



ERC research showcased at

**ESOF 2018**  
Euroscience Open Forum

*Sharing science:  
towards new horizons*

Toulouse (France)  
9 - 14 July 2018



**European Research Council**  
Established by the European Commission



## The European Research Council (ERC)

The European Research Council, set up by the European Union in 2007, is the premiere European funding organisation for excellent frontier research. Every year, it selects and funds the very best, creative researchers of any nationality and age, to run projects based in Europe. The ERC has three main grant schemes: Starting Grants, Consolidator Grants and Advanced Grants. The Synergy Grant scheme was re-launched in 2017.

To date, the ERC has funded over 8 000 top researchers at various stages of their careers, and over 50 000 postdocs, PhD students and other staff working in their research teams. The ERC also strives to attract top researchers from anywhere in the world to come to Europe. Key global research funding bodies in the United States, China, Japan, Brazil and other countries have concluded agreements to provide their researchers with opportunities to temporarily join the teams of ERC grantees.

The ERC is governed by an independent body, the Scientific Council, led by the ERC President, Prof. Jean-Pierre Bourguignon. The overall ERC budget from 2014 to 2020 is over €13 billion, as part of the EU Research and Innovation framework programme Horizon 2020, for which European Commissioner for Research, Innovation and Science Carlos Moedas is responsible.



# The ERC at ESOF 2018 - Toulouse

The EuroScience Open Forum (ESOF), held once every two years, is the largest interdisciplinary science event in Europe. It brings together over 4 000 leading thinkers, innovators, policy makers, journalists and educators from all over the world to discuss current and future breakthroughs in science. The 8<sup>th</sup> edition of ESOF “*Sharing science: towards new horizons*” will take place in Toulouse, France, from 9 to 14 July 2018.

The ERC will again take part in ESOF 2018 with its President, Prof. Jean-Pierre Bourguignon and over 20 of its grant-holders.

## ERC Sessions

Tuesday 10 July

10:15 - 11:30 **Science diplomacy on the ground: protecting researchers in difficult environments**

**ERC grantees:** Alia Gana, Barak Kalir, Emma Loosely, Silvana Mandolessi, Martin Saxer

**Other speakers:** Angela Liberatore - ERC

15:15 - 16:30 **The third millennium surgeon: a robot with artificial intelligence**

**ERC grantees:** Sir Alfred Cuschieri, Paolo Fiorini, Bradley Nelson

**Other speakers:** Sanja Dogramadzi - University of West England Bristol (UK),

Luigi Manfredi - University of Dundee (UK), Telma Carvalho - ERC

Wednesday 11 July

13:30 - 14:45 **Growing mini-organs on a petri dish: myth or reality**

**ERC grantees:** Juergen Knoblich, Elena Martínez

**Other speakers:** Jens Puschhof - Royal Netherlands Academy of Arts and Sciences (Netherlands)

13:30 - 14:45 **Clean Flights – Blue Skies**

**ERC grantees:** Giulia Lanzara, Aimee Morgans

**Other speakers:** Laurent Thomasson - Airbus Group (France), George Symeonidis - ERC

13:30 - 14:45 **Women in science: let's change the world**

**Speakers:** Claudia Alves de Jesus-Rydin - ERC, Jean-Pierre Bourguignon - President of the European Research Council, Daniel Conley - Lund University (Sweden), Veronique Garcon - CNRS-LEGOS (France), Alberto Montanari - University of Bologna (Italy)

Thursday 12 July

- 17:00 - 18:15 **European Grants for brilliant minds from across the world**  
**ERC grantee:** Eva Hevia  
**Other speakers:** Sophie Beernaerts - European Commission, Angela Liberatore - ERC, Agata Stasiak - Research Executive Agency, Graham Wilkie - European Commission

Friday 13 July

- 10:15 - 11:30 **The impact of atmospheric particles on climate and health**  
**ERC grantees:** Markus Kalberer, Athanasios Nenes, Ilona Riipinen, Bernadett Weinzierl  
**Other speakers:** Claudia Alves de Jesus-Rydin - ERC
- 13:30 - 14:45 **Challenges and promises of synthetic biology**  
**ERC grantees:** David Bikard, Sarah O'Connor, Nikolai Windbichler  
**Other speakers:** Maria Lluch - Center for Genomic Regulation (Spain)

## Sessions with the participation of the President of the ERC

Wednesday 11 July

- 17:00 - 18:45 **The lost generation of European scientists: how to make the system more sustainable?**  
**Speakers:** Jean-Pierre Bourguignon - President of the European Research Council, Maria-Antonietta Buccheri - Marie Curie Alumni Association (MCAA), Maria Gorna - Marie Curie Alumni Association (MCAA) / University of Warsaw (Poland), Gilles Mirambeau - UPMC Sorbonne Universités (France), Amaya Moro Martin - Space Telescope Science Institute (US), Sara Ricardo - MCAA/IBMB (Spain), Renée Schroeder - University of Vienna (Austria), Rolf Tarrach - European University Association, Varvara Trachana - University of Thessaly (Greece), Luc Van Dyck - Freelance

Thursday 12 July

- 18:30 - 19:30 **Pâtisserie with the Prof**  
Young scientists and students have a unique opportunity to meet renowned scientists in a casual atmosphere.



Friday 13 July

8:30 - 9:45

**Plenary Panel discussion: Inequalities in European Science**

**Speakers:** Martin Andler - Emeritus Professor of Mathematics Versailles St Quentin University (France), Vice-President of EuroScience, Vice-Chair of the ESOF 2018 Programme Committee, Jean-Pierre Bourguignon - President of the European Research Council, Elin Org - Senior Scientist Estonian Genome Centre, Institute of Genomics University of Tartu (Estonia), Carmen Vela - Spanish State Secretary for Research, Development and Innovation (Spain)

13:30 - 14:45

**Thinking outside of the box: how can industry best engage in fundamental research?**

**Speakers:** Jean-Luc Beylat - Nokia Bell Labs (France), Thierry Botter - Airbus (France), Jean-Pierre Bourguignon - President of the European Research Council, Alessandro Curioni - IBM (Switzerland), Paul Febvre - Satellite Applications Catapult (UK), Margaret Harris - Physics World, IOP Publishing (UK), Björn Pötter - ESG Elektroniksystem und Logistik (Germany), Kelly Richdale - ID Quantique (Switzerland)

## Exhibition area

More information about the ERC funding opportunities will be available at the European Commission, DG Research and Innovation booth in the exhibition area (Level Concorde -1), Centre de Congrès Pierre Baudis.

## ERC Press

ERC speakers are available for media interviews.

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## Science diplomacy on the ground: protecting researchers in difficult environments

Tuesday 10 July | 10:15 - 11:30

Research is at times a risky endeavor, not only concerning the possibility of failure of an experiment or a scientific theory but also in terms of researchers' safety and the safety of research subjects. Some research involves the need for fieldwork in conflict areas or countries where freedom of research is not safeguarded. Ethical protocols are being developed by research institutions to deal with such cases; this is necessary but insufficient to protect researchers and research subjects. Science Diplomacy is an important element to help ensure the right conditions for research to be pursued, for example by facilitating access to sites (e.g. access to archaeological sites, access for field work in/with displaced persons or minorities), protecting scientists in cases of tensions (with initiatives aimed at protecting refugee scientists and other academics at risk), and facilitating cooperation between 'foreign' and 'local' researchers.

Protecting scientists and scientific freedom is an increasingly important element of 'diplomacy for science' – one of the three elements of 'science diplomacy' as defined by the Royal Society/AAAS Report on 'New Frontiers on Science Diplomacy', the others being 'science for diplomacy' and 'science in diplomacy'. Diplomacy for science is mostly considered in terms of fostering S&T Agreements and other forms of scientific cooperation between different countries. Less understood is the role of diplomacy in safeguarding the researchers themselves.

The session gathers researchers conducting work in difficult environments - from Afghanistan to Syria and Mexico, examining sensitive issues ranging from asylum procedures to transitions to democracy or the roots of religious communities - and addresses questions based on their experience. How can diplomacy help? Why and when cases of researchers' safety have become "high politics"? How can 'traditional' diplomacy at state level and 'bottom-up' diplomatic practices by universities help?



**Alia Gana**  
ERC grantee

*National Center for Scientific Research - CNRS (France)*

Alia Gana is Research Professor at the National Centre for Scientific Research (France), currently on assignment at the Research institute on contemporary Maghreb in Tunis. Holding a PhD in development sociology from Cornell University, she has performed extensive research on social systems of farm production, rural livelihoods, agricultural policies, farmers' and rural protest movements. Her current research work explores the links between development, territories and democracy, in light of the political upheavals in North Africa. She is the principal investigator of the ERC-funded project "*Political and socioinstitutional change in North Africa*" (TARICA). This project seeks to highlight the complex processes which contribute to the diversity of the trajectories followed by five Northern African countries, directly or indirectly impacted by the "Arab revolts", i.e. Tunisia, Egypt, Morocco, Algeria and Libya.



**Barak Kalir**  
ERC grantee

*University of Amsterdam (Netherlands)*

Barak Kalir is Associate Professor at the department of Anthropology, co-director of the Institute for Migration and Ethnic Studies and programme director of Moving Matters: People, Goods, Power and Ideas of the University of Amsterdam. He studies and compares the actual implementation process of deportation regimes in different countries in Europe, Asia and Latin America.



### **Angela Liberatore**

**European Research Council**

Angela Liberatore is Head of Unit for Social Sciences and Humanities at the European Research Council Executive Agency. Previously she worked in DG RTD at the European Commission. She participated in the work for the White Paper on European Governance of the European Commission. Her publications include '*Climate Change, Security and Peace: The Role of the EU*'; '*Balancing security and democracy. Biometric politics in the European Union*'; '*Democratising Expertise, Expertising Democracy*'; '*The Management of Uncertainty: Learning from Chernobyl*'. She holds a PhD in Political and Social Sciences from the European University Institute.



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### **Emma Loosley**

**ERC grantee**

**University of Exeter (UK)**

Emma Loosley is Associate Professor in Theology and Religion at the University of Exeter (UK). Her work involves Archaeology, Art History and Religious Studies and explores early Christianity in the Middle East and Caucasus. In 2012-2017 she held an ERC Starting Grant that researched the relationship between Syria and Georgia in Late Antiquity. The results of this project are currently in press with Brill as '*Architecture and Asceticism: Cultural Interaction between Syria and Georgia in Late Antiquity*'.



### **Silvana Mandolessi**

**ERC grantee**

**KU Leuven (Belgium)**

Silvana Mandolessi is Professor of Cultural Studies at KU Leuven (Belgium). She has co-directed the project "*Transit: Transnationality at Large*"(2012-2016), funded by a Marie Skłodowska Curie grant. She is currently leading the ERC project "*We are all Ayotzinapa: the role of digital media in the shaping of transnational memories on disappearance*" (2016-2021). 'Digital Memories' aims at providing a theoretical model to analyze traumatic events that acquire a global dimension in the digital ecology.



### **Martin Saxer**

**ERC grantee**

**LMU Munich (Germany)**

Martin Saxer was a Clarendon Scholar at Oxford and received his doctorate in 2010. He conducted extensive fieldwork in Siberia, Tibet and Nepal and published the book *Manufacturing Tibetan Medicine: The Creation of an Industry and the Moral Economy of Tibetanness* (Berghahn 2013). He currently leads a 5-year research project funded by an ERC Starting Grant under the title "*Remoteness & Connectivity: Highland Asia in the World*".



## Asian highlands: remote, yet thoroughly connected to the outside world

*In the highlands of Asia, an area spanning the mountain regions between the Pamirs and the eastern Himalayas, livelihoods are shaped as much by remoteness as by connectivity. With ERC funding, Dr Martin Saxer intends to shed new light on these areas at the edge of nation-states yet in the centre of geopolitical concerns.*

What happens at the Afghan-Tajik border, in Kashmir, Tibet or Northeast India has a global impact. These frontier areas are depicted as refuges for transnational insurgents, as realms of authentic tribal culture, as trafficking routes for drugs and wildlife, or simply as underdeveloped rural peripheries. Policy-makers struggle to comprehend the dynamics involved, and local communities continue to feel misunderstood.

Remoteness is often assumed to be the defining condition of the highlands of Asia – they are isolated and far away from developed urban centres and state control. However, connectivity with the outside world is an essential feature of these zones which were for centuries crossroads of intensive exchange until, in the mid-twentieth century, they became peripheries at the margins of China and India. In the last years, these hotspots of tension and insecurity have, again, increasingly become areas of trade and exchange. Old trade routes closed for generations reopened and the quest for natural resources and new markets is attracting new actors and capital.

Dr Saxer studies this ongoing and poorly understood transformation, focusing on four locations: the Pamirs of Tajikistan, the Himalayas of northern Nepal, bordering China, the Indian-administered Kashmir, and the interface between China's Yunnan Province and neighbouring Myanmar. Building on extensive field work, he came to understand that remoteness and connectivity are not two independent features in these areas but are intertwined in many ways. He is investigating these dynamics adopting a comparative perspective, taking into account local histories as well as larger geo-political processes.

Apart from gaining insights into the role and position of remote Asian highlands in the world, this project is laying the groundwork for a better understanding of seemingly remote areas around the globe.

**Researcher:** Martin Saxer, Ludwig-Maximilian University Munich (Germany)

**ERC project:** Remoteness and Connectivity: Highland Asia in the World (Highland Connections)

**ERC funding:** Starting Grant 2014, €1.5 million (2015-2020)



At the crossroads in Sary Tash, Kyrgyzstan

## The third millennium surgeon: a robot with artificial intelligence

Tuesday 10 July | 15:15 - 16:30

Are you a living in a virtual environment? What you can see around you are high-resolution 3D-displays with magnified images, ergonomic consoles with touch-screens and joysticks that are moving interactive robotic arms, hands and fingers that are equipped with scalpels, scissors and blades. Believe it or not, you are not playing the latest manga videogame, in fact you see the sharp tiny nails of the robot softly getting into your body. The environment looks virtual but you are real: the real, scared patient undergoing a complex surgical operation. No worries: luckily, large incisions, bleeding, ugly scars, pain, long recovery time and overall complications are just nightmares of the past, thanks to the ultimate surgical robots.

The most advanced minimally-invasive robotic surgery is taking over the traditional open surgery, and is going to change the nature of surgery, forever. The nimble robotic arms that are tele-operated by the surgeon from a high-technology computer-controlled console are capable of complex procedures with unprecedented control and precision. The robotic arms and fingers can operate better than the most skilled and steadiest-hand surgeon and can perform highly-localized and selective procedures in hard-to-access areas, even with 360° rotations of the surgical tool. The “surgeon’s eyes” are cameras with bright lighting embedded in the robotic fingers, providing high-resolution 3D images that can be magnified on a display, and the “surgeon’s hand” movements are translated through the high-technology console into tiny and precise movements of the robotic hands. Meanwhile, the body is suffering from few quarter-inch incisions only.

Since 2000, more than 3 million patients worldwide have been operated by the “da Vinci Surgical System”, that is considered the pioneer of the surgical robots. Beside these success stories, there are many other research initiatives that are being pursued funded by the European Research Council and other funding schemes of the European Commission, a snapshot of which are highlighted in this session. The speakers will describe minimally-invasive robots for diagnostic applications, wearable robots for teleoperated surgery, new concepts for automatic robotic surgery, as well as micro-robots for precise drug delivery and personalized therapies.



**Telma Carvalho**  
*European Research Council*

Telma Carvalho is Research Programme Officer at the European Research Council Executive Agency being in charge of the coordination of the panel on Systems and Communication Engineering which focus on achieving significant advancements in photonics, micro - nanoelectronics, robotics and communication. She is a Materials Engineer by the Technical University of Lisbon and doctor in Engineering by the Catholic University of Leuven - KU Leuven. Before joining the European Commission, she was R&D Manager at a spin-off company of the KU Leuven charged of developing sensors and expert systems to assess the integrity of industrial components.



**Sir Alfred Cuschieri**  
**ERC grantee**  
*University of Dundee (UK)*

Sir Alfred Cuschieri is Professor of Surgery at the Scuola Superiore Sant’Anna in Pisa (Italy) and Chief Scientific Advisor to the Institute of Medical Science and Technology of the University of Dundee (UK). Within the framework of two ERC projects “*Colonic Disease Investigation by Robot-Hydro Colonoscopy*” (CODIR) and “*Compliant Actuation Robotic Platform for Flexible Endoscopy*” (CARPE), he has developed a novel Robotic Active Flexible Colonoscope.





### **Sanja Dogramadzi**

*University of West England Bristol (UK)*

Sanja Dogramadzi is leading the Robotic Engineering and Computing for Healthcare Centre at Bristol Robotics Laboratory (UK). Her research interests include design and control of surgical robots for minimally invasive fracture surgery and robot-assisted MIS, rehabilitation robots, physical assistance robots and safe and ethical human-robot interaction. Prof. Dogramadzi has more than 20 years of experience in healthcare-related robotics. She has led many research projects funded by UK research councils and the European Commission.



### **Paolo Fiorini**

**ERC grantee**

*University of Verona (Italy)*

Paolo Fiorini received his Master's Degree in Electronic Engineering from the University of Padova (Italy), an MSEE from the University of California at Irvine (USA), and a PhD in ME from UCLA (USA). From 1985 to 2000, he worked at the NASA Jet Propulsion Laboratory, California Institute of Technology. In 2001, he returned to Italy to the University of Verona where he is Full Professor and where he founded the ALTAIR robotics laboratory. His research focuses on teleoperation for surgery, space, and service robotics. He is an IEEE Fellow.



### **Luigi Manfredi**

*Institute for Medical Science and Technology, University of Dundee (UK)*

Luigi Manfredi is Senior Research Fellow at Institute of Medical Science and Technology of the University of Dundee (UK). He has worked with Prof. Alfred Cuschieri on the ERC projects CODIR and CARPE to develop the next generation of Robotic Active flexible Colonoscope and other flexible endoscopes, by using SMA wires actuators.



### **Bradley Nelson**

**ERC grantee**

*ETH Zürich – Swiss Federal Institute of Technology (Switzerland)*

Brad Nelson is Professor of Robotics and Intelligent Systems at ETH Zürich (Switzerland). His primary research focus is on micro and nanorobotics with emphasis on applications in biology and medicine. He obtained a PhD in Robotics from Carnegie Mellon University (USA) in 1995. He became an Assistant Professor at the University of Illinois at Chicago in 1995, then an Associate Professor at the University of Minnesota in 1998 before moving to Zürich in 2002.



## Microrobots for improved eye surgery

*With an aging population, Europe sees a rapid increase in the number of people affected by visual disorders requiring surgical intervention. Building on the recent advances in robotic assistance in surgery as well as in precisely targeted drug delivery therapies, Prof. Bradley Nelson has designed innovative microrobotics tools to overcome the particular difficulty of manual-performed eye surgery.*

Prof. Nelson is a specialist in the integration of microrobotics and nanomedicine. Funded by the ERC, he has developed new, wireless minimally invasive diagnostic and therapeutic microtechnologies with concrete applications for eye surgery. During his BOTMED project, he has used these microrobotic devices to pursue specific ophthalmic therapies, including the administration of drugs to the retina to treat AMD (age-related macular degeneration) and RVO (retinal vein occlusion), two major causes of vision loss around the world and for which there is no effective treatment. With his team, Prof. Nelson successfully performed animal trials on rabbits and started the first clinical trials on humans.

These novel microrobotics procedures could reduce the risks related to manual-performed eye surgery, result in less trauma and faster recovery times for the patients and enable new therapies that have not yet been conceived. Beyond ophthalmology, they clearly have the potential to be applied in many systems in the body - such as the digestive, the circulatory or the respiratory system. So far, three spin-off companies have benefited from the technology developed by BOTMED.

In 2016, Prof. Nelson has been awarded a second ERC grant to develop fundamental technologies required for the fabrication of intelligent soft microrobots for in vivo applications. This project is timing since the field of microrobotics has recently started to move towards soft microrobots, which are made of soft, deformable materials capable of sensing and autonomously responding to their environment to perform complex tasks.

**Researcher:** Bradley Nelson, ETH Zürich (Switzerland)

**ERC projects:** Microrobotics and Nanomedicine (BOTMED) + Soft Micro Robotics (SOMBOT)

**ERC funding:** Advanced Grant 2010, €2.5 million (2011-2016) + Advanced Grant 2016, €2.5 million (2017-2022)



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A microrobot docked in a retinal vein model

## Growing mini-organs on a petri dish: myth or reality

Wednesday 11 July | 13:30 - 14:45

Growing miniature versions of organs in a dish sounds like science-fiction. However advances in stem cell technology have made it possible to grow artificially masses of cells or tissues that resemble an organ - organoids. The recent development of organoids is a major technological breakthrough and the use of organoid culture models is already widespread in areas including organogenesis models, drug testing, tumor / disease / infection models, toxicity screening, personalized medicine and regenerative medicine / organ replacement.

During this session some of the leaders in the field will shed light on scientific advances on organoid technology and how they can be used as an in vitro model of human development and disease. Advantages, limitations and challenges faced with organoid cultures will be also discussed.



### **Mariam Benjdia**

*European Research Council*

Mariam Benjdia is a Research Programme Officer at the European Research Council Executive Agency (ERCEA). She obtained her PhD at the University of Tuebingen (Germany). She previously worked as Scientific Officer for the Bioenergy programme at the French Research Agency (ANR) and for the EU-funded Marie Skłodowska-Curie programme. In 2012, she joined the ERCEA as coordinator of the Cellular and Developmental Biology panel.



### **Juergen Knoblich**

**ERC grantee**

*Institute of Molecular Biotechnology (Austria)*

Juergen Knoblich is heading the Institute of Molecular Biotechnology in Vienna (Austria). He is a developmental neuroscientist studying human brain development and psychiatric disorders. His group has developed a method for growing human brain tissue in the lab. They can recapitulate human embryonic brain development during the first trimester and analyze the developmental defects leading to neurological disorders. His ERC project uses this method for genetic screening for neuro-developmental defects.



### **Elena Martínez**

**ERC grantee**

*Institute for Bioengineering of Catalonia (Spain)*

Elena Martínez holds a PhD in Physics by the University of Barcelona (Spain). After postdoctoral stages at the EPFL (Switzerland) and Imperial College (UK), she established at the Institute for Bioengineering of Catalonia (IBEC). Her research focus is the development of new systems that mimic 3D tissue microfeatures for biomimetic in vitro assays. She leads the COMIET project "Engineering complex intestinal epithelial tissue models", funded under the ERC Consolidator grant scheme.



### **Jens Puschhof**

*Royal Netherlands Academy of Arts and Sciences (Netherlands)*

Jens Puschhof graduated with an MSc from the University of Oxford and is currently working with Prof. Hans Clevers at the Hubrecht Institute in Utrecht (Netherlands). His research focuses on the implications of select microbes in colorectal cancer initiation and progression. He currently works to reconstitute parts of the gut microbiome in human organoids under the ERC Advanced grant Organoid - "Dissecting microbiome and immune interactions in human intestinal (cancer) organoids", led by Prof. Clevers.



## Growing intestinal organoids to open new research avenues in gut diseases

*Epithelial tissues cover all body surfaces and line most of our organs, internal cavities and passageways, including the digestive tract. Prof. Elena Martínez is engineering intestinal epithelial tissues that mimic the physiological characteristics of human intestinal tissue with the aim of advancing the in vitro modelling of diseases, the preclinical screening for drug efficacy and toxicity, and the understanding of organ development.*

Functional in vitro models of epithelial tissues are key elements in basic biological research, disease modelling, drug discovery and regenerative or personalised medicine. In the case of the small intestinal epithelium, functional in vitro models are needed to accurately predict the absorbance of drugs delivered orally.

Prof. Martínez applied an experimental approach combining microfabrication techniques, tissue engineering components and the self-organising characteristics of intestinal organoids to develop a new cell culture platform for intestinal epithelial tissues.

To date, the project team, funded by the ERC, has set up a strategy to fabricate micro 3D villi-like structures on very soft materials. The 3D model shows functional parameters that are closer to physiological tissue than conventional flat monolayer culture systems. In this, the researchers succeeded to 'open up' intestinal organoids which are 3D closed structures.

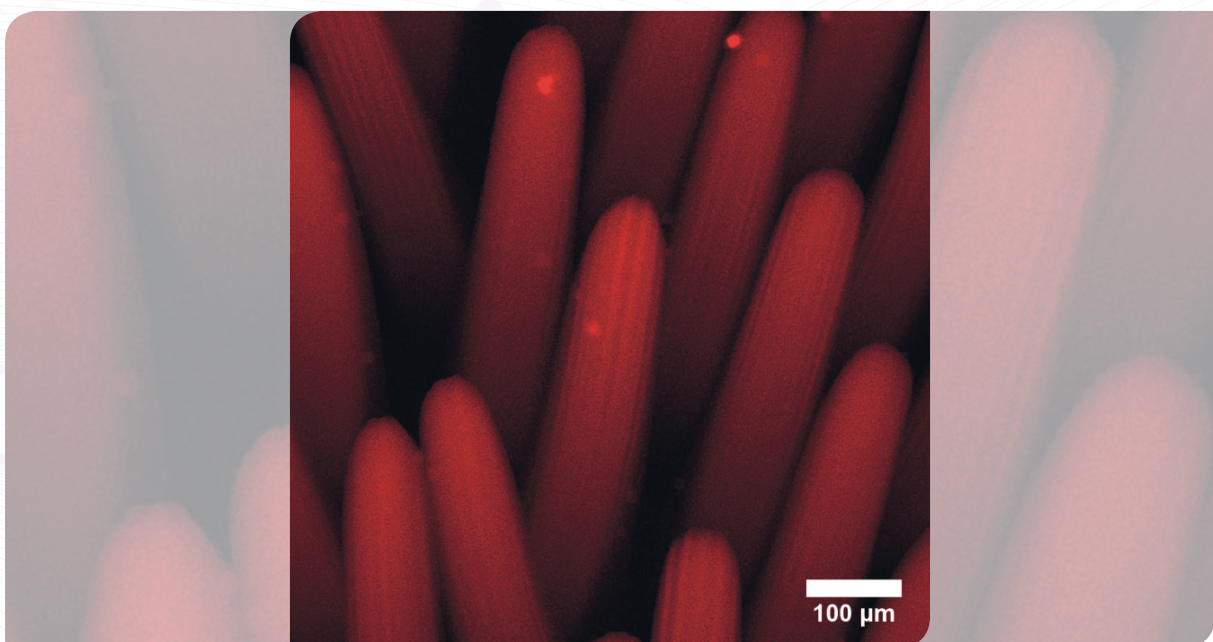
The most significant output of the COMIET project will be to demonstrate that engineering strategies can be successfully used to provide intestinal epithelial cells with physical and biochemical cues that guide their compartmentalisation, barrier formation and renewal as in vivo. "If this concept is successfully demonstrated, a similar approach could also be used to mimic other epithelial tissues with complex geometries such as kidney, skin or lungs" says Prof. Martínez.

Those involved in drug screening, drug absorption and toxicology could also benefit from a system that improves predictability of current assays. And patients will ultimately gain from the project outcomes, as the system can be used for personalised medicine strategies.

**Researcher:** Elena Martínez, Foundation Institute for Bioengineering of Catalonia (Spain)

**ERC project:** Engineering Complex Intestinal Epithelial Tissue Models (COMIET)

**ERC funding:** Consolidator Grant 2014, €2 million (2015-2020)



© Courtesy of M.Sc. Gizem Altay (IBEC).

Hydrogel microstructures mimicking villi of the small intestinal tissue. They have been fabricated of PEGDA polymer and functionalized with labelled protein (in red)



## Clean Flights - Blue Skies

Wednesday 11 July | 13:30 - 14:45

*Ever wondered what is left behind when we cross the skies?*

If global aviation was a country, it would rank in the top 10 emitters. With flying being a fast and comfortable way of commuting, the demand for aviation will constantly increase from 9 million flights in 2015 up to an estimated 15.4 million flights in 2035, reflecting not only population and economic growth, but also the societal impact of connectivity across the globe. The continuous efforts by industry to reduce the environmental footprint of aviation have resulted in the manufacture of efficient and quieter aircrafts, such as the Airbus A380, and have achieved the fuel efficiency per passenger of a small car. Nevertheless, the expansion of the sector is expected to lead to 70% more emissions in 2020 compared to the 2005 levels.

*What happens in the next 20 years?*

Climate change will also impact aviation, due to more severe conditions causing more disruptions and turbulence. The stakeholders set ambitious goals for carbon-neutral development, increased fuel efficiency and aircraft resilience. With the global fleet planned to be largely renewed in the next two decades, there is a golden opportunity to minimise the environmental impact of aviation by changing the game through science and innovation.

*ECO-FAST-SAFE*

'Come fly with ERC' exploring ground-breaking ERC-funded projects that can tackle the challenges in aviation from different angles: i) improving the efficiency of turbine engines, while decreasing emissions and damages by predicting and designing out combustion instabilities and ii) developing multifunctional materials that mimic biological systems and actively morph the wings providing improved control and strength. These inspiring techniques aim to bridge industrial practice and scientific breakthroughs for engines and shape of new aircrafts. If supported by the stakeholders they could make step changes in aviation allowing us to travel safer and faster and take a deep breath of fresh air in the future.



**Giulia Lanzara**

**ERC grantee**

*Roma Tre University (Italy)*

Giulia Lanzara is Assistant Professor at Roma Tre University (Italy), and Director of the Multifunctional Materials Laboratory. She previously spent six years at the Department of Aeronautics and Astronautics at Stanford University (USA). She is specialized in the development of novel morphing materials taking inspiration from nature. This is also the topic of her ERC Starting Grant, awarded in 2012. This research will revolutionize aircrafts design and flights concept.



**Aimee Morgans**

**ERC grantee**

*Imperial College London (UK)*

Aimee Morgans is Professor of Thermofluids at Imperial College London. She joined Imperial as a Lecturer (Assistant Professor) in 2007, progressing to full Professor in 2017. She has PhD, MEng and BA (starred First) degrees in Engineering, all from Cambridge University. Her main research topic is thermoacoustic instability - the key barrier to low NOx aero-engines and power gas turbines. She is a recent holder of an ERC Starting Grant (ACOULOMODE 2013-17) and a current holder of an ERC Consolidator Grant (AFIRMATIVE 2018-23), both on thermoacoustic instability.



## **George Symeonidis**

### ***European Research Council***

George Symeonidis has an Aerospace Engineering background - B.Sc. - PhD Univ. Bristol (UK); Diploma & PhD work von Karman Institute, VKI (Belgium). He is Scientific Officer at the ERC Executive Agency working with the Systems and Communication Engineering and Products and Processes Engineering Panels. He has previous research experience in aerothermodynamics and hypersonics (VKI & ESA/ESTEC), industrial experience in aircraft and aero-engine maintenance/repair/overhaul (Hellenic Aerospace Industry), and teaching experience in aerodynamics/gas dynamics/flight mechanics (Univs. Thessaly & Patras, Greece).



## **Laurent Thomasson**

### ***Airbus Group (France)***

Laurent Thomasson is Head of Airbus Defence & Space Innovation and Incubation since 2016. He is responsible for fostering the emergence of out-of-the-box and disruptive concepts, evaluating their sustainability for inclusion in the future portfolio. From 2007 to 2016, he was Head of Telecom R&D and Marketing in the Space Systems Programme Line of Airbus. Before he held various management positions in projects and research activities related to telecoms, radar and navigation space-based solutions. He graduated from ENST, Paris, a French leading Engineering School in the field of Telecoms Technologies.



## Mimicking nature to create new super materials

*Nature is a major source of inspiration for scientists. ERC grantee Giulia Lanzara is one of them. The unique sensing and shaping abilities of birds, dolphins and other living creatures inspired her to engineer novel multifunctional materials which could make a difference in a wide variety of industrial fields.*

There are many examples of animals that use their senses to heighten their abilities or that adapt their shape in response to external stimuli. Birds can control their wing configuration, even their feathers, to better adapt to flight conditions. Dolphins shape their skin to reduce the pressure and friction of water and swim faster. Such examples could be useful for the development of so-called morphing materials - materials that can change shape and still return to their initial form. There has been extensive research into morphing materials, but, so far, currently available ones are lacking sensitivity, adaptability and robustness, with high production prices.

Supported by the ERC, Dr Lanzara and her team propose an ambitious approach of integrating materials with non-invasive light-weight sensors and electronic networks to create innovative composites. These will be able to sense and adapt to their environment. Their research has already shown promising results with the design of innovative smart components and materials that can be used individually or in conjunction to deliver unprecedented material functionalities. For instance, electrospun miniaturized distributed artificial muscles and nanostructured sensors are embedded into a specially designed carbon fiber composite that is capable to autonomously change shape, rigidity and damping in response to thermal stimuli. Self-activating morphing cellular coatings and nanocomposite thin films, have also been implemented for highly insulating and damping purposes. These smart materials could be used, for example, in aircraft wings, providing improved, efficiency, control and strength in order to save fuel, but also ensuring quieter landings and reducing turbulence.

The team hopes to pave the way towards a new generation of bio-inspired materials and open new research paths with the potential to revolutionize the design, testing and production in areas such as aeronautics, automotive, electronics and medical devices.

**Researcher:** Giulia Lanzara, Roma Tre University (Italy)

**ERC project:** Morphing Locally and Globally Structures with Multiscale Intelligence by Mimicking Nature (MORPHOSIS)

**ERC funding:** Starting Grant 2012, €1.6 million (2013-2018)



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## Women in science: let's change the world!

Wednesday 11 July | 13:30 - 14:45

Which affirmative actions could reduce the underrepresentation of women in different fields of science? In today's changing world we need to tap the potential of every talented mind to develop solutions for a sustainable future. We need inspirational narratives that provide tools and ideas to change the world. This panel will focus on assertive actions that generate changes. We will present a range of approaches, measures and policies that have been successful in promoting women participation and advancement in the research area. We will examine the place of women in science. We will argue that equal opportunities should not be a 'women's issue' and will present choices and structures that promote or impede equal opportunities for men and consequently for women. Finally we will present various successful examples of the importance of speaking up and taking action for both women and men.



**Claudia Alves de Jesus-Rydin**

*European Research Council*

Claudia Alves de Jesus-Rydin is a Geotechnical Engineer, graduated from the New University of Lisbon. In 1999, she moved to Denmark as Marie Curie Research Fellow working in organic contamination of soils. After working as a senior consultant in both Denmark and Sweden for several years, in 2009 Claudia moved to Brussels where she has been the coordinator of Earth System Science research area of the ERC. She is also the coordinator of the Gender Activity Group at the ERCEA and organiser of various gender equality sessions in international events.



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**Jean-Pierre Bourguignon**

*President of the European Research Council*

Jean-Pierre Bourguignon is the President of the ERC since 2014. Until 2013 he was the director of the Institut des Hautes Études Scientifiques (IHES) in Paris. A mathematician by training, he spent his whole career as a fellow of the Centre National de la Recherche Scientifique. From 1990 to 1992, he was President of the Société Mathématique de France and President of the European Mathematical Society from 1995 to 1998.



**Daniel Conley**

*Lund University (Sweden)*

Daniel Conley is Professor in Biogeochemistry in the Department of Geology, Lund University (Sweden). His research focuses on perturbation of nutrient cycles by human activities and the responses of marine ecosystems to changes in human impact and climate. He studies the silicon cycle in the oceans through geological time, the harmful effects of bottom water hypoxia, and the role of unconscious bias in science.



**Véronique Garçon**

*CNRS-LEGOS (France)*

Véronique Garçon is a senior scientist at CNRS-LEGOS in Toulouse (France). She is currently acting as ex-officio in the SSC of the Surface Ocean Lower Atmosphere Study Global Research Project. Her research interests aim towards understanding and quantifying processes governing fluxes of carbon, oxygen and associated biogeochemical elements in the ocean, using in situ and satellite observations, and coupled physical biogeochemical models. She is a member of the Global Ocean Oxygen Network from IOC-UNESCO and of the IOCCP SSG. In 2017 she was awarded the IOC-UNESCO Anton Bruun Medal.



## **Alberto Montanari**

*University of Bologna (Italy)*

Alberto Montanari is full Professor of Hydrology and Head of the Department DICAM at the University of Bologna (Italy). He is President of the European Geosciences Union (EGU). From 2013 to 2017 he was Editor in Chief of Water Resources Research. From 2009 to 2017 he chaired the Union Awards and Medals Committee of EGU. In 2017 he was awarded the Union Service Award by EGU and was elected Fellow of the American Geophysical Union (AGU). In 2018 he was awarded the Henry Darcy Medal by EGU.



## European Grants for brilliant minds from across the world

Thursday 12 July | 17:00 - 18:15

Under the EU's H2020, three funding programmes offer funding to researchers from all walks of life to advance their ideas, showing that Europe supports the best minds all through their careers. The specialised speakers will take you on a journey through the exciting opportunities offered by the European Research Council (ERC), Marie Skłodowska-Curie Actions (MSCA) and Erasmus+. The ERC funds "frontier" research together with the MSCA focus on advancing "excellent" science, whereas Erasmus+ presents study exploration opportunities. The following questions will steer the interactive, open-to-questions debate: What concrete support are the ERC, MSCA and Erasmus+ providing to researchers? How does the Erasmus+ application process work? How is funding made available to ensure that women and men have equal opportunities to carry out excellent research? Do applicants from so-called "low performing countries" have the same likelihood of receiving ERC and MSCA grants? And finally, where can one find the necessary information? The ERC and MSCA are at the forefront of best practice with regard to gender balance and "Widening" participation. Both strive to ensure that women and men are equally able to perform excellent research by identifying and removing any gender bias in the granting process. "Widening" (Central and Eastern Europe) countries tend to apply less and coordinate fewer projects. To tackle this issue, in 2018 the MSCA for the first time, allows specific support by an earmarked budget, to undertake fellowships in a "widening" country. For its part, the ERC has a dedicated Working Group to encourage "low performing countries" to nurture scientific talent more effectively. A testimonial of a current ERC grantee, former MSCA fellow and an Erasmus student will be given by Prof. Eva Hevia. The EURAXESS joint initiative of the European Commission, a gateway bridging the gap between the research community and the job market, will also be presented.



### Sophie Beernaerts

*European Commission, Directorate-General for Education, Youth, Sport and Culture*

Sophie Beernaerts is the Head of Unit, in the European Commission, in charge of the Marie Skłodowska-Curie Actions that provide grants for researchers and encourage transnational, intersectoral and interdisciplinary mobility. She had previously been responsible for supporting school education policy development in the EU Member States and was in charge of the implementation of the Erasmus+ programme in the school, vocational and adult education sectors. She has also been in charge of the Europe for Citizens Programme. She graduated from Solvay Business School and holds a postgraduate degree in European Economics from the University of Brussels.



### Eva Hevia ERC grantee

*University of Strathclyde (UK)*

Eva Hevia is currently a Professor of Inorganic Chemistry at the University of Strathclyde (UK). Research in her group focuses on developing sustainable and greener methods for chemical synthesis using organometallic reagents. She received her MSci degree in Chemistry and her PhD from the University of Oviedo (Spain). With more than 120 peer-reviewed papers, her research has been recognised with several prestigious prizes including the 2016 SRUK Emerging Talent Award, which honours the most promising Spanish scientist in the UK under 40, and the 2017 RSC Corday-Morgan Prize awarded to the most meritorious contributions to Chemistry in the UK.





### **Angela Liberatore**

*European Research Council*

Angela Liberatore is Head of Unit for Social Sciences and Humanities at the European Research Council Executive Agency. Previously she worked in DG RTD at the European Commission. She participated in the work for the White Paper on European Governance of the European Commission. Her publications include 'Climate Change, Security and Peace: The Role of the EU'; 'Balancing security and democracy. Biometric politics in the European Union'; 'Democratising Expertise, Expertising Democracy'; 'The Management of Uncertainty: Learning from Chernobyl'. She holds a PhD in Political and Social Sciences from the European University Institute.



### **Agata Stasiak**

*Research Executive Agency*

Agata Stasiak graduated from Warsaw School of Economics (Poland) and holds MAs in EU Public Administration as well in Marketing and Management. Before joining the European Commission in 2003, she worked for the Polish Academy of Sciences, Institute of Biochemistry and Biophysics. From 2011 until 2016 she worked in the Communication Unit of DG Research and Innovation. Later on she joined the Research Executive Agency, as Head of Sector for Communication.



### **Graham Wilkie**

*European Commission, Directorate-General for Education, Youth, Sport and Culture*

Graham Wilkie has worked for the European Commission since 1997. Firstly in the Directorate General for Research, managing medical research programmes, then in Education and Culture where is currently Deputy Head in the International Cooperation team. He is a medical researcher by training, and got his PhD in Neuroscience from the University of Bath (UK) in 1994. He then worked as a postdoc before joining the UK Government in London to work on European research policy, before transferring to the European Commission in Brussels.

## EU grants: paving the way for young researchers

*Originally from Gijón (Spain), Prof. Eva Hevia is Professor of Inorganic Chemistry at the University of Strathclyde, in Glasgow (UK). First an Erasmus student, then a recipient of both Marie Skłodowska-Curie and ERC grants, she believes that each of these three EU funding schemes has represented a milestone at different stages of her career and has paved the future of her research.*

*"I received both my MSci degree in Chemistry and my PhD degree from the Universidad de Oviedo (Spain). From October 1998 to March 1999 I visited the University of Bristol (UK) as an **Erasmus** student. During this stay, I had my first chance to work in a research laboratory and I became truly fascinated with organometallic chemistry. This experience motivated me to enrol in a PhD programme in this area in Spain, my home country.*

*By the time I finished my PhD studies, I had no doubts that my future would lie in research and academia. Aiming to broaden my knowledge, I spent three years, from 2004 to 2006, at the University of Strathclyde (UK) working on metal chemistry in the group of Robert Mulvey, thanks to a **Marie Skłodowska-Curie** grant. This was a particularly prolific and exciting time, where my fellowship gave me the opportunity to develop some of my own ideas and publish my first papers as corresponding author. After three-years at Strathclyde working as a Marie Curie Fellow, in 2006 I took up a Royal Society University Research Fellowship there, where I subsequently was promoted to Senior Lecturer in 2010 and then Reader in 2011.*

*I established my own research group in 2006, working in the evolving area of polar organometallic chemistry. In 2011, I was awarded an **ERC Starting Grant** which provided me with a critical mass of resources to tackle some of the main challenges facing this area of research. Results obtained from this project were instrumental in my fast promotion to Professor in 2013 at the age of 36. To date the progresses made by my ERC team have been recognised with a large string of publications and several research awards. Research in my group specialises in organometallic chemistry, which is used in the manufacture of agrochemicals, pharmaceuticals and other medicines, perfumes or plastics. Some of our recent work includes the advancement of new methods that replace the use of toxic organic solvents in this chemistry by more sustainable and biorenewable systems."*

**Researcher:** Eva Hevia, University of Strathclyde (UK)

**ERC project:** Tailoring Mixed-Metal Chemistry for Frontier Synthetic and Catalytic Applications (MixMetApps)

**ERC funding:** Starting Grant 2011, €1.5 million (2011-2017)





## The impact of atmospheric particles on climate and health

Friday 13 July | 10:15 - 11:30

Our atmosphere is composed of gases, mainly nitrogen (N<sub>2</sub>) and oxygen (O<sub>2</sub>), and in lesser quantities argon (Ar), carbon dioxide (CO<sub>2</sub>) and many others. The atmosphere also frequently contains water (H<sub>2</sub>O) in its gaseous form. In addition to gases, the atmosphere consists of a mixture of solid and liquid particles suspended in the air, so-called aerosols. Aerosols are of central importance to atmospheric chemistry and physics, as they interact with the biosphere and climate. In polluted atmospheres, they contain toxic components with profound impacts on public health, since exposure to such particles causes stress that affects our lungs, heart and potentially every system in our bodies. It is estimated that air pollution in cities and rural areas causes more than 3 million premature deaths worldwide. The panel will showcase innovative approaches - from laboratory experiments, ground-based, airborne and satellite observations to numerical modelling - in order to better understand the drivers, mechanisms and impact of the atmospheric constituents on the Earth's climate and on human health. This research sheds light on interactions at different physical scales (from molecules and tiny particles to clouds and large-scale weather systems), and at human scales covering the urban environment up to remote ecosystems and global biosphere-atmosphere interactions.



### **Claudia Alves de Jesus-Rydin**

*European Research Council*

Claudia Alves de Jesus-Rydin is a Geotechnical Engineer, graduated from the New University of Lisbon. In 1999, she moved to Denmark as Marie Curie Research Fellow working in organic contamination of soils. After working as a senior consultant in both Denmark and Sweden for several years, in 2009 Claudia moved to Brussels where she has been the coordinator of Earth System Science research area of the ERC. She is also the coordinator of the Gender Activity Group at the ERCEA and organiser of various gender equality sessions in international events.



### **Markus Kalberer**

**ERC grantee**

*University of Cambridge (UK)*

Markus Kalberer is Professor of Atmospheric Science at the Department of Chemistry, University of Cambridge. He did his undergraduate and graduate studies at ETH Zürich and the University of Bern (Switzerland). His research interests are in atmospheric science. During his ERC grant he developed new mass spectrometry techniques to characterise particle composition and the first field-portable instrument to quantify aerosol oxidative properties, a key parameter to assess air pollution toxicity.



### **Athanasios Nenes**

**ERC grantee**

*Foundation for Research and Technology Hellas (Greece)*

Athanasios Nenes is Professor at Georgia Tech (USA) & Research Affiliate at Foundation for Research and Technology Hellas, National Observatory of Athens (Greece). His research focuses on atmospheric aerosols, their impacts on air quality, ecosystems, clouds and climate. Author of 250 manuscripts, developer of the ISORROPIA thermodynamics codes, co-inventor of the Continuous Flow Streamwise Thermal Gradient CCN chamber. He was awarded an ERC grant to study the impact of biomass burning on climate and health (PyroTRACH).





**Ilona Riipinen**  
**ERC grantee**

*Stockholm University (Sweden)*

Ilona Riipinen is a Professor of atmospheric science at Stockholm University (Sweden). Her work focuses on understanding the atmospheric processes governing air quality and global climate. Her ERC starting grant project ATMOGAIN (2011-2016) focused on understanding mass transfer processes at atmospheric gas-liquid interfaces. The outcomes of ATMOGAIN addressed some of the major unknowns in understanding the behavior and impacts of atmospheric aerosol particles, and eventually the natural vs. human influence on atmospheric composition.



**Bernadett Weinzierl**  
**ERC grantee**

*Vienna University (Austria)*

Bernadett Weinzierl is an atmospheric and aerosol physicist. She is the Head of the Aerosol Physics and Environmental Physics Research Group at the Faculty of Physics of the University of Vienna (Austria). She obtained her PhD from the Ludwig-Maximilians-Universität (LMU) München (Germany) in 2008. Previously, she held several research posts in Germany and the USA.

## Watching aerosols closely

*Aerosols are tiny particles suspended in the air. From natural or man-made sources which are critically important to the global climate system. Prof. Bernadett Weinzierl, a meteorologist and aerosol scientist, looks at the atmosphere, aiming to understand what happens in the upper layers of the sky.*

Both natural and man-made particles contribute to the global aerosol load and have an impact on the environment. Overall, aerosols have a cooling effect because they scatter the sunlight. They can also change the properties of clouds, making them appear brighter in a polluted environment and changing their lifespan. Some aerosols like mineral dust and black carbon (BC) not only scatter but also absorb sunlight, which can lead to a warming of the atmosphere, with important implications for weather and climate.

During their lifetime, aerosols from different sources move through the atmosphere, they mix with each other and can have their physical and chemical properties modified. Prof. Weinzierl studies these mixtures, in particular those of mineral dust and black carbon – the latter has been identified as the second or third contributor to current global warming after CO<sub>2</sub>. She identifies the absorption levels of each aerosol type and studies potential links between the presence of absorbing particles and aerosol layer lifetime. As there is only sparse data on these particles, in all their diversity, at different altitudes and latitudes, Prof. Weinzierl flies through the aerosol layers and has developed instrumentation to directly observe and measure their characteristics in different environments.

The analysis of the collected dataset will help to reduce existing uncertainties in the understanding of absorbing aerosols. It will also provide important input towards evidence-based policy-making in the field of climate change.

**Researcher:** Bernadett Weinzierl, University of Vienna (Austria)

**ERC project:** Absorbing aerosol layers in a changing climate: ageing, lifetime and dynamics (A-LIFE)

**ERC funding:** Starting Grant 2014, €1.9 million (2015-2020)



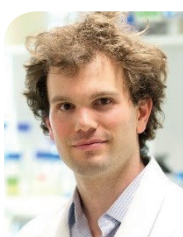
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## Challenges and Promises of Synthetic biology

Friday 13 July | 13:30 - 14:45

Synthetic biology is a broad and very interdisciplinary area of research that has experienced notable advances since the years 2000's when the first genetic switch was demonstrated in E. Coli. The aim of synthetic biology is to build artificial systems for novel applications in biotechnology, medicine, engineering, and provides answers to long standing questions in biology. This area of research is highly interdisciplinary because it combines disciplines such as biotechnology, molecular biology, genetic and chemical engineering, modelling, systems and evolutionary biology. The focus on biotechnological and medical applications makes it a very timely topic of discussion including the societal acceptance of such technology as it potentially touches closely on many aspects of our daily life such as drugs development, energy production, the creation of artificial DNA and forms of life. To date, the European Research Council (ERC) has supported around 203 projects in synthetic biology related research, representing around 380 million EUR invested in these research area.



**David Bikard**  
ERC grantee

*Institut Pasteur (France)*

David Bikard obtained a degree in Engineering from AgroParisTech and a PhD from Paris Diderot University for his work performed at the Institut Pasteur (France). He then joined the laboratory of Luciano Marraffini at the Rockefeller University to work on CRISPR systems. In 2014, he started his own group at the Institut Pasteur to work on CRISPR systems and their application to better understand and fight pathogenic bacteria. His research is supported by an ERC grant.



**Maria Lluch**

*Centre for Genomic Regulation (Spain)*

Maria Lluch obtained her PhD at the IBB, in a lab of molecular biology and microbiology. In 2014, she became staff scientist in Prof. Luis Serrano's lab heading the Mycoplasma team which developed the necessary tools for large scale-genome engineering of M. pneumoniae. In parallel with the Systems Biology line of research, she also manages a team that focuses on synthetic biology, having the goal of engineering M. pneumoniae to treat human lung diseases. She works with Prof. Serrano on the ERC project Mycochassis.



**Sarah O'Connor**  
ERC grantee

*John Innes Centre (UK)*

Sarah O'Connor has been a Professor and Project Leader in Biological Chemistry at the John Innes Centre (UK) since 2011. Her research interests focus on medicinally active natural products from plants, with a particular interest in alkaloids. In her ERC-funded work, her group takes a broad approach to understanding these plant biosynthetic pathways, with the ultimate goal of harnessing the medicinal activity of these plant-derived molecules.



**Nikolai Windbichler**  
ERC grantee

*Imperial College London (UK)*

Nikolai Windbichler obtained his PhD from the University of Vienna (Austria) and moved to Imperial College (UK) in 2006 to develop genetic control technologies for the malaria mosquito. This resulted in the successful demonstration of the first gene drive system - a finding that has kick-started this research field. His research group, funded by the ERC, the BBSRC and the B&MGF, seeks to bring this technology to the field and develop synthetic biology tools for engineering genomes and pan-genomes with precision.



## Putting the CRISPR back in bacteria

*CRISPR is a widely used molecular biology tool exploiting an immune process discovered in bacteria. Dr David Bikard studies CRISPR in bacterial cells, in conjunction with different DNA repair systems, to create even newer tools. He hopes to gain insight into bacterial genetics, and develop increasingly effective medical treatments.*

In 2015, CRISPR, a tool that allows for the “editing” of genes in target cells, was elected “Scientific Discovery of the Year”. Undoubtedly, it has contributed greatly to fields ranging from medical microbiology to crop science. CRISPR systems contain programmable DNA scissors, known as Cas proteins, that can be used to cut specific target genes. The DNA repair systems of eukaryotic cells – cells like ours or like those of animals and plants – can then be used to repair the break, allowing for the incorporation of precise modifications. Originally though, CRISPR evolved as a form of immunity to capture and destroy invasive DNA, such as that of viruses, in bacteria and other unicellular organisms.

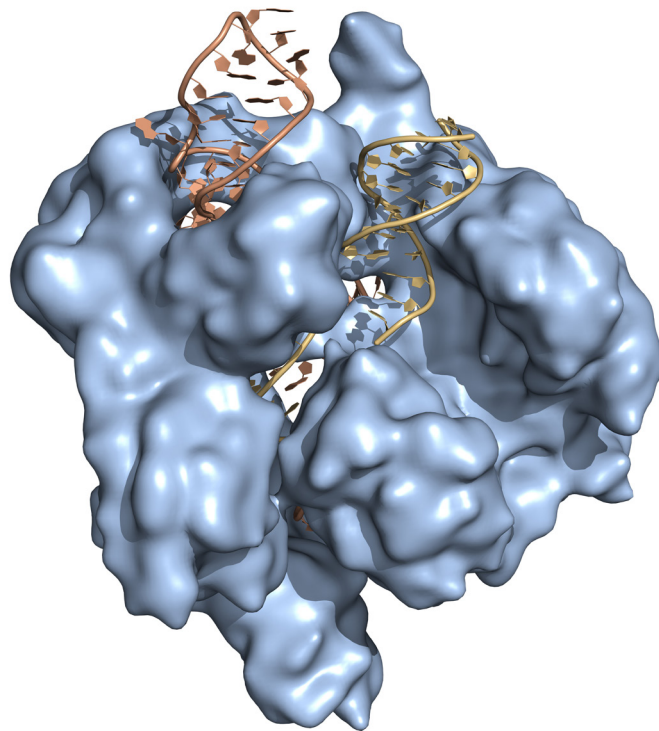
Funded by the ERC, Dr Bikard studies CRISPR in the bacterial cells where it all began. In the natural CRISPR immune response, to mend invasive DNA which has been cut out would be rather counter-productive. Bacteria do possess other repair systems though, pushing Dr Bikard to investigate them in conjunction to CRISPR. This will allow him to develop new, efficient tools for bacterial gene editing, thanks to which he hopes to be able to study bacterial genomes on a scale never achieved before.

Dr Bikard’s work could have widespread repercussions. A thorough knowledge of bacterial genetics will help our arms race for better antibiotics, and our fight against deadlier, more resistant pathogens. He is co-founder of the biotech company Eligo Biosciences, where this knowledge will be put to use to develop powerful tools against infection, including potential solutions to poorly understood gut syndromes and other personalised treatments.

**Researcher:** David Bikard, Institut Pasteur (France)

**ERC project:** Study of the interplay between CRISPR interference and DNA repair pathways towards the development of novel CRISPR tools (CRISPAIR)

**ERC funding:** Starting Grant 2015, €1.5 million (2016-2021)



The CRISPR/Cas9 genome editing/engineering system. Simplified surface model of Cas9, DNA in yellow, RNA in orange.



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Jean-Pierre Bourguignon  
ERC President and Chair of its Scientific Council



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