUGAL

PORTUGUESE ACADEMY OF ENGINEERING



Fernando Santana, is a Full Professor at the Faculty of Science and Technology of the University Nova of Lisbon. He has been the Director of this Faculty (since 2006), accumulating with those of President of Uninova – Institute for the Development of New Technologies and President of the Board of Directors of Madan Science Park, having previously chaired the Department of Environmental Sciences and Engineering.

He is a Civil Engineer (University of Luanda), Master of Science in Public Health Engineering (Imperial College, University of London), Doctor in Sanitary Engineering (University Nova of Lisbon) and Habilitation on

Environmental Equipment Project (Faculty of Sciences and Technology). In addition to his teaching and scientific activities at the Faculty of Science and Technology, he is President of the Portuguese Academy of Engineering, Corresponding Member of the Lisbon Academy of Sciences, Member of the Admissions and Qualification Council of the Engineers Association and Guest Member of the National Water Council. Professor Santana is the Director of the Water & Environment Journal.

### Elvira Fortunato | Portugal

EurASc



Elvira Fortunato is full Professor of Materials Science at the Faculty of Science and Technology of Universidade NOVA de Lisboa and Vice-Rector of Universidade NOVA de Lisboa.

In 2008 she earns in the first edition and Advanced Grant from ERC to the project "Invisible" that was selected as a success story from ERC. She is member of the Engineering Academy of Portugal. She was honored with several National and International prizes like the Doctor Honoris Causa in 2009 by Gallati University, the grade of Grand Officer of the Order of Prince Henry the Navigator given by the President of the Republic of Portugal in 2010 and the

Blaise Pascal Medal for Materials Science given by the European Academy of Sciences in 2016 and in 2017 the Czochralski award given by the Polish Academy of Sciences in conjunction with the E-MRS.

She integrates the High Level Group of the Scientific Advise Mechanism of the European Commission since 2016.

### Hélène de Rode | France

U.C.L. - MONS, ACTIUM-LAW, LIEGE, BELGIUM



Professor Hélène de Rode graduated University of Louvain, where she became professor of law in 1993 till 2003.

She published numerous papers and gave invited talks in international meetings and symposia. She also practices law and is a partner of her law firm Actium-Law. She is a member of the Liege Bar Association. She oversees for the Academy programmes related to Law Sciences. Since 2009, she is professor at the UCL Mons.

### CARLOS RIBEIRO | PORTUGAL

CHAMPALIMAUD FOUNDATION



Carlos Ribeiro studied Bio II at the Biozentrum of the University of Basel and performed his diploma under the supervision of Dr. Markus Affolter and Prof. Walter Gehring studying how TGF-beta signaling and HOX transcription factors affect transcription in the Drosophila embryo. After graduating in 1999 he continued in the laboratory of Prof. Affolter for his PhD studies until 2003 where he used 3D time lapse imaging approaches in the living embryo to study the molecular and cellular mechanisms used to sculpt the tubular breathing network of the fruitfully. In 2004 he joined the laboratory of Barry Dickson at the IMP in Vienna, Austria, for his

postdoctoral training where he first characterized Robot receptor trafficking in living Drosophila embryos and then became interested in decision making in the adult fly. Carlos Ribeiro became principal investigator of the Champalimaud Neuroscience Programme at the IGC in 2009. His laboratory studies how neuronal systems sense metabolic needs and modify neuronal processes to generate thecorrect behavioral decisions needed for the survival and reproduction of organisms.

# INVITED SPEAKERS SHORT BIOGRAPHY AND ABSTRACT



EUROPEAN ACADEMY OF SCIENCES IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

### ALEXANDRE QUINTANILHA I PORTUGAL

HEAD OF SCIENCE AND EDUCATION COMMITTEE IN THE PORTUGUESE PARLIAMENT

#### SHORT BIOGRAPHY



Professor Alexandre Quintanilha, completed his Ph.D. in Theoretical Physics in 1972. He spent the next two decades at U.C. Berkeley and the Lawrence Berkeley National Laboratory as professor of cell physiology and director of a Centre for Environmental Studies. He moved to the University of Porto as professor of biophysics at the Biomedical Faculty and, until very recently, director of both the IBMC and INEB. Over the years he has chaired various committees at the European Science Foundation, the European Commission, the Organization for Economic Cooperation and Development and several other national and international research organizations. His current interests are in the areas of

biological stress, risk perception and public understanding of science.

#### « Searching and sharing knowledge »

In 2005, I came across a recently published book that stuck in my mind ever since. The title "Take care of freedom and the truth will take care of itself", seems to fit well with what I want to say in this talk. Written by a philosopher, professor of Comparative Literature, I would venture to propose that the message in that title applies to all fields of learning. Our search for knowledge, clearly depends on our freedom to ask questions, our freedom to propose answers and the possibility of testing the fertility of those answers.

Curiosity is the source of all questions. And since questions can sometimes be threatening, it is no wonder that they were often discouraged by the established authorities, whether religious or secular. But without the freedom to ask questions, and more important, the freedom to imagine different answers, we might still be living in caves. Natural scientists have a name for these tentative answers: they call them hypotheses. In the social sciences, they are sometimes referred to as narratives. In the Humanities, they are called stories. But they all serve a similar purpose. They are attempts to provide answers to our questions. Even to questions we have not yet asked.

The task of testing these answers can take many lifetimes. But it can also occur with a simple change in perspective; something often called a sudden change in paradigm. However long it takes, the robustness of an answer is usually measured in terms of what it can explain and what it can predict. That is also a measure of what we take to be the truth contained in that answer.

New knowledge frequently leads to innovation. I will provide evidence that this happens in all fields of learning, even though we usually tend to focus on the more technical domains. That knowledge will continue to fascinate and frighten us, is not new. There is ample evidence that it has benefitted us greatly, but also often at a heavy price. That is probably why we are unable to stop searching for it. Since the current challenges are enormous, maybe we could refocus our curiosity and imagination on some of these pressing problems.

### **ARNOLD TUKKER I NETHERLANDS**

LEIDEN UNIVERSITY

#### SHORT BIOGRAPHY



Arnold Tukker is since 1 October 2013 the Professor of Industrial Ecology and Scientific director of the Institute of Environmental Sciences (CML) at Leiden University for 70% of his time. He retains a 30% position as senior researcher at TNO, a large Dutch not for profit research organisations. Arnold set up prominent EU projects in the field of sustainable product design (SusProNet) and sustainable consumption and production (SCORE!) and was core member of the 10 Million Euro Dutch Knowledge Network on Sustainable System Innovations. He currently co-ordinates a string of major programs of some 15 million

Euro with some 20 key European research institutes in the field of resource-efficiency, a.o. constructing world's most ambitious and

detailed global energy/resource/economic input-output databases and models (EXIOBASE). He further set up with 6 partner universities an EU Marie Curie Innovative Training Network of 15 PhDs researching the circular economy (Circ€uit). He authored 6 books, about 70 refereed papers and 7 special issues on sustainability research. He has been engaged with work of the UN on the Green Economy Initiative, the Resources Panel, the Ten Year Framework of Programs on Sustainable Consumption and Production, and Sustainable Development Goals.

#### « The transition to a circular economy - some (in)convenient truths »

The transition towards a more resource-efficient society is a core goal of governments in Europe and worldwide. The European Commission recently adopted an ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth while using primary resources more efficiently (European Commission, 2015). Furthermore, a series of incidents in the past has shown Europe is vulnerable when it comes down to security of supply of resources (EC, 2009; 2013, 2016). The transition towards a more resource-efficient society that has a resilient resource supply is a hence core goal of governments in Europe and worldwide. The European Commission recently adopted an ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth [ref]. Circular economy comprises an integral approach to a resource efficient future, necessitating cooperation of all stakeholders along the value chain. To achieve this, the further development of circular, service -oriented business is especially promising and will be the focus of the proposed research. This links product and service design, supply chain management, manufacturing technologies, product and service use, product treatment at end-of- life, and business models and strategies such as portfolio management and branding. Simultaneously, economic, societal and environmental aspects must be taken into account. To understand and optimally exploit the potential of a Circular Economy, not only advances in the above-mentioned fields are needed, but also above all mutual understanding and interaction between the disciplines involved. The keynote will discuss the following issues :

a) The (un)likelihood that resource constraints will drive a circularity transition – challenges on the short and long term;

b) Perpetual growth versus degrowth - the rationale for starting a circularity transition now;

c) Business models supporting circularity;

d) Governance approaches supporting circularity.

### **ERIC GAFFET | FRANCE**

CNRS, UNIVERSITY OF TECHNOLOGY OF BELFORT-MONTBÉLIARD

#### SHORT BIOGRAPHY



Eric Gaffet is research director at CNRS (senior scientist) and is the director of the Institut Jean Lamour (Nancy, UMR 7198 CNRS – University of Lorraine) involving 550 people in the fields of nanosciences, electronic, materials, surfaces, plasmas and metallurgy (2012 – 2017).

Eric Gaffet is (co-)authored of more than 333 publications, 465 Congress participations and 2 patents in the field of nanostructured materials (Spark Plasma Sintering, Mechanically Activated Powder Metallurgy, Mechanosynthesis-Mechanochemistry, Laser Surface Treatment) Member of the Committee of Specialized Experts (CES) on Risks related to physical agents, new technologies and large developments "of ANSES (French Agency for

Occupational Health and Environmental Safety), he has chaired the various nanomaterials specialists groups gathered by the agency from 2004 until 2016. Since 2016, he is member of the Scientific Committee for Consumer Safety (European Commission).

Overall Scientific Expertise: Synthesis of nanostructured materials – powder metallurgy, powder consolidation, nano-layers (Mechanochemistry, Spark Plasma Sintering, Ultra high vacuum physical deposition), Physico – chemical Characterization of Nanomaterials (X-Ray diffraction, Scanning and Transmission Electron Microscopy, Thermal Stability), Responsible development of nanomaterials and nanotechnology (safer by design / by process, regulation).

#### « Nano - solutions for sustainable materials management »

The design of new materials to be applied for sustainable development, for new technologies and for new sources of energy, is largely dependant on rare chemical elements, which were until now produced in some rare geographic zones in the world. The question of the availability and/or substitution of those materials is then critical for the future.

Several ways of designing new materials are currently in development addressing chemical substitution and /or chemical optimization :

The first is to make new products that use the same metal but in smaller amounts, such as new catalysts that contain less platinum.

A second option is to replace a rare or risky metal by another more common or less risky metal. For example, considerable efforts are being made to develop new magnets to replace neodymium based ones (neodymium is one of the Rare Earth Elements).

A third way to make new products is to replace metal-based materials with carbon-based or bio sourced materials.

Amongst new materials being considered, the talk will be devoted to discussion on one of the most promising family, i.e. the so-called nano-structured materials, which display outstanding properties, which are still not entirely understood. Such an innovative solution will be discussed in terms of a so-called incremental and/or drastic evolution. The full lifecycle assessment taking into account the nanorisks and the new approach so – called "safer by design/process" will be also addressed.

In addition to this materials solution approach, attention will be paid to approaches considering the global technical point of view enlarging up to « New Conception / New Design / New System » in order to achieve products achievements with improved properties.

### SIGURD WAGNER | AUSTRIA

PRINCETON UNIVERSITY, NEW JERSEY, USA

#### SHORT BIOGRAPHY



Sigurd Wagner is seeking to introduce fundamentally new electronic materials. He has been working in three areas: (i) new materials for solar cells; (ii) hydrogenated amorphous silicon; and (iii) flexible, conformably shaped and stretchable large-area displays, electrotextiles, and electronic skin. He is widely considered the father of the field of flexible and stretchable electronics. Award citations speak of "groundbreaking research, both fundamental and applied, on amorphous semiconductors as well as chalcopyrites" (2009 Sir Nevill F. Mott Lecture Award, 23rd International Conference on Amorphous and Nanocrystalline Semiconductors) and "pioneering research on flexible and stretchable large-area

electronics, and comprehensive study of the mechanical behavior of the same, which will be applied to various products in the near future" (2014 International Thin-Film Transistor Conference, 10th Anniversary Prize). Sigurd is a fellow of the American Physical Society, a fellow of the Institute of Electrical and Electronics Engineers, a corresponding member of the Austrian Academy of Sciences, and an Alexander von Humboldt Foundation Senior Fellow.

#### « Challenges to realizing an energy economy powered exclusively by sun and wind »

We stand at the dawn of an epochal change in the world's energy economy, as energy supply is moving from one largely fossil-derived to one where electricity is directly generated from sun and wind. Eventually, the world's energy is to come fully from renewable sources. The share of energy that solar and wind can contribute is captured in two characteristic quantities, average availability and capacity credit. An examination of these two quantities shows that the goal of a fully renewable energy economy cannot be attained with the solar and wind conversion technologies available today. Moreover, the high cost of integrating renewables with the electric power grid calls for continued, and substantial, cost reduction of electricity from sun and wind. These three factors – average availability, capacity credit, and cost – present fundamental, long-term, research challenges to the physical and biological sciences.

A look at the numbers highlights the gap that must be bridged by science. Electricity from solar cells and wind turbines is intermittent. Its average availability over a year is low at only 25% to 35%; in contrast, base-load electricity from fossil fueled, nuclear, and many hydroelectric electric power plants is available 90%. Moreover, electricity from solar and wind fluctuates – it cannot be scheduled predictably. Therefore, at a high share of renewable electricity its capacity credit can become as low as 0%. In consequence, electricity from renewables would cover only 25% to 35% of all energy (i.e., low average availability), far below the goal of a fully renewable energy economy. And, it would have to be backed up fully by conventional power plants (i.e., no capacity credit).

These challenges are enormous. They are even bigger than stated above because in an energy economy dominated by electricity, widely distributed generators of renewable electricity will have to accommodate a greatly enlarged mix of consumers. Such a vast change in the overall electric power grid also will need broad efforts of research and development. Here, we focus on three advances in renewable power conversion that could enhance average availability and capacity credit, and lessen cost.

- The average availability of solar and wind power could be raised to close to 100% by high-temperature superconducting power lines that transport electricity from the day-side to the night-side of the earth.

- The capacity credit could be raised indirectly by converting sunlight to storable fuels, via photosynthetic, photoelectrochemical and photocatalytic techniques. Progress is held back by the lack of efficient catalysts, as it is in conventional electrolysis.

- The cost of photovoltaic converters could be reduced by harvesting hot carriers, before they thermalize in picoseconds.

The course of the world's energy economy will depend immensely on fundamental discoveries in solid-state science and in synthetic biology.

### **ADÉLIO MENDES I PORTUGAL**

FEUP-PORTO

#### SHORT BIOGRAPHY



Professor Adélio Mendes received his PhD degree from the University of Porto in 1993. Full Professor at the Department of Chemical Engineering of the Faculty of Engineering of the University of Porto. Coordinates a large research team with research interests mainly in dye sensitized solar cells and perovskite solar cells, photoelectrochemical cells and solar redox flow batteries, electrochemical membrane reactors (PEMFC, H-SOFC, chemical synthesis), methanol steam reforming, membrane and adsorbent-based gas separations and carbon molecular sieve membranes synthesis and characterization.

Professor Mendes co-authored 300 articles in peer-review international journals, filled 23 families of patents and is the author of a textbook. In

2012 he received an Advanced ResearchGrant from the ERC. He received the Air Products Faculty Excellence 2011 Award (USA) for developments in gas separation and Solvay & Hovione Innovation Challenge 2011 prize, Ramos Catarino Innovation Award 2011-2012, ACP Diogo Vasconcelos Applied Research Award 2011, City of Porto Merit Municipal Medal – Gold Degree in 2015 and the Prize of Coimbra University of 2016. Presently, he is the Coordinator of CEner-FEUP, the Competence Center for Energy of the Faculty of Engineering at the University of Porto.

#### « Electricity from renewable sunlight: cheaper and cleaner »

In the 16 th century Thomas More described an ideal and sustainable city in his book Utopia. Today's an ideal city should comply with the Near Zero Energy Building directive and going beyond. PV electricity is already today the cheapest if produced in countries with high solar irradiance.

However, PV electricity is only generated during the daylight time and then just partially dispatchable. To make it fully dispatchable it is necessary to store it and batteries is a technology of choice. Among electricity storage technologies redox flow batteries (RFB) emerged as promising offering low storage costs – expected of 3  $\notin$ /kWh/cycle [1], independent power from storage capacity, very reliable and robust operation. The all vanadium RFBs display an energy density that can reach 50 Wh/L but the use of non-aqueous solvents for dissolving the redox pairs promise to bring soon this energy density to values which ideally can reach 1 kWh/L. The storage of electricity in an electrochemical fluid instead of a solid such as in conventional batteries opens the doors to the electrochemical fuels that can be easily stored and transported.

More recently, it was proposed the direct conversion of sunlight into storable electrochemical fuels using photoelectrochemical panels. These panels comprehend just a glass window coated with a semiconductor and an ion-exchange membrane; the positive and negative electrolytes pass through charging and heating up in a cogeneration process. The solar redox flow batteries promise to bring the cost of stored electricity to even lower values making the dream of self-energy sustainable cities a closer reality.

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### **ERNST WAGNER | GERMANY**

LMU, MUNICH

#### SHORT BIOGRAPHY



Professional Experience: 1985-1987 Postdoctoral Researcher, ETH, Zurich/Switzerland; 1988-1995 Group Leader, Institute of Molecular Pathology, Vienna/Austria; 1992-2001, Director for Cancer Vaccines, Boehringer Ingelheim Austria; 1994 Habilitation, University of Vienna/Austria; 1995-2001 Group Leader, Institute of Biochemistry, Vienna/Austria; Since 2001 Professor (C4) for Pharmaceutical Biology-Biotechnology, LMU; 20 patents and >400 publications in the field of protein, gene and cell therapy. Educational Background: 1983 Diploma (Dipl.Ing.) in Chemistry/ Biochemistry; Technical University of Vienna; 1985 Ph. D. (Dr. tech.) in Organic Chemistry; Technical University of Vienna; 1994 Habilitation

(Doz.) in Biochemistry; University of Vienna, Medical Faculty.

#### « Chemical evolution of carriers for use in nanomedicine »

Nanotechnology comprises the option of more effective administration of innovative drugs. Accordingly, nanomedicines with less side effects can be obtained, provided the challenge of efficient delivery and retention in the target tissue can be overcome. Viruses and protein toxins present natural nanoagents displaying potent intracellular delivery of nucleic acids or proteins. Natural evolution has optimized such carriers that comprise multiple different functions for overcoming the delivery barriers. The evolution process takes advantage of the definition of each carrier as a specific amino acid sequence stored in form of a genetic sequence. Refinement of sequences occurred by variations such as mutations, deletions, additions, or larger rearrangements such as domain shuffling, followed by functional selection for a biological task in the set environment. We intend to use these basic design principles of natural evolution for the generation of artificial drug delivery systems. A chemical evolution process takes advantage of combining empirical with rational design and utilize a far more diverse chemical design space than the natural variation of amino acids.

Chemical evolution includes identification of chemical motifs for specific delivery steps and assembly of such micro-domains into defined larger sequences. It includes rational or random variation and rearrangement into various topologies, followed by screening for a pre-defined delivery task. Chemical motifs may include but are not restricted to natural amin o acids. For example, polymer units like polyethylene glycol or polyethylenimine, despite their simple structure, can exert delivery functions such as shielding or endosomal escape, respectively, with similar efficacy as far more sophisticated natural proteins. In search for improved carriers, we focus on the assembly of building blocks into libraries of defined oligomer sequences by semi-manual or automated solid phase-assisted chemical synthesis. A series of drug substances (natural products, protein, pDNA, siRNA) have been formulated and screened in relevant models. Evaluation in tumor models has provided synthetic nanoparticles and artificial immunotoxins with antitumoral activity.

### DANIEL SCHERMAN I FRANCE

UTCBS-CNRS

#### SHORT BIOGRAPHY



Exceptional Class Director of the Centre National de la Recherche Scientifique (CNRS / National Scientific Research Center) – France. Competence fields: Drug delivery and targeting, Gene therapy, Non viral Gene delivery, In vivo imaging.

Main present and recent functions: 2002- ongoing: creator and director of the Chemical and Genetic Pharmacology Unit Partners: INSERM, CNRS, Pharmacy University, Ecole Nationale Supérieure de Chimie de Paris (staff 40-45); 2009-ongoing : President of the Committee of "Non Viral Gene Therapy" of the European Society of Cell and Gene Therapy (ESGCT) ; Member of the Non Viral Gene Therapy Committee of the American Society of Gene Therapy (ASGT)

(two 3 years terms). Founding bureau member of the "Société Française de Thérapie Cellulaire et Génique; 2008-ongoing: Member of the National Committe of the French « Centre national de la Recherche Scientifique » (CNRS).

## $\ensuremath{\mathsf{w}}$ Genetic pharmacology and gene therapy, the new revolutionary frontiers of innovative medicine $\ensuremath{\mathsf{w}}$

Medicinal active agents, whose effects are based on the universal concept of "target recognition". Their history is characterized by a limited number of revolutionary advances, one of the first breakthrough being the discovery of chemical drugs directed to a molecularly defined "receptor" target in agreement with the Paul Ehrlich "lock and key" chemotherapy theory, and another major advances being represented by the development of protein drugs, such as monoclonal antibodies.

As an overwhelming rule for both chemical and protein drugs, the molecular target in the patient is a protein, with rare exceptions including cytotoxic anticancer agents such as cisplatin which bind to DNA independently of the genetic sequence.

Both genetic pharmacology and gene therapy representing the most recent revolutionary leap forward, based on the use of the genetic code. Genetic pharmacology represents the critical ultimate step of the Paul Ehrlich "lock and key" concept, in which the drug target is an intracellular genetic sequence within either a DNA or a RNA molecule which is recognized by Watson-Crick or Hogsteen base pairing. By contrast, in gene therapy a gene is administered to the patient's cells, leading to the transcription by RNA polymerases of a RNA, which can be by itself a therapeutic agent, or most often represents an mRNA translated into a therapeutic protein by the ribosome machinery. In gene therapy, the administered gene can thus be considered as a "prodrug", with the amplification advantage resulting from the continuous intracellular production of the therapeutic RNA and eventually protein.

The conference will describe the concepts and applications of genetic pharmacology and gene therapy, and give several examples of revolutionary clinical successes.

### ASUNCIÓN GÓMEZ-PEREZ I SPAIN

UNIVERSIDAD POLITÉCNICA DE MADRID

#### SHORT BIOGRAPHY



Asunción Gómez-Pérez is Professor of Artificial Intelligence, Vice-president for Research, Innovation and Doctoral Studies, and Director of the Ontology Engineering Group at Universidad Politécnica de Madrid. Her research interests focus on Ontological Engineering, Semantics, Data Integration and Cognitive Systems. In 2015, she was awarded the Aritmel National Prize on Computer Science, and the 2nd edition of the National Ada Byron prize for Women in IT in Spain. She was also distinguished by the Universidad Politécnica de Madrid with the Research Award in 2015. She has published more than 300 papers. Her book on ontology engineering is a reference book in the field. The wide impact of her research papers

is accompanied by numerous international projects and collaborations with companies. She has coordinated 5 European projects and participated in more than 24 European projects since FP5 until H2020. She also has a long record of collaboration with companies.

#### « Automated Data Markets »

One of the biggest challenges of the 21st century is undoubtedly the management of data markets, regardless of whether metadata and data are generated by individuals (i.e., social media) in multiple languages and across heterogeneous media formats, by devices (i.e., sensors) in the Internet of Things, by software behind apps, or by public administrations (i.e., open data portals), and private or public institutions.

The near future web will be populated by machines that will publish, and consume metadata and data, not necessarily in the same language, with heterogeneous licenses, and will constantly be transacting and making business with minimal or without human intervention. Individuals and institutions will also codify their regulations, preferences and business models as machine-readable policies making explicit conditional access to their data. Understanding the way in which intelligent actors, such as people, institutions and machines share and reason with metadata and data in an automated data market requires an interdisciplinary approach involving computer science, law, political science, social science and economics.

The main information technology challenges are related with thinking over and designing an automated data market of metadata and data. Limitations imposed by organizational, language and data format barriers need to be solved. Organizations have their own focus and structure their data according to their primary use cases of interest. This makes it difficult to find related or comparable content available in other organizations located in different countries. These differences can be overcome by using ontologies to harmonize the vocabularies in use. In this context, data is typically restricted to one language, and thus not accessible or linked to related data in other languages. Semantic technologies enable enriching existing resources with other data across data sources in different languages and geographically distributed. Further, important meta-properties including time, space, provenance and intellectual property rights (IPR) are typically not expressed, so data cannot be filtered, queried and aggregated across such "modalities".

In this talk, I will analyze and highlight how ontologies help to achieve a better future by reducing inequalities. The potential and challenges of semantic technologies can also contribute to the sustainability of natural resources, health, and transport.

### MARGHERITA VENTURI I ITALY

Università di Bologna

#### SHORT BIOGRAPHY



Research activity: She is currently involved in Photochemistry and Supramolecular Electrochemistry and her present research activity is dedicated to the design, construction, and characterization of molecular-level devices and machines in the frame of the bottom-up approach to nanotechnology. The importance of the development of artificial molecular machines, on which her activity is mainly focussed, is testified by the fact that this research topic was awarded the Nobel Prize in Chemistry 2016.

Professional Experience: Since 2015 she is President of the Photochemistry Interdivisional Group of the Italian Chemical Society; since 2017 she is member of the Scientific Board of book series "Guide

per lo sviluppo professionale degli insegnanti". In 2017 she was nominated honorary member of the CICAP (Italian Committee for the Investigation of Claims on the Pseudosciences) the honorary President of which is Piero Angela; she plays the role of referee for the following international journals: Angew. Chem. Int. Ed., Chem. Commun., Chem. Eur. J., Collect. Czech. Chem. Commun., Chem. Soc. Rev., Dalton Trans., Inorg. Chem., J. Am. Chem. Soc., J. Lumin., J. Org. Chem., J. Phys. Chem., New J. Chem., Org. Biom. Chem., Org. Lett., Photochem. Photobiol. Sci., PhysChemChemPhys, Radiat. Phys. Chem.

#### « Artificial molecular-level devices and machines »

The area of nanotechnology is a very broad one. From the chemical viewpoint, nanotechnology can be defined as the marriage between the synthetic talent of chemists with a device driven ingenuity. The chemical, bottom up approach, based on the concepts of supramolecular chemistry, can indeed be very useful to design and construct interesting nanostructures.

By using this approach, the macroscopic concepts of a device and a machine can be straightforwardly extended to the molecular level [1]. A molecular-level device can be defined as an assembly of a discrete number of molecular components designed to achieve a specific function. Each molecular component performs a single act, while the entire assembly performs a more complex function, which results from the cooperation of the various molecular components. A molecular-level machine is a particular type of molecular-level device in which the component parts can display changes in their relative positions as a result of some external stimulus.

Molecular-level devices and machines operate via electronic and/or nuclear rearrangements and, like macroscopic devices and machines, are characterized by (i) the kind of energy input supplied to make them work, (ii) the way in which their operation can be monitored, (iii) the possibility to repeat the operation at will (cyclic process), (iv) the time scale needed to complete a cycle, and (v) the performed function [2-4].

Our group has since long been engaged in using the chemical (bottom up) approach to the design and construction of molecular-level devices and machines. In this lecture, recent examples studied in our laboratory will be presented; limitations and perspectives of this kind of systems will also be discussed.

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### **RAJA CHATILA I FRANCE**

INSTITUTE OF INTELLIGENT SYSTEMS AND ROBOTICS (ISIR)

#### SHORT BIOGRAPHY



Raja Chatila is Professor at Pierre et Marie Curie University in Paris and Director of the Institute of Intelligent Systems and Robotics (ISIR), as well as of the SMART laboratory of excellence on human-machine interactions. His research interests focus on autonomous robotics and interactive and cognitive robotics.

He is a member of the Commission on the Ethics of Research on Digital Science and Technology (CERNA). He is also chair of the IEEE Global Initiative for Ethical Considerations in the Design of Artificial Intelligence and Autonomous Systems.

#### « Ethical Considerations in Artificial Intelligence Robotics and Autonomous Systems »

Ethical, legal and societal issues (ELS) raised by the development of Artificial Intelligence, Robotics and Autonomous Systems have emerged about fifteen years ago and have recently gained in importance with the development of new applications and use cases, such as personal robotics, autonomous cars or autonomous weapons. These ELS questions cover a wide range of subjects such as: future of employment, privacy and data protection, surveillance, interaction with vulnerable people, human dignity, autonomous decision-making, moral and legal responsibility of robots, imitation of living beings and humans, human augmentation, or the status of robots in society.

Research and design processes themselves are at stake: how to adopt an ethical and responsible methodology for developing such systems? Is it possible to design systems that include human values in their own operations? Is it possible to embed ethical reasoning in autonomous decision-making processes?

These questions sometimes raise classical issues in ethical philosophy and law by transposing them to intelligent machines, but they also pose new problems on which reflection must mobilize interdisciplinary communities in order to grasp globally the scientific, technical, and social aspects. The question in developing theses technologies, which might have an unprecedented impact on our society, is finally about how to make them aligned with the values on which are based human rights and well-being.

### **ARLINDO OLIVEIRA I PORTUGAL**

INSTITUTO SUPERIOR TÉCNICO

#### SHORT BIOGRAPHY



Arlindo Oliveira obtained his engineering degree from Instituto Superior Técnico (BSc, 1986; MSc, 1989), and his PhD degree from the University of California, Berkeley (1994). His areas of interest are algorithms and complexity, machine learning, bioinformatics and digital circuit design. He has worked at CERN, the Electronics Research Lab of UC Berkeley, the Cadence Laboratories and INESC-ID. He is a professor of the Department of Computer Science and Engineering of Instituto Superior Técnico (IST) and president of IST since January 2012. He is the author of more than 100 scientific articles and papers in conferences and the author of two books, "The Digital Mind" (MIT Press) and "Digital Systems and Microprocessors"

(IST Press), which have been translated into several languages. He is a senior member of the IEEE, a member of the Portuguese Academy of Engineering, and a member and past president of the Portuguese Association for Artificial Intelligence. He is currently the head of the Portuguese node of ELIXIR and was director of INESC-ID between 2000 and 2009.

#### « Digital Minds: Science Fiction or Near Future Reality? »

New technologies have been introduced in human lives at an ever increasing rate, since the first significant advances took place with the cognitive revolution, some 70.000 years ago. Although electronic computers are recent and have been around for only a few decades, they represent just the latest way to process information and create order out of chaos. Before computers, the job of processing information was done by living organisms, which are nothing more than complex information processing devices, created by billions of years of evolution.

Computers execute algorithms, sequences of small steps that, in the end, perform some desired computation, be it simple or complex. Algorithms are everywhere, and they became an integral part of our lives. Evolution is, in itself, a complex and long- running algorithm that created all species on Earth. The most advanced of these species, Homo sapiens, was endowed with a brain that is the most complex information processing device ever devised. Brains enable humans to process information in a way unparalleled by any other species, living or extinct, or by any machine. They provide humans with intelligence, consciousness and, some believe, even with a soul, a characteristic that makes humans different from all other animals and from any machine in existence.

But brains also enabled humans to develop science and technology to a point where it is possible to design computers with a power comparable to that of the human brain. Artificial intelligence will one day make it possible to create intelligent machines and computational biology will one day enable us to model, simulate and understand biological systems and even complete brains with unprecedented levels of detail. From these efforts, new minds will eventually emerge, minds that will emanate from the execution of programs running in powerful computers. These digital minds may one day rival our own, become our partners and replace humans in many tasks. They may usher in a technological singularity, a revolution in human society unlike any other that happened before. They may make humans obsolete and even a threatened species or they make us super-humans or demi-gods.

How will we create these digital minds? How will they change our daily lives? Will we recognize them as equals or will they forever be our slaves? Will we ever be able to simulate truly human-like minds in computers? Will humans transcend the frontiers of biology and become immortal? Will humans remain, forever, the only known intelligence in the universe?

### SIERD CLOETINGH I NETHERLANDS

UTRECHT UNIVERSITY

#### SHORT BIOGRAPHY



Sierd Cloetingh is Utrecht University Distinguished Professor. His research field is Earth Sciences. He published more than 335 papers in international peer-reviewed journals (11560 citations, h-index 59) and has been promotor of more than 75 PhD students of 18 different nationalities.

Currently he serves as President of the Academia Europaea and President of the COST Association.

In addition, he is Editor-in-Chief of the international journal "Global and Planetary Change" and Chairman of the TOPO-EUROPE collaborative research program.

Past functions include Membership of the Scientific Council (2009–2015) and Vice-President of the European Research Council (ERC), President of the International Lithosphere Program (2004–2017), President of the European Geophysical Society (1998–2000) and Professor of the Royal Netherlands Academy for Arts and Sciences (KNAW, 2006–2015).

Sierd Cloetingh received honorary doctorates from five European universities and numerous medals and awards. He is member of the Royal Netherlands Academy of Sciences, the Royal Norwegian Academy, the Royal Danish Academy, the German national Academy for Technical Sciences, the Heidelberg Academy, the Bavarian Academy of Sciences and honorary member of the Hungarian Academy of Sciences. He was distinguished in 2006 as Chevalier de Legion d'Honneur and in 2014 as Knight of the Royal Order of the Netherlands Lion for his contributions to science and European scientific cooperation in research and education.

## $\ensuremath{\mathsf{w}}$ Promoting and spreading Scientific Excellence in Europe: Perspectives from Academia Europaea $\ensuremath{\mathsf{w}}$

To promote scientific excellence and to unlock potential for scientific excellence, wherever located in Europe, is a prerequisite for Europe at large. Academia Europaea (AE), founded in 1988 as a bottom-up initiative of a group of leading European scholars, sees this as one of its main priorities. The Academia Europaea has more than 3500 members from all over Europe, as well as a hundred foreign members with strong affinities to the European scientific community. All are elected by their scientific peers. These members cover a broad range of fields and belong to the following four classes : The Physical sciences and Engineering, the Life Sciences, the Social and Societal Sciences, and the Humanities. Within and between these four classes, the Academia Europaea promotes interdisciplinary dialogue and co-operation.

Closely affiliated to Academia Europaea is the Young Academy of Europe. It was founded recently as a bottom-up initiative by a group of ERC Starting Grantees. Currently, the YAE has 200 members with the ambition to growth in the coming years to 500 members, and with a full coverage of Europe and disciplines. The YAE is open for talented young researchers, and is not limited to ERC grantees. Academia Europaea, with its headquarters in London, has established over the last few years 4 regional knowledge centres (hubs), located in respectively Wroclaw, Barcelona, Bergen and Cardiff. Each of these hubs has, apart from a regional character, also a thematic focus. Our hub in Wroclaw for example, has a strong focus on the Social Sciences and Humanities, but is also deeply engaged in activities concerning coaching and mentoring of young researchers from eastern and central Europe. These activities are often co-organised with the YAE and the Widening European Participation Group of the European Research Council (ERC). It is evident from various surveys that mobility and brain circulation of talent is essential to widening European participation of the research community from the less research intensive countries. Here a strong potential exists for synergizing further the activities in the ERA, benefiting from what been accomplished in the last decades on a European level. Due to the efforts of the European Commission, young researchers in Europe have now access to a career ladder starting with the Erasmus programmes and Marie Curie Sklodowska Fellowships and training networks all the way to the prestigious ERC grants. At the same time, the COST organisation is making a great effort in building bridges, through its networking schemes (the COST actions, involving currently 45.000 researchers) between individual researchers in a bottom-up mode, fostering Interdisciplinarity and empowerment of young researchers, in particular from the less research intensive countries. As such, COST is serving with great success as an effective pre-portal to other ERA instruments.

We as Academia Europaea, recognize the importance of these joint efforts for the future of science which are completely in line with our own mission. The same is true for the topic of science for policy. The Cardiff hub of Academia Europaea, co-ordinates AE activities in the framework of our membership of SAPEA; the consortium of 5 academic networks in Europe co-operating with the High Level Group (HLG) and the Joint Research Centre (JRC) in the Scientific Advisory Mechanism (SAM), that has been established by the European Commission. Also here, we see from our side a great potential for further synergy with organizations such as EURASC and the high-level expertise they bring together through their membership.

Altogether, it appears that there is a great awareness within the scientific community for the need to work closely together, both in promoting and spreading research excellence in Europe, and also in taking its responsibility to provide scientific-informed policy advice, addressing societal and political challenges facing Europe.

### MARIA DA GRAÇA CARVALHO I PORTUGAL

EUROPEAN PARLIAMENT

#### SHORT BIOGRAPHY



Maria da Graça Carvalho is currently member of the Unit "Scientific Advice Mechanism" of the Directorate-General Research and Innovation of the European Commission. She was a senior advisor of Commissioner for Research, Science and Innovation from November 2014 to December 2015. She was a member of the European Parliament in the EPP group since July 2009 to May 2014. In the capacity she was one of the rapporteurs of Horizon 2020. She has been Principal Adviser of President Barroso in the areas of Science, Higher Education, Innovation, Research Policy, Energy, Environment and Climate Change from 2006 to 2009. She has been Minister of Science and Higher Education of the XV Constitutional Government of Portugal

and Minister of Science, Innovation and Higher Education of the XVI Constitutional Government. She is a Full Professor at Instituto Superior Técnico (University of Lisbon).

She is a member of 22 national and international scientific associations and fellow of the American Association for the Advancement of Science (AAAS), of the American Institute of Aeronautics and Astronautics (AIAA), of the World Academy of Art and Science(WAAS) and has been a Deputy President of the Portuguese Institute of Engineers and remains a fellow of the Portuguese Institute of Engineers, of the Portuguese Academy of Science, of the Royal Academy of Engineers of Spain and a founder of the Portuguese Academy of Engineers (she is Member number 2). She has been an active collaborator of EASAC-European Academies Science Advisory Council and the EuroCASE-European Council of Applied Sciences Technologies and Engineering since the outset.

#### « Reducing inequalities: the role of social innovation »

The presentation aims to highlight the importance of social innovation in reducing inequalities and to discuss the future trends in social innovation.

Social innovations are innovations that are social in both their ends and their means. Specifically, social innovations are new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. They are innovations that are not only good for society but also enhance society's capacity to act (see "Empowering people, driving change - Social innovation in the European Union - Study, BEPA- Bureau of European Policy Advisors, European Commission, 2011").

Social innovation is one way in which people and communities provide a positive response to the adversity that they face. One of the major concerns nowadays is the rising inequality mainly in the middle class of the so-called industrialized countries. The rapidly changing global economic environment and the advent of new information technologies have a drastic effect on local labor markets and on the wealth distribution.

Social innovation may become a powerful tool to fight inequality. Through the sharing economy, the reinvention of manufacturing (combining the empowering of "Do-It-Yourself", and the co- or participatory creation dimension of social innovation), the reshaping of agriculture, and the urban social innovations, environmentally and socially sustainable alternatives to current dominant approaches to community life will be developed. As consequence, poverty will be alleviated by empowering under-resourced people; housing and living conditions will be improved rendering a boost in the economy and quality of life.

Social innovation is an integral part of the European culture and way of life, including of its public institutions. However, social innovation actions need to grow in size and impact and social innovation should become systemic for the benefit of Europe and its citizens.

The presentation discusses the concept of social innovation, the way social innovation reconciles economic and social performances and the new trends in social innovation.

### JOSE LABASTIDA | BELGIUM

HEAD OF THE SCIENTIFIC MANAGEMENT DEPARTMENT OF THE EUROPEAN RESEARCH COUNCIL

#### SHORT BIOGRAPHY



Professor Jose Labastida is the Head of the Scientific Management Department of the European Research Council since February 2011. Before joining the European Research Council he was Secretary General for Science and Technology Policy and Director General for Research of the Ministry of Science and Innovation of Spain (2008-2011). Previously he was Vice-president for Research of CSIC, the Spanish National Research Council (2004-2008).

Formerly, he was a Researcher and Professor of Theoretical Physics occupying positions at the Institute for Advanced Study in Princeton, CERN, CSIC and the University of Santiago de Compostela.

He holds a Ph.D. in Physics from Stony Brook University.

#### « The role of ERC in boosting Science in Europe »

The European Research Council (ERC) was founded in 2007 as an organization to fund frontier research in all areas of knowledge through pan-European competitions. Ten years later ERC has become a prominent actor in the European research landscape after funding more than 7000 projects carrying out top-quality research. In the introduction the main achievements met during these ten years, highlighting the key elements that are behind ERC's success, will be presented.

### YVETTE VAN KOOYK I NETHERLANDS

ERC Advanced Grant

#### SHORT BIOGRAPHY



Professor Yvette van Kooyk is head of the department Molecular Cell Biology and Immunology at the VU University Medical Center in Amsterdam and chairs the division Dendritic Cell Biology. She obtained her PhD in 1993 at the Medical Faculty of the University of Amsterdam, on her work performed at the Netherlands Cancer Institute, revealing pioneering molecular mechanisms that regulate immune cell adhesion through integrin activation. In 2001, she discovered the innate receptor DC-SIGN, a C-type lectin on Dendritic cells, playing a crucial role in HIV recognition and cellular immune interactions through the recognition of glycan structures. This discovery set the stage of a whole new field that led to new concepts on pathogen interactions through C-type lectin

receptor that modify dendritic cell responses. Yvette van Kooyk has (co-)authored over 200 peer-reviewed publications in international scientific journals and 13 book chapters. Professor van Kooyk has supervised 28 PhD students (1992-2017). She is a member of the Dutch Royal Society of Sciences (KNAW), awarded the van Loghem award for life time achievements in field of Immunology. She is director of the Amsterdam Infection and Immunity research Institute AI&II. She is also inventor on 4 patents and is Chief Scientific Officer of the start-up biotech company DC4U.

#### « Will nano-vaccines be the new generation of cancer vaccines? »

The presentation will highlight the importance of professional antigen-presenting cells such as dendritic cells (DC) and Langerhans cells (LC) that form a link between first line host-defence and cellular immunity. As sentinels in tissues, such as the skin, DC/LC express a range of innate receptors, such as Toll-like receptors and C-type lectins that recognize a variety of pathogens and self-antigens through the recognition of glycans. Cancer nanovaccines can be designed that use carbohydrates for targeting purposes to C-type lectins bringing the vaccine at the right spot, the DC and LC in the skin. Moreover glyco-nanomedicines are processed efficiently by DC resulting in enhance anti-tumor T cell responses. We also unravel how glycosylation in (tumor) tissue dictates specific DC inhibitory programs that exert their effect on the adaptive and innate immunity (T cell and NK(T) cell function). By improving anti-cancer vaccines and unleashing the immune inhibitory tumor microenvironment we aim to come to the best immunotherapy treatments for melanoma, glioblastoma and pancreatic cancer. By studying posttranslational processes such as glycosylation, glycosciences, a novel language will be uncovered that regulate the communication between immune system. Because this new language can be stimulating or inhibitory these discoveries will be implemented in the treatment of cancer and auto-immune diseases

Within the last 15 year Y. van Kooyk's research line was directed into the field of functional glycomics, a field neglected by immunologist, which focuses on the understanding how the exposed glycans on glycoproteins/lipids, are instrumental for the functional activity of proteins, and in cellular communication. This field lead to pioneering scientific discoveries, but also to clinical applications into the field of DC-targeting strategies, improving/inhibiting immune responses, and in the field of diagnostics by constructing glycan detection probes for new discovery of tumor associated diseases, linking basic science driven research to translational research. The ERC – Adv. grant GLYCOTREAT, rewarded in 2013, investigates how cancer vaccines can be improved using glycans and how the tumor microenvironment uses glycans to mislead the immune system.

### TIM P. VOGELS I UNITED KINGDOM

UNIVERSITY OF OXFORD, UNITED KINGDOM FENS KAVLI NETWORK OF EXCELLENCE IN NEUROSCIENCE

#### SHORT BIOGRAPHY



Tim Vogels studied physics at Technische Universität Berlin and neuroscience at Brandeis University as a Fulbright Scholar. He received his PhD in 2007 in the laboratory of Larry Abbott. After a postdoctoral stay as a Patterson Brain Trust Fellow with Rafa Yuste at Columbia University, he became a Marie Curie Reintegration Fellow in the laboratory of Wulfram Gerstner at the École Polytechnique Fédérale de Lausanne (EPFL). Tim was awarded the Bernstein Award for Computational Neuroscience in 2012.

Since his arrival at Oxford in 2013 Tim Vogels is establishing a research group in theoretical and computational neuroscience within the CNCB. As a computational neuroscientist, he builds conceptual models to

understand the fundamentals of neural systems at the cellular level. His research group is funded by a Sir Henry Dale Fellowship of the Welcome Trust and the Royal Society and part of the neurotheory initiative at the University of Oxford. His group is looking to build models of cortical networks that contain our cumulative current knowledge. In particular, they are interested in the neuronal interplay of excitatory and inhibitory activity in cortex and how theses dynamics can form reliable sensory perceptions and stable memories.

#### « Innovating funding for innovation: An early-career perspective on European Grants »

The current state of European funding for early- and mid-career independent scientists is more challenging than ever before. Despite their pivotal role as innovation drivers, emerging group leaders find it often difficult to compete with established senior scientists who routinely attract the lions' share of the funding. To provide well-founded recommendations on how to improve funding for the emerging generation of European innovators, the FENS Kavli Network for Excellence in neuroscience conducted a Europe-wide survey for early and mid-career independent researchers to better understand their needs and wishes. In my talk I will discuss four key points that emerge from the answers of over 300 respondents.

**1.** Gender equality in science. In our survey we found substantial gender differences in success rates, pay, lab size, anxiety about career prospects and other markers of academic success. It is reassuring that Horizon2020 funding schemes continue to counter-steer against these lingering effects of gender discrimination in academia. Self-regulating a balanced distribution of awarded grants that takes into account the number of submissions will be a step in the right direction.

**2.** A dearth of specifically tailored funding instruments for early-career-PI opportunities. In many EU member states, European Research Council (ERC) grants are a prominent (and sometimes sole) mechanism for starting/ consolidating a lab, but success rates are very low. Most other Horizon 2020 (H2020 funding instruments cannot provide adequate opportunities for supporting emerging European scientific leaders. More specifically, collaborative, and network grant schemes often come with high administrative burden, generally low acceptance rates, and the added difficulty of finding consortium partners at an early career stage. An increase in theavailable funding tools specifically tailored to early-/mid-career scientists and a special attention to promoting the participation of emerging European science leaders in all H2020 funding schemes would be desirable. This could take the shape of increasing the number of availablesingle PI-driven grants, but also by creating dedicated "young networks" grants, specifically for early career scientists with their traditionally smaller networks, or by requiring the participation of a minimum number of young PIs in H2020 projects.

**3.** The current ERC grant application system is not a true 2-stage application system. All current ERC applications require the submission of a research proposal in two parts, part B1 & part B2. The latter is used only to assess applicants who successfully pass the first stage of the application process. Taking into account the self-reported work hours for Part B2 and the total number of rejected applications in stage one, we can calculate the total researcher time wasted on a one-step ERC application process. This amounts to a staggering 13,000 researcher hours (60 researcher years) per call, time that would be better spent on scientific discovery. The current process could be streamlined – with huge benefits for the entire European research community – by truly separating the application into a two-step process. Only candidates who emerge short-listed according to a (short) part B1 should be invited to submit a long and significantly more work-intensive part B2.

**4.** The quality of the ERC reviewer system is viewed sceptically. Among scientists, ERC grants are currently recognized as the best funding instrument within H2020, independent of application success or failure. However, the level of satisfaction with the review process of ERC grants in our survey was 50%. This is due to several factors, but two reasons stood out: A) The perceived low amount of time reviewers spent on individual grants, and B) a lack of expertise in the field of the application (as reflected in the quality of the review). This is especially frustrating, given that the amount of time spent on an individual application can be several hundred hours. Three action points to alleviate these problems were suggested: 1) Create larger panels of experts ithin each field, based on recommendations from ERC grantees and panel members, who will nominate reviewers for each application; 2) use nominated reviewers for stages 1 and 2 and pay them for their work and 3) systematically use applicants' feedback on the reviews to ensure a consistently high quality of reviewers. We believe that ERC grants are crucial to European science, and hugely popular. The mentioned action points would urther improve the funding process through H2020 and bring overdue relief to European early-and mid-career PIs to support this important pillar of European science and innovation.

### LUÍS PEREIRA I PORTUGAL

ERC - STARTING GRANT, CENIMAT/I3N

#### SHORT BIOGRAPHY



Luís Pereira received the Engineering degree in Materials Science in 2001 and has finished the Ph.D. in Microelectronics and Optoelectronics Materials in 2008 at Universidade Nova de Lisboa. His Ph.D. work was focused on polycrystalline silicon and high k dielectrics for TFT's application.

The expertise gained on oxide materials for electronics allowed focusing the pos-doc activities on the development printed inorganic nanostructured materials for chromogenic, electronic and electrochemical devices on paper and plastic substrates. He was involved in the team that demonstrated for the first time transistors made of oxides with paper as dielectric. He has authored and

co-authored 156 publications in peer-reviewed journals and proceedings of the ISI with more than 3500 citations and has a H factor of 32.

He is currently a researcher at CENIMAT/i3N coordinating and participating in R&D projects and has been granted in 2015 with a Starting Grant of the European Research Council on the development of cellulose nanocomposites for paper electronics (New-Fun, project 640598). His current research interests are on the design and synthesis of 1D, 2D and 3D inorganic and hybrid nanostructures, chiral cellulose nanocomposites, functional micro and nanofibers and it integration on chromogenic, electronic and electrochemical devices.

#### « A new era of electronics and photonics on paper »

The market for flexible and printed large-area electronics is rapidly growing and it is expected to become an eighty billion dollars market before 2025. The growth will be supported by the creation of new markets for low cost and disposable products based on flexible substrates, from opportunities enabled by printing of full-feature electronics, and from electronic devices integrated into novel systems, where recyclability is a key vector.

So far, commercial activity for printed electronics has largely been confined to glass and a narrow range of plastic substrates. On the other hand, paper is potentially useful for some specific applications and markets such as diagnostics, smart packaging and RFID. Printing on paper is very logical and the strong interest is mainly driven by its low-cost ( $€0.001/dm^2$  comparing with  $£25/dm^2$  for silicon or  $€1-10/dm^2$  for polymer substrates), light weight, flexibility and recyclability. Moreover, in contrast to plastic foils, paper is made of natural, sustainable and abundant raw materials and it is recyclable.

Up to know, "Paper electronics" has consisted basically the preparation of paper substrates with the required mechanical and physical properties for additive processes where passive and active components are combined. However organic active materials have been preferred so far but they hardly meet the requirements in terms of electric performance and stability without specific deposition conditions and expensive encapsulation/preparation of the paper substrates. The possibility to integrate electro/opto-electronic functions within the production methods of the paper industry is so of current interest, to enhance and to add new functionalities to conventional cellulose fibers. To fulfil these demands materials and methods should be developed for cheap and mass production. targeting novel cellulose nanocomposites, able to be formed or printed on paper in a multifunctional structure by techniques compatible with real industrial environment. This means, cellulose will be the major constituent of a new generation of electronic and photonic devices, turning possible electronics on paper but also built from paper, that does not exist so far.

In our previous research activities we have demonstrated by the first time that paper can be used as an active component in oxide field effect transistors (FETs). Paper electronics with inorganic functional materials, namely oxides, benefits of the advantage that cellulose is chemically more compatible with oxides than with many organic semiconductors<sup>1</sup>, and that they can bind well at low temperatures. Moreover, cellulose nanocrystals can form chiral nematic liquid crystalline that can be retained in a solid film when the dried.<sup>2</sup> These films exhibit photonic properties including the selective reflection of left-handed circularly polarized light (CPL). These can be used as CPL filters or even to program chirality in inorganic structures, allowing the detection of chiral molecules in oxide semiconductor phototransistors, with high impact in bio-detection. Although the central focus of this ambitious frontier research is on rendering cellulose a truly electronic and photonic material, the set of outputs generated on materials, processing concepts and devices will be of great importance to other emerging fields involving printing technology, data storage, spintronics and bio-compatible and implantable devices.

<sup>1</sup> D. Tobjork, et al., "Paper Electronics", Advanced Materials 23 (2011) 1935

<sup>2</sup> A.G. Dumanli,et al., "Digital Color in Cellulose Nanocrystal Films", ACS Appl. Mater. Interfaces 6 (2014) 12302–12306

### PEDRO BARQUINHA I PORTUGAL

ERC - STARTING GRANT, CENIMAT/I3N

#### SHORT BIOGRAPHY



Pedro Barquinha received the Ph.D. degree from Universidade Nova de Lisboa in 2010, in Nanotechnologies and Nanosciences, with the dissertation "Transparent Oxide Thin–Film Transistors". He is an Assistant Professor at the Materials Science Department of FCT–UNL since 2012, lecturing the courses of Nanofabrication and Characterization of Nanostructures, Flat Panel Displays, Microlectronics and Materials Characterization Techniques.

His work in oxide electronics spans many areas, from the design, deposition and characterization of multicomponent oxides, fabrication and characterization of oxide TFTs, to their integration in analog and digital circuits on flexible substrates. He is co-author of more than 120

peer-reviewed papers, with more than 5300 citations (h-index=33, as July 2017). He co-authored 2 books and 4 book chapters on this area as well. He won important scientific prizes, such as the "Stimulus to research 2008" (Calouste Gulbenkian Foundation) and "Innovation Prize for Young Engineers 2008" (Portuguese Order of Engineers) and gave more than 40 invited lectures including 2 key-notes in international scientific conferences and workshops. He was program coordinator in ITC2012 conference and co-organizer of the 1st E-MRS/MRS- J Bilateral Symposia, "Materials Frontier for Transparent Advanced Electronics". Since 2004 he participated in more than 30 research and innovation projects, mostly focusing oxide semiconductors, TFTs and circuit integration, both by physical and solution processing routes. He is currently principal investigator from FCT-UNL on two EU projects (H2020 Roll-Out and H2020 ID-Neon).

His current research focus is to take oxide electronics to performance and integration levels suitable for future ICTs. This involves pursuing low temperature synthesis routes of high quality oxide nanostructures and integrating them in nanodevices and circuits, always complemented by device modeling/simulation. In 2016 he got an ERC Starting Grant (TREND) to advance this research topic.

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TREND is an ERC Starting Grant started in January 2017 aiming to take transparent electronics into as-of-yet unexplored levels of integration, by combining transparent and high-speed nanocircuits with energy harvesting capabilities on flexible substrates, all based on multicomponent metal oxide nanowires (NWs).

For this end, sustainable and recyclable materials as ZnO,  $SnO_2$ ,  $Cu_2O$  are being synthesized in different forms of heterostructured NWs, using low-temperature and low-cost solution processes. At this stage, the main focus is to build a database of these materials that can then be used for multiple applications. Particular emphasis is being given to zinc-tin oxide (ZTO), which can be directly grown on flexible substrates using seed layers or even converted from ZnO NWs at temperatures below 200°C, assuring the compatibility with temperature-sensitive substrates.

In parallel, precise positioning of these NWs is starting to be studied, either by transfer methods or direct growth using seed layers patterned by nanoimprint lithography. This will be crucial for integration in different nanotransistor structures, which will be combined into digital/analog nanocircuits following planar and 3D approaches. Energy will be provided by piezoelectric nanogenerators with innovative structures and materials. Final platform of nanocircuits+nanogenerators will make use of NW interconnects, bringing a new dimension to the systems-on-foil concept.

TREND is thus an ambitious multidisciplinary project motivating advances in materials science, engineering, physics and chemistry, with impact extending from consumer electronics to health monitoring wearable devices. By promoting new ideas for practical ends, it will contribute to place Europe in the leading position of such strategic areas, where sustainability and innovation are key factors.

For myself and my hosting institution this ERC grant is bringing unique opportunities to advance science and career. Being such a prestigious grant I received applications for open positions from highly skilled scientists from all over the world, enabling me to start building a very competent and multidisciplinary team. The opportunity to acquire within the same project both e-beam lithography and nanoimprint lithography add-ons for existing tools is also something unique and fundamental to turn my ideas for oxide nanoelectronics into reality. The low administrative burden and relative long period of implementation compared to most of the collaborative funding schemes are also very important for early-career scientists as myself: more time can be dedicated to science and to the challenges of supervising a team working in so many different parts of the whole thing. With all this, rather than being simply a very important project during 5 years, an ERC grant can be a true life changer: besides the massive daily learning of such an experience, the recognition and enrichment of our network of international collaborations can be a "simple consequence" of the successful implementation of the project, potentiating that as PI I can continue to bring innovative science to Europe for many years after the ERC grant.

### MARA G. FREIRE I PORTUGAL

ERC - STARTING GRANT, CICECO

#### SHORT BIOGRAPHY



Mara G. Freire graduated in Chemistry in 2003, receiving the "Best Chemistry Student Award" from Dow Portugal, and by the end of 2007 she completed her PhD in Chemical Engineering, by University of Aveiro, followed by post-doctoral research activities at ITQB2, New University of Lisbon, Portugal. During 2013, Freire was an Assistant Researcher, and since February 2014 she is a Coordinator Researcher at CICECO – Aveiro Institute of Materials, Chemistry Department, University of Aveiro, Portugal. Freire is the Coordinator of Group 5 – Biomedical and Biomimetic Materials – of CICECO, and a Member of the Young Scientists Seminar of the Lisbon Academy of Sciences. Freire has completed the supervision of 6 post-doctoral researchers, 6 PhD students, 31 MSc

students and 22 BSc students, and is currently supervising 10 post-doctoral researchers, 9 PhD students, 6 MSc students and 5 BSc students.

Freire published more than 150 papers in international peer reviewed journals, five book chapters and edited one book, and has over 5500 citations (excluding self-citations) and an h-index of 48. The scientific network of Freire is supported by publications with more than 150 distinct authors with the most diverse affiliations. In addition to several best poster awards in scientific conferences, Freire was the advisor of the winner MSc thesis in the Industrial and Technology Category in the Future Ideas Thesis Competition 2014, the co-advisor of the Best PhD thesis - Mário Quartin Graça Award - in the Technologies and Natural Sciences Category in 2016, was recognized amongst the top 20 "Women in Science" in Portugal in 2015, received the ECTP-NETZSCH Young Scientist Award in 2014, and was recently recognized in the "Green Chemistry 2017 Emerging Investigators" themed issue of the Green Chemistry scientific journal.

Freire participated in 18 Ŕ&D projects with a total budget over 17M€, being the principal investigator in 2 of these projects. Currently, Freire is the principal investigator of a Starting Grant from the European Research Council (ERC).

#### « Design of Effective Purification Platforms for Biopharmaceuticals »

The biopharmaceuticals market, worldwide estimated at US\$199.7 billion in 2013, has been projected to reach US\$497.9 billion by 2020 [1]. In 2013, 970 biopharmaceuticals were under development, of which 338 are monoclonal antibodies (mAbs), 93 are recombinant proteins, 46 are gene therapy products and 15 are RNA antisense therapeutics [2]. In addition to the more investigated mAbs, antibodies present in hen egg yolk, namely immunoglobulin Y (lgY), are an alternative option that can be obtained in higher titres and at lower cost.

Although biopharmaceuticals target diseases such as cancer, rheumatoid arthritis, infectious diseases, among others, their recurrent use by a widespread population is still restricted by their current high cost. The major constraints in the current manufacturing platforms for biopharmaceuticals are no longer found in the upstream production processes, where productivity has dramatically increased over the past decade. The major constraints are now found in the downstream processing, which are responsible for many inefficiencies, including the inability to handle the increasing concentrations of products in the crude feedstock, difficulties in integrating cell culture with primary recovery steps, excessive cost of goods/consumables and high energy and water consumption, and accounting for 80% of the total biological manufacturing costs [3]. Although a large number of processes were already proposed to manufacture biopharmaceuticals at a lower cost [3], innovative purification operations are still required to further decrease their costs and to improve their efficiency.

In the past few years, we have been devoted to the development of more cost-effective and sustainable platforms for the purification of biopharmaceuticals (including antibodies, recombinant proteins and nucleic acids products). Some examples of such developed techniques, as integrated extraction, purification and concentration platforms, will be presented. Examples of some of the developed strategies for the target products recovery and to guarantee the recyclability of the solvents used also will be provided. Such developments aimed to maximize the yield and purity level of current biopharmaceuticals, thus facilitating the access of a widespread population to advanced therapeutic products and/or personalized medicinal treatments at a lower cost.

References:

[1] Biopharmaceuticals - A Global Market Overview. (2013) Industry Experts. Dublin.

[2] PhRMA-Pharmaceutical Research and Manufactures of America. (2013)Medicines in Development. 2013 report.

[3] Walsh, G. (2010) Biopharmaceutical benchmarks 2010. Nature Biotechnology 28, 917-924.

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# LEONARDO DA VINCI AWARDEE AND BLAISE PASCAL MEDALISTS SHORT BIOGRAPHY AND ABSTRACT



EUROPEAN ACADEMY OF SCIENCES IN SUPPORT OF EXCELLENCE IN SCIENCE AND TECHNOLOGY

### LEONARDO DA VINCI AWARD

"In recognition of his many outstanding contributions to the development of major branches of chemistry that include Photochemistry, Supramolecular Chemistry, and Molecular Nanotechnology."

### VINCENZO BALZANI I UNIVERSITY OF BOLOGNA, ITALY



His scientific activity is documented by more than 600 papers in the fields of photochemistry, supramolecular chemistry, molecular machines, and solar energy conversion. His books Molecular Devices and Machines-Concepts and Perspectives for the Nanoworld (2008), Energy for a Sustainable World (2011), and Photochemistry and Photophysics: Concepts, Research, Applications (2015) have been and/or are currently adopted as textbooks in several universities worldwide, including China and Japan. His scientific research is combined with an intense divulgation activity on the relationship between science and society, and between science and peace, with particular reference to the themes of energy and resources. He is very proud of the title "Public Passion" used by Nature (503 559 2013) to

comment on the delivery to him of the Award for Mentoring in Science.

#### ABSTRACT | Chemistry and Creativity

Creativity is a basic feature of Science. Like in many other fields, creativity in chemistry results from recombining old materials with a new design in mind. In recent years, chemists have learnt to operate like engineers, with the ambitious task of using molecules to make devices and machines of nanometric size. Several molecular level systems have indeed been designed and constructed that are capable of performing functions like those performed by devices and machines of the macroscopic world. Such systems are often obtained starting from "old" molecules whose well-known properties are exploited by novel ideas coming from nanoscience and nanotechnology. This lecture will illustrate the working principles of photochemical molecular devices for information processing, with examples of memories, logic gates, and encoding/decoding systems, and the operational mechanisms of light-powered molecular machines, with examples of shuttles and switchable boxes.

[1] V. Balzani, A. Credi, M. Venturi Molecular Devices and Machines – Concepts and Perspectives for the Nanoworld, Wiley-VCH, 2008.

[2] V. Balzani, P. Ceroni, A. Juris Photochemistry and Photophysics: Concepts, Research, Applications, Wiley-VCH,

### **BLAISE PASCAL MEDAL IN CHEMISTRY**

"In recognition of his ground-breaking contributions and pioneering role in the areas of inorganic and structural chemistry where he profoundly influenced the development of the field"

### MICHAEL MINGOS I UNIVERSITY OF OXFORD, UK



Michael Mingos has made a unique contribution to inorganic chemistry by developing new bonding models and testing their consequences by an imaginative experimental programme. He showed great originality in developing new bonding concepts in cluster and organometallic chemistry and simultaneously made significant contributions to synthetic, structural and spectroscopic aspects of the subject. This led to the first examples of icosahedral high nuclearity gold clusters, which he had earlier predicted, the first example of skeletal isomerism in the solid state, the first examples of gold-platinum and compounds, platinum-thallium cluster and the development of sulfur dioxide as an alternative stabilising ligand. His theoretical

contributions include general bonding models for gold and platinum clusters, definition of the closed-shell equirements for condensed and high-nuclearity clusters, and the isolobal analogy.

Michael's structural definition and bonding analysis of ambivalent ligands such as nitric oxide and sulfur dioxide have had important implications for the extensive biological role of nitric oxide. He also developed a wide range of applications of microwave dielectric heating to inorganic, organometallic and catalytic chemistry.

#### ABSTRACT | Structural and Bonding Patterns in Molecular Clusters

The synthesis and study of molecular cluster compounds has proved to be a recurrent theme in inorganic chemistry for more than 50 years. Initially the field attracted scientists because of the novel structures which were observed for these compounds in the solid state, but in recent years as the synthetic methods have become more sophisticated pure samples of molecular clusters containing 50-300 metal atoms have been made. Consequently their importance as nano-metal particles has become more important and their potential applications have been explored in more detail. This has also raised the question of the inter-relationships between molecular clusters and metal colloids, which were first studied by Faraday in the 19th Century at the laboratories of the Royal Institution. The study of gold cluster compounds originated from Malatesta's syntheses of tertiaryphosphine derivatives in the 1960s and was greatly extended between 1970 and 2000 by groups in Oxford and Nijmegen. Single crystal X-ray studies defined the major structural classes and led to the development of a theoretical model which accounted for their closed shell requirements in terms of their topological features. This proved to be sufficiently flexible to be extended to related heteronuclear cluster compounds. Since the turn of the century the range of gold cluster compounds has been greatly extended by the study of organothiolato- gold cluster compounds. The structures of these compounds have revealed that the gold atoms combine with the organothiolato- ligands to generate a novel class of metallo-organothiolato- ligands which protect and stabilise the inner core of gold atoms. These developments originally suggested that the phosphine and organothiolato- clusters defined quite distinct classes of gold clusters, but recent structural and theoretical developments have reconciled many of these differences.

Although the lecture will discuss the structural implications which have emerged from the study of phosphine and thiolato- clusters of gold it will also seek to provide some broader principles and generalisations regarding clusters, colloids and nano-particles of metal atoms.

### **BLAISE PASCAL MEDAL IN ENGINEERING**

"In recognition of his outstanding and innovative contributions to advanced nonlinear solid mechanics, fracture mechanics, and the related engineering applications"

### NIKITA MOROZOV I MOSCOW, RUSSIA



Nikita Fedorovich Morozov is a Full Member of the Russian Academy of Sciences (2000), Honored Science Worker of Russian Federation (1995), a winner of the State Prize of the Russian Federation in the field of science and technology (2000), Doctor of Physical and Mathematical Sciences (1967), and Professor (1970). He graduated from the Mathematical and Mechanical Faculty of the Leningrad State University. He has been working there since 1970 and has been the head of the department of elasticty theory since 1976. Academician Morozov is a leading specialist in the field of the theory of elasticity and the nonlinear mechanics of deformable bodies, fracture mechanics, in particular, under dynamic loading, and the theory of integral equations.

#### **ABSTRACT** | Mechanics and nanomechanics

Last 50 years we can see the great progress in the nanotechnology. Very many nanosize mechanisms work in the different regions of industry, biology etc. It is necessary to have a theory for analysis the work of nano-objects. This theory exists – it is classical theory taking account the surface effect (R. Miller, V.Shenoy, B.Karihaloo, H.Altenbach, etc.) We take in our investigation some classical problems (problem Kirsch, elastic plate with inclusion, system of parallel cracks etc.) and analyze the influence of surface effect on solution of problem.

### **BLAISE PASCAL MEDAL IN MATERIALS SCIENCE**

"In recognition of his contributions to the understanding of metal nanocrystal growth and self-assembly, plasmonic properties and sensing applications"

### LUIS M. LIZ-MARZAN I CIC BIOMAGUNE, SAN SEBASTIAN, SPAIN



Research line: Nanoparticle synthesis and assembly, nanoplasmonics, and development of nanoparticle-based sensing and diagnostic tools. Previous research experience in the University of Vigo, University of Utrecht, Tohoku University, University of Michigan, University of Melbourne, University of Hamburg and Max Planck Institute of Colloids and Interfaces. He is Ikerbasque Professor and Scientific Director of CIC biomaGUNE, where he leads the BioNanoplasmonics Lab. Doctor in Chemistry 1992 from the University of Santiago de Compostela.

#### **ABSTRACT** | Colloidal Nanoplasmonics

Nanoplasmonics refers to the manipulation of light using materials with sizes much smaller than the radiation wavelength. This is typically achieved using nanostructured metals, as they can efficiently absorb and scatter light because of their ability to support coherent oscillations of free (conduction) electrons. Although the remarkable optical response of "finely divided" metals is well known since more than 150 years ago, the recent development of sophisticated characterization techniques and modeling methods has dramatically reactivated the field. Another extremely important pillar on which the development of nanoplasmonics has been the remarkable advancement in fabrication methods, which provide us with an exquisite control over the composition and morphology of nanostructured metals. Both lithography and solution chemistry provide tools for exquisite fabrication control, to a degree that seemed impossible only a decade ago. In particular, Colloid Chemistry methods provide us with (apparent) simplicity and large scale production, while offering a number of parameters that can be used to direct not only nanoparticle morphology but also surface properties, assembly and subsequent processing. Interestingly, by fine tuning of nanoparticle size and shape, the optical (plasmonic) response. i.e. the resonance wavelength and the ratio between absorption and scattering can be tailored toward specific applications, such as energy conversion, photothermal therapy, sensing and diagnostics, among others.

This talk will focus on the basics and some recent advances in the field of "colloidal nanoplasmonics", highlighting promising directions in the various aspects involved, from synthesis to applications.

References

M. Faraday, Philos. Trans. Royal Soc. London 1857, 147, 145.
M. Grzelczak, L. M. Liz-Marzán, Langmuir 2013, 29, 4652–4663.

### **BLAISE PASCAL MEDAL IN MATHEMATICS**

"In recognition for seminal contributions on stochastic homogenization, calculus of variations, functional analysis and applications to thin-film micro magnetism"

### FELIX OTTO I LEIPZIG, GERMANY



Study of mathematics and PhD at Bonn Univ. (1993), Professor at University of California at Santa Barbara (1998), Professor at Bonn University (1999), Managing director of the cluster of excellence "Hausdorff Center for Mathematics" (2006-2009), Collatz price of ICIAM (2007), Director and Scientific Member at the Max Planck Institute for Mathematics in the Sciences (since 2010), Honorary Professor at Leipzig University (since 2010), Member of Berlin-Brandenburg Academy of Sciences Leopoldina (since 2008), Gottfried-Wilhelm-Leibniz Award of the DFG (2006).

#### ABSTRACT | Randomness in Partial Differential Equations

In applications, we often do not know the exact details of a heterogeneous medium. Here, randomness in the coefficients of a typically elliptic partial differential equation is used to express a lack of knowledge. Nevertheless, some properties of the solution are robust under this lack of knowledge. This is the area of Stochastic Homogenization.

Thermal fluctuations typically give rise to a driving force that appears as a right-hand side in an often nonlinear parabolic partial differential equation. How to develop a notion of solution in the presence of nonlinearity and a rough right-hand side is the subject of the area of Stochastic Partial Differential Equations (SPDE).

While Homogenization capitalizes on random cancellations on large scales, SPDE copes with roughness on small scales. However, both directions have to confront similar issues in elliptic/ parabolic regularity theory.

### **BLAISE PASCAL MEDAL IN LIFE SCIENCES**

"In recognition of his outstanding contribution to the field of evolution and experimental evolutionary biology"

### FRANCISCO J. AYALA I UC-IRVINE, USA



Francisco José Ayala, Spanish-born American evolutionary geneticist and molecular biologist, well known for clarifying the philosophical perspective that Darwinism and religious faith are compatible. Received a B.S. in physics from the University of Madrid in 1955. Between 1955 and 1960 studied theology at the Pontifical Faculty of San Esteban in Salamanca. He received a PhD in genetics from Columbia University (1964). After early appointments at Rockefeller University and Providence College, he became a professor of genetics at the University of California, Davis, in 1971. In 1987 he became a professor of biological sciences at the University of California, Irvine and jointly as a professor of philosophy in 1989. He made significant contributions to public health through his research into the population structure, mode of reproduction, and evolution

of parasitic protozoans. Throughout his career, Ayala defended the teaching of evolution in public schools in the United States, and his efforts served to strengthen evolutionary theory. He served as an expert witness in McLean v. Arkansas Board of Education (1981), which overturned a state law that required the teaching of creationism alongside evolution in science classes. In 1984 and again in 1999, he was the principal author of Science and Creationism: A View from the National Academy of Sciences. In Darwin's Gift to Science and Religion (2007), he argued that creationist beliefs run counter to theological concepts. He is author or editor of more than 60 books and 1,200 scientific papers. He hasreceived the U.S. National Medal of Science (2001) and the Templeton Prize (2010), among numerous awards and honors.

#### ABSTRACT | Two Revolutions: Copernicus and Darwin

Darwin occupies an exalted place in the history of Western thought, deservedly receiving credit for the theory of evolution. However, Darwin accomplished something much more important than demonstrating evolution. Darwin's Origin of Species is, first and foremost, a sustained argument to solve the problem of how to account scientifically for the design of organisms. Accumulating evidence for common descent with diversification may very well have been a subsidiary objective of Darwin's masterpiece. Darwin seeks to explain the design of organisms, their complexity, diversity, and marvelous contrivances as the result of natural processes. Darwin brings about the evidence for evolution because evolution is a necessary consequence of his theory of design. The advances of physical science brought about by the Copernican Revolution had driven mankind's conception of the universe to a split-personality state of affairs. Scientific explanations, derived from natural laws, dominated the world of nonliving matter, on the Earth as well as in the heavens. Supernatural explanations, which depended on the unfathomable deeds of the Creator, were accepted as explanations of the origin and configuration of living creatures.

It was Darwin's genius to resolve this conceptual schizophrenia. Darwin completed the Copernican Revolution by drawing out for biology the notion of nature as a lawful system of matter in motion that human reason can explain without recourse to supernatural agencies. The complex organization and functionality of living beings can be explained as the result of a natural process-natural selection-without any need to resort to a Creator or other external agent. The origin and adaptations of organisms in their profusion and wondrous variations were thus brought into the realm of science.

### LOCATIONS

### LISBON ACADEMY OF SCIENCES | RUA DA ACADEMIA DAS CIÊNCIAS, 19 1249-122 LISBOA, PORTUGAL

The Lisbon Academy of Sciences is one of the oldest national scientific institutions of continuous existence. It was founded on December 24th, 1779, during the reign of D. Maria I, under the inspiring sign of a verse of Fedro\*:

Nisi utile est quod facimus stulta est gloria. If what we do is not useful, the glory is vain.

#### Mission:

Under the statutory terms, it is incumbent upon the Lisbon Academy of Sciences to:

- promote scientific research and disseminate its results;
- promote the study of the history of Portugal and its relations with other peoples;
- foster the enrichment of thought, literature, language and other sources of national science and culture;
- contribute to the development of science and cultural progress of the country;
- provide the Portuguese Government with linguistic and scientific advice of national interest, coordinating its action with the Brazilian Academy of Letters and with the network of European and world academies, with special attention to Portuguese-speaking countries and Portuguese nuclei abroad ;
- contribute to the information, knowledge and wisdom society with a view to enhancing Portuguese participation in globalism.

### CENTRO CULTURAL DE CASCAIS I Avenida Rei Humberto II de Itália, 2750 Cascais, Portugal

The Cascais Cultural Centreal is a secular building, born from the rehabilitation of the old Convent of Our Lady of Mercy.

It opened doors on May 15th, 2000, and today constitutes a multidisciplinary space, especially aimed to visual arts. It also has a cozy auditorium with capacity for 144 seats, suitable for hosting conferences, seminars, small music concerts and performances, as well as a pleasant cafeteria served by a terrace located in an inner courtyard.

The convent was built on the initiative of the IV Count of Monsanto, D. António de Castro, who wanted to install there the first

Philosophy Portuguese College. The works were completed in the year of 1641. The convent's history until 1834 is described in the Chronicle of the Barefoot Carmelites, religious order that occupied it until that date. When in that year the religious orders were extinguished, the convent was voted to the abandonment and ruin.

After passing through several owners was acquired by the Viscount of Gandarinha, in the late XIX century, who had his summer palace installed there.

In the middle of the XX century the building was acquired by the Espírito Santo family and, in 1977 the Cascais Town Hall took possession of the Casas da Gandarinha SARL Society by donation, with the safeguard of the management of the chapel by the local ecclesiastical authority.

With a shared management between the D. Luís Foundation, responsible for the programming of the exhibition center, and the Cascais Town Hall, which assures the programming of the auditorium, the Cultural Center also has a very dynamic Cultural and Educational Service.





### **SPONSORS & COLLABORATORS**

The Organising Committee thanks all the sponsors and collaborators for all the support given, and for believing in the success of this great event that by sure will be a landmark for science.

Indeed, nothing is done without dedication, resources and, clearly without credit. Of these three elements, the most difficult to conquer is credit. Not a bank loan, but a credit that comes from trust placed in a teamwork.

It is for the credit and for the confidence shown in our work, and for sharing with us the challenges we took, which we thank all of you for making all of us going further.



### **TEAM COLLABORATORS**

A special acknowledgment to this wonderful team! Each of you has proven to be a valuable and indispensable element in the success of the entire organization of this event.

In the end, the success of a project depends on the commitment of every member of a team. And you all showed great determination and dedication, and an incredible team spirit.

All are to be congratulated and deserve a sincere thanks for the work done! Congratulations and thank you all!

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