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THE PRESIDENT EDITORIAL L'ÉDITO DU PRÉSIDENT

The year 2016, in continuity with the two previous years, confirmed the increase of the activities of the STUDIUM Loire Valley Institute for Advanced Studies. The implementation of four Ambition Research and Development 2020 programmes, the entry of its SMART LOIRE VALLEY FELLOWSHIP PROGRAMME in the Marie Skłodowska-Curie Actions of the European Union, the numerous positive interactions with its partners and the dynamism of its team are the markers of this year 2016.

Our ambition remains to contribute to the international exposure of research conducted in the region Centre-Val de Loire, international scientific exchanges, the strengthening of human capital in the region and the development of the territory. A real attraction and visibility tool for research in the region Centre-Val de Loire, LE STUDIUM's annual call for applications has received sixty applications (compared with around twenty in previous years). Hundreds of international researchers have been welcomed this year, for stays lasting a few days (Conference, Workshop, Summer School), a week (Consortium) or from several months to the whole year (Fellowship, Chair, Professorship). In residence in 2016 at the University of Orléans, University François-Rabelais of Tours, INSA Centre Val de Loire, CNRS, INRA, CEA and Inserm, 28 of these researchers found, as result of the environment created by LE STUDIUM, favourable conditions for the success of their project, and more broadly to the enhancement of their stay in the region Centre-Val de Loire.

In order to highlight the work carried out by the regional scientific community, LE STUDIUM has again chosen to describe in this scientific report all the research activities developed by these researchers during their stay. It is important to account for the richness of their fellowship and how the various instruments proposed by LE STUDIUM contribute to it. We were attentive to report the quality of the environment offered to these researchers by our various member organisations in the region Centre Val-de-Loire and we applaud this collaborative space that we are creating together at the meeting point between fundamental research and innovation and which bring concrete scientific and socio-economic benefits to our territory.

For this year 2016, I would like to thank again the commitment of the Centre-Val de Loire Regional Council, the Agglo Orléans, the Loiret Department all our contributing members and the European Union through the European Regional Development Funds and the H2020 COFUND Marie-Skłodowska-Curie programme. I am also grateful to the entire LE STUDIUM team both at the Orléans and Tours sites (Professor Nicola Fazzalari, Scientific Director, Sophie Gabillet, General Secretary, Dr Aurélien Montagu, Scientific Relations Manager, Marie-Frédérique Pellerin, Vincent Godard, Maurine Villiers and Amélie Schneuwly and Ludovic Michel respectively from the Universities of Orléans and Tours)) for the investment and quality of work.

My new position as President of the University of Orléans since the summer of 2016 obliges me to leave my position of president of LE STUDIUM during the Spring 2017. From now on I am registering as a faithful partner who will endeavor to broaden and strengthen the collaborative space that unites LE STUDIUM with the University of Orléans and its regional partners.

I renew to our members, partners and donors, my sincere thanks for their trust and commitment to us.

Professor Ary Bruand, President

L'année 2016, dans la continuité des deux exercices précédents, a confirmé l'accroissement des activités du STUDIUM Loire Valley Institute for Advanced Studies. La mise en œuvre de quatre programmes Ambition Recherche et Développement 2020, l'entrée de son Programme Général SMART LOIRE VALLEY FELLOWSHIP PROGRAMME dans les Actions Marie Skłodowska-Curie de l'Union Européenne, son dynamisme reconnu et les interactions menées auprès des différents acteurs par une équipe impliquée sont les points marqueurs de cette année 2016.

Notre ambition demeure de contribuer au rayonnement à l'international des recherches conduites en région Centre-Val de Loire, aux échanges scientifiques internationaux, au renforcement du capital humain en région ainsi qu'au développement du territoire. Véritable outil d'attractivité et de visibilité pour la recherche en région Centre-Val de Loire, l'appel à candidatures annuel du STUDIUM a reçu soixante candidatures (contre une vingtaine les années précédentes). Chaque année LE STUDIUM accueille plus de deux cents chercheurs internationaux au travers toutes les disciplines, pour des séjours d'une durée de quelques jours (Workshop, Conférence, Summer School), d'une semaine (Consortium), ou encore de plusieurs mois à l'année entière (Fellowship, Chair, Professorship). En résidence en 2016 à l'Université d'Orléans, l'Université François-Rabelais de Tours, à l'INSA Centre Val de Loire, au CNRS, à l'INRA, au CEA et à l'Inserm, vingt-huit de ces chercheurs ont trouvé, grâce à l'environnement créé par LE STUDIUM, des conditions favorables à la réussite de leur projet, et plus largement à la valorisation de leur séjour en région Centre-Val de Loire.

Afin de mettre en lumière les travaux menés par la communauté scientifique régionale, LE STUDIUM a fait à nouveau le choix de décrire dans ce rapport scientifique l'ensemble des activités de recherche développées par ces chercheurs au cours de leur séjour. Il est important de rendre compte de la richesse de tels accueils et de la façon dont les différents instruments proposés par LE STUDIUM y contribuent. Nous avons été attentifs à faire état de la qualité de l'environnement offert à ces chercheurs par nos différentes organisations membres en région Centre Val-de-Loire et nous nous félicitons de cet espace collaboratif que nous créons ensemble et qui se révèle porteur d'excellentes retombées scientifiques et socio-économiques pour notre territoire, à la rencontre entre recherche fondamentale et innovation.

Pour cette année 2016, je tiens à remercier à nouveau l'engagement du Conseil Régional Centre-Val de Loire, du Département du Loiret, de l'Agglo Orléans, tous nos partenaires et membres, et le soutien de l'Union Européenne au travers des Fonds Européen de Développement Régional et du programme H2020 COFUND Marie-Skłodowska Curie, mais aussi l'investissement et la qualité du travail accompli par l'ensemble de l'équipe du STUDIUM tant sur les sites d'Orléans que de Tours par le Professeur Nicola Fazzalari, Directeur Scientifique, Sophie Gabillet, Secrétaire Générale, le Docteur Aurélien Montagu, Chargé de relations scientifiques, nos collaborateurs Marie-Frédérique Pellerin, Vincent Godard, Maurine Villiers ainsi qu'Amélie Schneuwly et Ludovic Michel respectivement des Universités d'Orléans et de Tours. Mes nouvelles fonctions de Président de l'Université d'Orléans depuis l'été 2016 m'obligent à quitter ma position de président du STUDIUM au Printemps 2017. Dès lors je m'inscris comme un fidèle partenaire qui s'efforcera d'élargir et de renforcer l'espace collaboratif qui unit LE STUDIUM à l'Université d'Orléans et ses partenaires régionaux.

Je renouvelle à nos membres, partenaires et bailleurs, mes remerciements les plus sincères pour la confiance accordée et leur engagement à nos côtés.

Professeur Ary Bruand, Président



SCIENTIFIC VISION AND SURROUNDINGS

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In 2016, LE STUDIUM Loire Valley Institute for Advanced Studies experienced a new boost in its activities with the start of several new programmes. The focus of its mission remains to build the human capacity for research and scientific knowledge to foster socioeconomic development and innovation. As a matter of fact, LE STUDIUM has the expertise to attract, manage and grow a flow of global research exchanges, create new scientific value chains, and contribute to the emergence of innovative, collaborative research and enterprise activity. The impact of new knowledge on the economy is incremental, but the cumulative effect of these changes is substantial.

The European Union Horizon 2020 COFUND grant awarded in 2015 in the category of the Marie Skłodowska-Curie Actions started in November 2015. As planned, it now enables LE STUDIUM to select and attract an increased number of experienced research fellows to the region Centre-Val de Loire under its Smart Loire Valley Fellowship Programme (SLV). This award brings a five-year co-financing to the initial support provided by the Regional Council of Centre-Val de Loire and brings substantial benefits to all the laboratories of LE STUDIUM members.

In June 2016, LE STUDIUM Scientific Council reviewed sixty applications and recommended a total of fifteen awards, including one Research Professorship, twelve Fellowships and two Consortia. Other recruitments were conducted in the framework of the ARD 2020 specialization programmes initiated by the Region Centre-Val de Loire in which LE STUDIUM is a key partner for the international dynamic and scientific events.

This past year, LE STUDIUM has attracted and welcomed a total of twenty eight international researchers from thirteen countries, an increase of 22% over last year. These awards were across diverse disciplines from the social sciences, natural sciences and engineering at laboratories located in Orléans, Tours, Bourges and Blois.

The format of the monthly transdisciplinary seminars, LE STUDIUM Thursdays, evolved to include an introduction of regional laboratories prior to the presentation of Research Fellows. Considering the increased number of Research Fellows in residence this year, LE STUDIUM Thursdays have counted two Research Fellows per event.

Praised by all participants, LE STUDIUM Thursdays enable Research Fellows to advance their presentation skills, to gain a deeper understanding of all regional research activities, to experiment concrete transdisciplinary exchanges and to enhance visibility of host laboratories. From September 2016, access is given and encouraged for all doctoral schools of the region. PhD students may so validate transversal credits and increase their scientific culture and knowledge. LE STUDIUM thereby fulfills its mission to contribute building human capacity in the region.

LE STUDIUM Conferences continue to attract a large number of leading international researchers to the region Centre-Val de Loire. These conferences are multidisciplinary and are accompanied by dynamic discussions, which often result in new ideas for research and international collaborations. This past year we have also been pleased to partner with regional laboratories to hold a number of affiliated scientific fora. These partnership events are a significant evidence of the collaborative dynamic existing between LE STUDIUM and the laboratories of our regional members.

The organization of evening public Lectures and Rencontres Leonardo contributes to the public awareness of research and transfer of scientific knowledge; these events keep the local community informed about regional research activities and events have become increasingly popular following the implementation of a new community linked promotion strategy. The partnership with the universities and other local actors is essential to increase visibility and participation to these events.

LE STUDIUM is an international outward looking regional partner offering opportunities to access and develop fundamental research projects. These are essential to lead to new knowledge and create the fund from which the practical application of knowledge must be drawn. LE STUDIUM's mission nurtures this process closely linked to innovation, together with the laboratories of our members, to achieve quality socio-economic outcomes for the region Centre-Val de Loire.



IDENTITY & MISSION

Established in 1996 and inspired by the historical, geographical and human cultures of the Loire Valley, LE STUDIUM Loire Valley Institute for Advanced Studies is an internationally recognised regional agency, whose mission is to create in the region Centre-Val de Loire an outward looking dynamic for the scientific community that includes public and private research stakeholders, to contribute to the strengthening of human capital for research, development and innovation and to participate in the valorization of research and regional scientific and economic influence.

To achieve its objectives LE STUDIUM supports international collaborative research projects and the mobility of experienced international researchers across all scientific disciplines, selects, recruits and hosts experienced international researchers through calls for applications and develops a rich scientific animation programme with the organization of international conferences, workshops, transdisciplinary seminars, and events for the promotion of the scientific culture and knowledge.

The SMART LOIRE VALLEY programme, for the period 2015-2020, operates with a co-financing from the European Union in the framework of the Marie Skłodowska-Curie Actions - COFUND for the mobility of experienced researchers. Parallely LE STUDIUM is the official partner for the international dynamic, recruitments and scientific events of the ARD 2020 specialization programmes initiated by the Region Centre-Val de Loire.

Based in city centre of Orléans at the Hôtel Dupanloup, the International University Centre for Research, LE STUDIUM maintains deep interactions with many regional cities, structures and agencies. It enjoys prestigious premises and exceptional facilities available to visiting and regional researchers. Its enhanced international presence in the city of Orléans strengthens its

attractiveness to welcome high-level talents in the region Central-Val de Loire. LE STUDIUM relies on the laboratories to host international researchers that can benefit from and contribute to the laboratories and the region's international recognition in various research themes and positions itself at the interconnection between fundamental research and innovation.

In order to achieve its mission, LE STUDIUM benefits from a strong regional partnerships network and works in close collaboration with regional research stakeholders:

- Higher education and research institutions: University of Orléans, University François-Rabelais of Tours, INSA Centre-Val de Loire, ESAD Orléans
- National research institutes: BRGM, CNRS Centre Limousin Poitou-Charente, CEA Le Ripault, Centre Inra Val de Loire, Inserm, IRSTEA
- Poles of Competitiveness: Cosmetic Valley, Elastopole, Dream, S2E2
- Other clusters and organisations: Dev'Up, Vegepolys, POLEPHARMA, Centre-Sciences, CCI, etc.

LE STUDIUM Loire Valley Institute for Advanced Studies provides its researchers in residence an intellectual and human space, which favours interdisciplinary exchanges and debates, guided by the three necessary conditions required for creative activity, namely Curiosity, Imagination and Intuition.



THE SMART LOIRE VALLEY PROGRAMMES

The Smart Loire Valley General Programme

The Smart Loire Valley Programme call for applications, open from November each year to February next year, for the period 2015-2020, operates with a co-financing from the European Union in the framework of the Marie Skłodowska-Curie Actions - COFUND (Co-Funding of regional, national and international programmes) for the mobility of experienced researchers. The Smart Loire Valley Programme is designed to foster international scientific exchanges and collaborations and to build human capacity and scientific knowledge for research, development and innovation in the region Centre-Val de Loire. It is open to all scientific disciplines and is a precious tool to access funding to develop fundamental research projects. Events and the networking actions organised by LE STUDIUM aim at creating synergies between academic disciplines and links with the industrial world in order to increase interdisciplinary research and translational research to stimulate socioeconomic development. Scientific projects are evaluated and selected by independent external peer reviewers and an independent Scientific Council to award the best candidates and high added-value research projects. To be eligible, applicant researchers must be nationals or long-term residents of a country other than France and comply with the European mobility rules.

- **LE STUDIUM RESEARCH FELLOWSHIP**

This award enables experienced international researchers to work in a host laboratory for one-year. The award is designed to offer internationally competitive researchers the opportunity to discover and work in nationally accredited laboratories with international renown in the region Centre-Val de Loire. A salary and a fully furnished housing are associated to the award.

- **LE STUDIUM RESEARCH PROFESSORSHIP**

This award enables an experienced international Professor to participate in research, research team building and postgraduate teaching. The Professorship residency is a period of three months in the region Centre-Val de Loire for 4 consecutive years (12 months in total). For this award two laboratories in the region Centre-Val de Loire or three teams from the same laboratory need to be involved. A salary and a fully furnished housing are associated to the award.

- **LE STUDIUM RESEARCH CONSORTIUM**

This award enables the creation of a team of five researchers (including one researcher or research team from the region Centre-Val de Loire) and funds its regular gatherings for a full week twice a year over 2 years (4 meetings in total). The consortium projects has well-defined research objectives, a work plan to implement and milestone goals to achieve between meetings.

The Ambition Research Development 2020 Programmes (ARD 2020)

The long-term socioeconomic development of the region Centre-Val de Loire, in a period of economic fragility, depends on the strength and growth of quality research, development and innovation.

The ARD 2020 programmes, the region Centre-Val de Loire initiative to implement the EU Smart Specialisation Strategy, have been designed to generate socioeconomic impacts by providing support to create strong regional research and develop centres of international scale, stimulate innovation and job creation and, socioeconomic dynamism in the territory.

Thus, the region has supported the strengthening of quality research in a number of domains to foster the development of world-class poles to enhance research and innovation activity in the region:

- **ARD 2020 Biomédicaments (biopharmaceuticals),**
- **ARD 2020 Cosmetosciences (cosmetics),**
- **ARD 2020 LAVOISIER (renewable energies),**
- **ARD 2020 PIVOTS (environmental metrology),**
- **and ARD 2020 Intelligence des Patrimoines (regional patrimony heritage).**

LE STUDIUM is an official partner of these five ARD 2020 regional programmes, holding a leading role on international actions and promotion of international exchanges.

ARD 2020 BIOPHARMACEUTICALS

A drug is any substance or composition presented as having properties for treating, preventing or diagnosing disease in humans or animals. Whereas biopharmaceuticals in the strict sense of the term, are molecules that have the characteristic of being produced from living organisms or their cellular components. These molecules are intermediate between chemical drugs and organisms' intrinsic biologics. The proportion of biopharmaceuticals in the drug market should increase from 20% in 2014 to more than 40% by 2020. The region Centre-Val de Loire is at the cutting edge of research in the pharmaceutical sector, consequently the Regional Government has provided 7M€ over 3 years for research and to facilitate innovative inter-sectorial industrial development and partnerships for socioeconomic development beyond 2020.

The ARD 2020 Biopharmaceuticals programme aims to further develop and strengthen the region Centre-Val de Loire biopharmaceuticals industry by capitalising on the recognised capabilities of the multidisciplinary research teams from the regional research institutions.

The programme aims to:

- Develop a flagship research and development pole on biopharmaceuticals in the region Centre-Val de Loire.
- Configure the biopharmaceuticals field by inter-sectorial development and innovation in the pharmacy/health sectors through start-ups, SMEs (Small and Medium Enterprises) including established local and regional based multinational companies.
- Promote the transfer of technologies/competences to existing and new businesses.

The Biopharmaceuticals Programme focuses on the design and biosynthesis of biomolecules for preclinical and clinical development by including the search for synergies with conventional chemically synthesised drugs. The programme involves working with a wide spectrum of biological molecules (vaccines, therapeutic antibodies, nucleic acids, lipoproteins...) with the need for a diverse range of competences and the involvement of teams with complementary expertise.

The researchers present in the region Centre-Val de Loire, working in the disciplines of life sciences, are invited to participate and work in synergy, for inter-sectorial development and innovation, in the pharmacy/health sectors to deliver socioeconomic outcomes.

Research institutions and Partners



ARD 2020 COSMETOSCIENCES

In an international environment characterised by changing regulatory regimes and increasing harsh competition, research and innovation are key factors to ensure smart specialisation and sustainable economic development of territories and stakeholders. In the very well established perfume and cosmetic industry of region Centre-Val de Loire, the COSMETOSCIENCES programme aims at giving a significant impetus to research projects with a strong character of innovation to unlock industrial development blockages by opening the door to new concepts and enable new startups. It fosters French leadership in the sector and the leadership of the region Centre-Val de Loire, particularly with regard to sustainable cosmetics.

Anchored in the region Centre-Val de Loire, this project articulates around the structuring of research at the national level on this cosmetic theme, including through the research group (GDR) Cosmactifs, created by CNRS in January 2015. It brings 48 laboratories together and is driven by the University of Orléans. Focused on economic development, this project shares in the international influence of the French cosmetics industry across the region Centre-Val de Loire.

Together with the Cosmetic Valley competitiveness cluster and in conjunction with the cosmetic industry the programme creates the Centre of Expertise for the Cosmetics Industry. Located at the very heart of the territory covered by Cosmetic Valley, the centre's mission is to support business growth in the perfume and cosmetics sector with research, training and development activities and services specifically targeting very small and medium sized enterprises (VSEs and SMEs). The centre focuses on three complementary developmental axes:

1. Cosmétologie et Cosmétiques Durables,
2. Glycochimie et Glycobiologie
3. Innovation in Formulation, Cellular Tools and Technologies.

The programme is funded by the Region Centre-Val de Loire, for the 1st phase of the project (2015/2016) funding amounts to 3.3M€.

Research institutions and partners



ARD 2020 LAVOISIER

LAVOISIER stands for LAboratory with a VOcation for Innovation of the Safety and Industrialisation of Renewable Energy.

The central subject of the LAVOISIER Programme revolves around promoting a process of design, research, development and industrialisation of materials and systems oriented towards new energies, including all considerations of reliability and safety of use for the devices studied during all stages of their deployment. This programme supports the development of the ALHyance platform.

The ALHyance platform is dedicated to joint research efforts (CEA, Universities, CNRS, industrials) in the domain of materials and low carbon energies. The thematic of research are the following: design and materials expertise, safety and effectiveness of the systems, synthesis and characterisation, and methods and implementations. This programme covers activities through research to transfer of technologies and is supported by the Centre-Val de Loire Regional Government over 6 years till end of 2019.

The programme aims to:

- Gather the conditions to support the energies of tomorrow and develop promising innovations of growth by strengthening academic and industrial collaborations.
- Accelerate the industrialisation and the dissemination of innovative new products for low-carbon energy, focusing on the storage of electrical energy and hydrogen.
- Stimulate research on storage of clean and renewable energies (hydrogen, wind and photovoltaic), in order to facilitate their delivery from the place of production to the place of consumption.
- Promote the transfer of technologies/competences to existing businesses at the regional level and beyond.

The research focuses on the following topics: storage of hydrogen, storage of electrical energy, energy conversion, fuel cells and the production of hydrogen, development of a new and emerging topic on materials related to solar thermodynamic systems and the mechanical storage of energy.

In addition to these research topics, the programme develops a new approach for the design and development of low carbon materials, supported by the analysis of the environmental safety and impact of systems throughout their development stages and life cycles. This is a transverse topic where engineering and research and development are intertwined in the effectiveness of the choice of design guidelines, reducing the development time by optimising the qualification of materials and the quantification of safety margins against dreaded phenomena. This approach gives the project a unique specificity in France in the field of research into new technologies for energy.

Research institutions and Partners



ARD 2020 PIVOTS

PIVOTS - Environmental Technology Innovation, Development and Optimisation Platforms project

The PIVOTS project is a coordinated set of experimental and analytical platforms focused on environmental quality monitoring and sustainable management of natural resources (soil, subsurface, surface water, groundwater, sediment and air) within a context of global change.

Innovation in the area of the environment, ecotechnology, and ecoservices is a major challenge for sustainable development in today's societies. This innovation must be founded on an integrated approach based research by academic and industrial experts together at all stages of the value chain, from fundamental research to validation of products and services. The goal of the PIVOTS project is to accomplish this integration and to promote the emergence of an economic stream in the area of environmental metrology, remediation processes and associated services.

Through these new platforms, the region Centre-Val de Loire will offer a comprehensive set of experimental, observational, measurement, analytical, and testing equipment in the sectors of environmental metrology, environmental management and remediation and development of related ecotechnologies. These innovative projects will promote competitiveness among companies, particularly small and medium-sized companies, and scientific excellence in the research teams involved, while also aiming to create employment and promote the attractiveness of region Centre-Val de Loire nationally and internationally in the eyes of top-quality students and researchers.

The ambition of the PIVOTS project is to develop in region Centre-Val de Loire the interface between a knowledgeable society where problems of energy, ecology and economic performance all play an ever-increasing role, and a dynamic environment subject to global change. New environmental information will become available through the development of low-cost sensors that are increasingly robust and autonomous, diversified and adapted to the various media. As for protecting and/or restoring the environment, that will depend on the development and validation of innovative remediation processes. The PIVOTS project will promote the region Centre-Val de Loire as a top-ranked hub in this innovative sector nationally and throughout Europe to create the jobs of the future.

Research Institutions and Partners





LABORATORIES IN MATERIALS & ENERGY SCIENCES

ICMN - INTERFACES, CONFINEMENT, MATÉRIAUX ET NANOSTRUCTURES (ICMN) - UMR 7374 - UNIVERSITÉ D'ORLÉANS, CNRS



The Research Center on Divided Materials (CRMD) was originally created as a CNRS unit in 1991. The institute is today a research unit shared by CNRS and University of Orléans including 30 permanent researchers and around 25 PhD students and postdocs. On 1st January 2015, CRMD changed its name to become Interfaces, Containment, Materials and Nanostructures (ICMN). The ICMN laboratory is involved in research and training activities at the heart of a physicochemical multiscale approach, which addresses the intermediate material scale between nanometer and millimeter scales. Tools such as experimental methods and laboratory characterization, which include synchrotron methods and mathematical modelling, are widely used. They are applied to studies of a range of fundamental issues and their potential applications including energy storage and conversion, photovoltaic devices, water pollution control and environmental protection, sustainability of heritage, catalysis, aerospace, cosmetics, health, nanofluidic networks and nanomagnetic devices.



GRUPE DE RECHERCHE EN MATÉRIAUX, MICROÉLECTRONIQUE, ACOUSTIQUE ET NANOTECHNOLOGIES (GREMAN) UMR 7347 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS, INSA-CVL



Created in 2012 through the fusion of 3 teams. Its staff is currently 115 among which 45 permanent academics. GREMAN aims at developing novel functional materials and components/devices for microelectronic and energy efficiency applications. Its main expertise lies in the field of electronics, materials science and ultrasonics. The applications include industrial, domestic and medical fields. The team located within INSA Centre Val de Loire focuses its work on two main topics: (i) the use of ultrasonic waves to characterize complex materials and structures and (ii) the development of piezoelectric devices for energy conversion, energy harvesting and ultrasonic transducers.



PHYSICS AND CHEMISTRY OF MATERIALS AND ELECTROLYTES FOR ENERGY (PCM2E) EA6299 UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS



The Laboratory of Physics and Chemistry of Materials and Electrolytes for Energy (PCM2E) was created in 2012 and works in the field of energy conversion and storage (batteries, supercapacitors, hybrid photovoltaic, ionic liquids), nanostructured materials and organic electrochromic devices. Located in Tours, The PCM2E laboratory has about 35 people including 14 assistant professors, three professors, a professor emeritus and a lecturer Excellence recruited in September 2012 (as part of an LRC partnership since 2010 with CEA le Ripault). It has been strongly renewed since the last four-year contract since nearly half of these members have been recruited since 2007. The overall project of the laboratory is built around competences in electrochemistry, thermodynamics and chemistry of materials. The laboratory has three priority themes:

- Electrolytes, membranes and electrode materials for energy storage
- Organic semiconductors and nanostructured materials
- Ionic Liquids

In addition to the above mentioned directions of research, this laboratory is a unique research organisation owing to its in-depth focus on the design and development of novel electrolyte compositions. The electrolyte properties such as ionic conductivity, thermal behaviour, potential range of stability, polarisability and dielectric constant fundamentally impact the performance of all types of batteries and form the core of the research activities. The beneficial effect of choosing and designing novel materials and compositions of the electrolytes and applying appropriately to different battery systems has been demonstrated through numerous publications and patents at PCM2E.



DEVELOPING HIGH ENERGY DENSITY STORAGE TECHNOLOGIES FOR PORTABLE AND TRANSPORTATION APPLICATIONS

PROJECT

The consortium was designed to encourage a long term scientific collaboration between carefully selected scientific peers working on closely related topics from around the world. The recently organized consortium was held in Tours from December 12-16 and was attended by Pr Sagar Mitra from IIT Bombay (India) and Dr Roman Mysyk (Spain). The combined expertise of the participants covers almost all areas of electrochemical energy storage technologies which includes Lithium ion Batteries, Lithium sulphur Batteries, Metalair Batteries, Lead acid Batteries, Supercapacitors, Flow and Hybrid Capacitors and High temperature Batteries. This free exchange of knowledge and combination of advances in technology and understanding in different parts of the world is crucial for enhancing the rate of development of these technologies. During this consortium the participants agreed to pursue joint development on four new research avenues in lithium ion, sodium ion and advanced lead carbon batteries.



Pr Meriem Anouti
Consortium Coordinator

Professor Meriem Anouti is a Professor in the PCM2E laboratory at the University Francois-Rabelais of Tours. Her research focuses of electrolytes for electrochemical energy storage (electrochemical capacitors, lithium-ion and sulfur batteries and hybrid systems) with a particular emphasis on room temperature molten salts (RTMS) as ionic liquids, deep eutectic solvents and their mixtures. She also applies ionic liquids for nanomaterials synthesis and studies fundamental properties including dissolution of gases. In all the applications the properties of RTMS are correlated with their structure and interactions. Based on the use of ionic liquids, she formulates electrolytes for improving the lifetime of energy storage systems, especially by enhancing the voltage and operating temperature range and by controlling the phenomena at the electrode/electrolyte interface. She coordinates numerous ANR, regional funded and industrial research projects while also supervising PhD students. Her industrial research includes contracting with national and multinational companies. Her international collaborations include laboratories in Ireland, Canada, Germany and Poland.

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LE STUDIUM Research Fellow - ARD 2020 LAVOISIER
 From: Yerevan State University, Armenia
 In residence at: ICMN, Orléans

Arayik HAMBARDZUMYAN is an Assistant Professor in Yerevan State University. He has the following diplomas and experience: Asperantura (PhD degree) from the Yerevan State University, Armenia, awarded 1994. PhD in Reactions in biphasic water/organic solvent systems in the presence of surfactant: Inverse phase transfer catalysis or interfacial catalysis, from Montpellier II University, France, awarded 1999. He has held post-doctoral positions at the Catholic University of Louvain, Belgium (1999-2001) and then at INRA, Reims, France (2001-2003). He has expertise in colloidal systems, emulsions, solid surfaces, and lignocellulosic materials.

ENHANCING THE MECHANICAL PROPERTIES OF THIN FILM POLYMERS BY CELLULOSE NANOCRYSTALS FOR USE

Fuel cells (FCs) are electrochemical devices that produce electrical energy from the chemical energy of a fuel and oxygen. They are alternatives to traditional energy generating sources utilizing fossil fuels.

Although the most common fuel is hydrogen, other fuels, such as methanol, are also used. Hydrogen contains more energy per unit weight than any other fuel. The advantage of electricity generation from hydrogen via a FC is evident if electrical energy is used directly (e.g. in domestic power supplies, communication equipment, electronic devices, and portable electronics) rather than indirectly to generate mechanical movement. Since the 1960s, FCs have been used to power numerous mechanical and electronic systems, from spacecraft systems to electric vehicles, submarines, and portable electronics.

During the last two decades great efforts have been made to advance the FC technology and fundamental research. However, the widespread commercialization of this technology is hampered by both the expensive materials and the relatively low durability of proton exchange membrane (PEM). Numerous experimental and theoretical studies have been realized in order to improve the mechanical properties of proton exchange membranes and to identify influential factors. A promising way to enhance the mechanical properties of proton exchange membranes is PEM-composite membranes preparation technology using either organic or inorganic substances as dopants.

The purpose of this study is to investigate a new way of processing cellulose whiskers reinforced polymer based on the introduction of cellulose nanocrystals (CNs) in the matrix of the polymer. However, from a practical point of view, the processing of a composite polymer electrolyte from an aqueous suspension of cellulose whiskers (generally, cellulose whiskers are obtained during an acidic hydrolyze of micro-fibrils of cellulose in aqueous medium) is not easy, since water is not miscible with the solvent of polymers (generally organic or hydrophobic solvent).

This project aims to improve the experimental conditions allowing CNs to be well distributed in the matrix and enhancing the mechanical properties of polymer membranes.



Dr Marylène Vayer
 Laboratory Host Scientist

Marylène Vayer, CNRS researcher, is a chemical engineer graduated from the ENSCS (Ecole Nationale Supérieure de Chimie de Strasbourg). She obtained her PhD at the University of Nancy I, in Material Science in 1987. She has expertise in surface and interface science. She works on phenomena involving surfaces and interfaces such as catalysis, ion implantation and the nanostructure of polymers in thin films.



PR JOHNSON IRUDAYARAJ

LE STUDIUM Research Fellow - ARD 2020 LAVOISIER
 From: St. Joseph's college, India
 In residence at: GREMAN, Blois

The researcher has 25 years of teaching (Academic experience) and 16 years of research experience. He published nearly 50 research papers in peer reviewed journals and proceedings. He completed 3 major research projects in India. He guided 4 PhD candidates and is guiding 4 PhD candidates at present. He completed his post doctoral studies at university of Coimbra, Portugal in the period of 2005 to 2006. He was a visiting scientist to University of Zaragoza in 2007 under Indo-Spanish cultural exchange program. He was a recipient of the American physical society Indo-US professorship award to deliver lectures at Utah State University in 2011. He also organized an Indo-US workshop on Ultrasonics and Nanosonics and an International conference on Nanotechnology in India which has been sponsored by three international agencies IUSSTF, ICA and ICTP. He was a Visiting scholar to KU Leuven in 2012 under Erasmus Mundus Nano program. During this period he made invited talks and presentations at KU Leuven and Max Planck, Dresden. He was a resource person for Indo-French conference on Acoustics (SFA and ASI) in 2013 at New Delhi and Royal society Indo-UK seminar in 2014 at Chennai. His research fields include Acoustics, Energy, Material science and Nano materials for Energy and medical applications.

Planned summary of academic and research activities of the researcher as Le Studium fellow :

In the olden days people used to say that No power is costlier than no power. But we are living in an era of seeking the cheapest and low cost ways to produce, save and redistribute energy. Mankind is also seeking for environmentally friendly ways to produce such energy. Designing a proper curriculum on such energy program at Masters level with international cooperation and collaboration will be the need of the hour at INSA, Blois. There are many ways to produce nano particles of energy and medical importance. But however producing such nano particles by Ultrasound and Green synthesis is more environmentally friendly and economically viable. Fine tuning and tailoring of nano particles is also possible. Characterization of nano / micro thin films and materials by acoustical means is another interesting area which provides a non invasive method.

ENGINEERING AND SYSTEMS FOR RENEWABLE ENERGY

The goals of the projects are :

- To help and coordinate the academic and scientific preparation for a new course at Masters level in Energy engineering
- To create and establish ways to sign M.O.U with leading universities for the above program since INSA-CVL wishes to develop students exchange and double degree programs.
- To be involved in research on Ultrasonics and Nanomaterials

Study of different syllabi and curriculum for different energy engineering program all over the world has been started. A detailed presentation will be done in the core group. Meeting of different Indian universities who are having Masters in Energy engineering has been done.

Identification of possible research collaboration in acoustical characterization of thin films and nano materials at Blois has been done.



Pr Marc Lethiecq
 Laboratory Host Scientist

Marc Lethiecq graduated in Electrical Engineering in 1984 and received the DEA (MSc) in acoustics followed by a Doctorat d'Ingénieur (PhD) in Non Destructive Testing in 1988, all from Institut National des Sciences Appliquées, Lyon, France. He has been with the University-François-Rabelais of Tours since 1990, first as an assistant professor and since 1994 as a professor, and has setup a research group on ultrasonic & piezoelectric devices. In 1988 and 1999 he worked as a research engineer on ultrasonic transducers for biological and medical applications for Vermon S.A. and CNTS. He has been teaching electronics, feedback control and courses related to his research activities since 1984 in several universities and engineering schools. He was scientific coordinator of a European Network of Excellence on piezoelectric materials & devices. He is a senior member of IEEE and member of SFA the French Society of Acoustics. He is director of GREMAN research laboratory and director of education at INSA Centre Val de Loire.

JANUARY 2016

JUNE 2017



DR SATYAJIT PHADKE

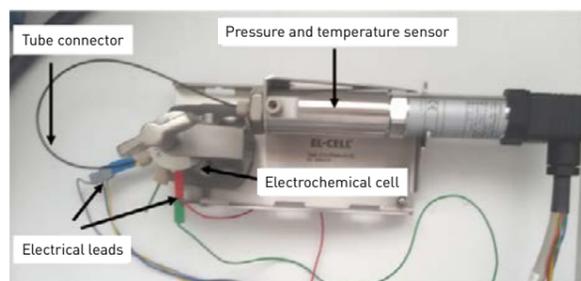
LE STUDIUM Research Fellow - ARD 2020 LAVOISIER
 From: Customized Energy Solutions (CES), India
 In residence at: PCM2E, Tours

Dr. Satyajit Phadke completed his Bachelors (B.Tech.) in Metallurgical and Materials engineering from the Indian Institute of Technology (IIT) Roorkee in India. He obtained his PhD in Materials Science and Engineering from the University of Florida. His main interest area was the development of intermediate temperature proton conducting membranes for applications in PEM fuel cells. Thereafter he worked on an ARPA-E (Advanced Research Projects Agency for Energy) funded project as a post doctoral associate at Massachusetts Institute of Technology (MIT). Here he pursued the development of a novel high temperature all liquid battery for stationary grid scale storage applications. He holds several patents from this work all of which have been licensed to a Cambridge based company Ambri, Inc. which is pursuing manufacturing and commercialization of this technology. During his position as a materials scientist at Alveo Energy, Inc which is a startup based in the Silicon Valley he worked on the development of Prussian Blue analogue battery materials. Additionally he has worked on the development of zinc alkaline batteries for transportation applications during his stay at Princeton University. He has also worked as a technical consultant for Customized Energy Solutions where he provided consultation services in his core area of energy storage and conversion technologies. Currently at the PCM2E laboratory his work is focused on development of novel electrolytes for next generation high energy density Lithium ion batteries which include Lithium rich cathodes, Lithium-sulfur and Lithium-air batteries. He is the author of several publications in the field of energy storage and conversion technologies.

ENERGY STORAGE SYSTEMS

The research project focuses on Energy Storage and Conversion Technologies and is supported by the ARD 2020 LAVOISIER Programme. The objective of the project is to develop novel materials (electrolytes, positive and negative electrodes) for advanced energy storage devices. Under this program in the last one year we have worked on developing new electrode materials and on optimizing the performance of the energy storage devices using modified electrolyte compositions. Details about the topics of research and the progress made are listed below:

High energy NMC cathodes (HE-NMC): The high energy NMC cathodes have considerably higher energy density when compared to conventional lithium ion battery materials such as LCO, LMO, NMC, etc. These materials are very promising for transportation and portable electronics applications as the demand for long range on electric cars and longer life for portable electronics continues to grow. However, in order to achieve widespread commercialization some major technical challenges need to be overcome. These are namely high capacity fade, voltage fade and low coulombic efficiency on the first charge. Through work done over the last 12 months, specific electrolyte modification strategies have been demonstrated to significantly reduce the capacity fade in these cathodes. In this work supported by SAFT and UMICORE technologies we have reported a 10X improvement in the cycle life of the electrodes by optimising the composition of the electrolyte. We have also demonstrated the applicability of a completely new characterisation technique of in-situ pressure measurement during galvanostatic cycling which aids in the study of the HE-NMC materials.



Pr Meriem Anouti
 Laboratory Host Scientist

Professor Meriem Anouti is a Professor in the PCM2E laboratory at the University Francois-Rabelais of Tours. Her research focuses on electrolytes for electrochemical energy storage (electrochemical capacitors, lithium-ion and sulfur batteries and hybrid systems) with a particular emphasis on room temperature molten salts (RTMS) as ionic liquids, deep eutectic solvents and their mixtures. She also applies ionic liquids for nanomaterials synthesis and studies fundamental properties including dissolution of gases. In all the applications the properties of RTMS are correlated with their structure and interactions. Based on the use of ionic liquids, she formulates electrolytes for improving the lifetime of energy storage systems, especially by enhancing the voltage and operating temperature range and by controlling the phenomena at the electrode/electrolyte interface. She coordinates numerous ANR, regional funded and industrial research projects while also supervising PhD students. Her international collaborations include laboratories in Ireland, Canada, Germany and Poland.

Lithium-sulfur (Li/S): Li/S batteries have an extremely high theoretical capacity density of about 1600 mAh/g due to which a very promising candidate for applications requiring lightweight batteries. By comparison, the conventionally used Lithium ion battery cathodes have a capacity density of 150-200 mAh/g. Thus the use of Li/S batteries has the potential to reduce the weight of batteries by 4-6X. The main challenges limiting its commercialization are low cycle life, low coulombic efficiency and high self-discharge. In previously published literature the micro-structural modification of the sulfur electrode has been the primary approach for performance improvement. Although significant progress has been made through this approach globally, most of the processes used are either difficult to scale up industrially or require the use of very expensive additives which increase the price significantly. Through the on-going work at PCM2E we have shown that the electrolyte modification through the use of specific electrochemically active disulphide additives can not only significantly prolong the cycle life but also provide a very high coulombic efficiency. In addition, we have also shown that the additive modification technique can allow the batteries to operate at high c-rates opening the door for high power applications.

Organic electrodes: Organic polymer materials have attracted a lot of attention in last decade due to their favourable characteristics to serve as effective electrode materials. This is a new line of research initiated in the last 6 months at PCM2E. In this research we are focusing on the characterization of PAQS (poly anthraquinone sulphide) as a negative electrode (anode) material. The material was synthesized in the lab and its electrochemical performance was evaluated using standard coin cells. It shows excellent cycling stability with a high discharge capacity of 150 mAh/g and very fast redox kinetics. By increasing the cycling rate from 1C to 4C only a 25% reduction in capacity is observed which makes it suitable for high power applications. Owing to the excellent charge/discharge characteristics, the material will now be paired with activated carbon (for supercapacitors) and with conventional lithium ion cathode materials where PAQS can serve as a highly reversible and stable anode. Recent tests conducted using sodium and potassium intercalation show favourable cycling performance which opens avenues for the use of PAQS in sodium and potassium ion batteries also. Currently we are performing further investigation on the insertion/deinsertion kinetics of larger cations (potassium and sodium). This experimental work is being partially carried out by an intern Mingli Cao who is being trained in the appropriate synthesis and characterization techniques.

Measurement of gas solubility in electrolytes: Satyajit has been co-guiding with the research work of a doctoral candidate BaoKou Xiong who is working under the guidance of Pr Anouti. The doctoral work is focused on the measurements of the solubility of gases in various electrolytes and solvents of interest. In addition to the solubility measurements this work permits the calculation the fundamental thermodynamic values of entropy, enthalpy and free energy of interaction of gases and liquids. Complimentary to these measurements are the pouch cell volume expansion studies and the pressure cell measurements. These studies together allow precise in-situ determination of the evolution of gases during the cell cycling. Such studies focused on understanding the mechanisms of gas evolution in cells are essential for prolonging the cycle life of batteries. The results of this research are summarized in a recently submitted research article and will be presented through an oral presentation at the Topical Meeting of the International Society of Electrochemistry in Buenos Aires.



AROUND THE PROJECT

ORAL COMMUNICATIONS

Phadke, S. High Temperature Batteries for Grid Scale Storage: Applications for Efficient Renewable Energy Utilization, Le Studium Thursday, Tours (France), July 7, 2016.

Phadke, S. High Temperature Batteries for Grid Scale Storage: Applications for Efficient Renewable Energy Utilization, PCM2E seminars, Tours (France), May 19, 2016.

POSTER

Phadke, S. Effect of lithium salt concentration on the capacity retention of High - Energy NMC cathodes, Future Strategies in Electrochemical Technologies for Efficient Energy Utilization, Tours (France), September 7-9, 2016.



see details of the events on the next page



DR CHANDRASEKARAN RAMASAMY

LE STUDIUM Research Fellow / ARD 2020 LAVOISIER

From: India

In residence at: PCM2E, Tours

Ramasamy Chandrasekaran has finished his doctoral research in the field of thin film Polymer electrolytes for battery applications (2001, Anna University; Chennai, Materials chemistry specialization). After his PhD degree, he has continued his research on energy storage devices through various research positions which were sponsored by CISR India -Senior Research Associate, Senior research assistant (Imdea, Spain), Post-doctoral position (Science Frontier Program -JSPS sponsored, AIT Nagoya JAPAN), Post-doctoral scientist (AIST fellow, Tsukuba JAPAN), Post-doctoral fellow (ORDIST-MEST sponsored -Kansai University and Daikin Industries, Osaka JAPAN), Scientist (QHS scheme, CECRI, INDIA). He has 30 articles, 3 patents, 7 CISR patent files and 20 conferences in his credits as well as reviewer of some journals like Journal of alloys and compounds; Electrochimica Acta; RSC advances; Ionics. His topic of interest is the electrochemical energy storage devices and their physico-electrochemical characterisations.

REDOX-FLOW AND HYBRID ENERGY STORAGE SYSTEMS

The objective of the research project is to find out the supercapacitor enhancements in which analyze of electrolyte systems by Electric double-layer capacitors -EDLC and flow cell model is the important research line in terms of conventional and cost effectiveness. Hybrid geks are mainly concerned one for the capacitor applications (an aqueous- organic mixed electrolyte system).

For a high energy system, a formulation of electrode materials by intercalated oxide materials, modified activated carbons, hybrid materials (electrostatic-redox), etc and redox induced electrolyte scheme are some of the routes EDLCs were fabricated by using a aqueous gel based on Polyvinyl alcohol-PVA and Li salt . The normal cell behaviour was shifted to a high performance by adding an organic additive (formamide)

The EDLCs were also examined by using an ionic liquid, Pyrrolidinium Nitrate-(PyrNO₃). The gels were examined at five different compositions like low to rich Li salt in Ionic liquid and vice versa; Finally, in order to confirm the aqueous-organic mix, a hybrid form of the gel (aqueous-organic mix) was also tested by glycol which has influenced to enhance in the cell parameters especially the cell potentials and cycling at high potential margin.

A Static Flow Cell was examined by the use of the above said electrolytes. The cell has shown a high vapacity , nearly three times than the EDLC form. The carbon slurry behaviour was well pronounced by the organic additive,

The capacitor electrochemical characterisations are subjected at three different nodes of scale:

1. Meso carbon
2. Micro carbon and
3. Intercalated electrodes



Pr Meriem Anouti

Laboratory Host Scientist

Professor Meriem Anouti is a Professor in the PCM2E laboratory at the University Francois-Rabelais of Tours. Her research focuses of electrolytes for electrochemical energy storage (electrochemical capacitors, lithium-ion and sulfur batteries and hybrid systems) with a particular emphasis on room temperature molten salts (RTMS) as ionic liquids, deep eutectic solvents and their mixtures. She also applies ionic liquids for nanomaterials synthesis and studies fundamental properties including dissolution of gases. In all the applications the properties of RTMS are correlated with their structure and interactions. Based on the use of ionic liquids, she formulates electrolytes for improving the lifetime of energy storage systems, especially by enhancing the voltage and operating temperature range and by controlling the phenomena at the electrode/electrolyte interface. She coordinates numerous ANR, regional funded and industrial research projects while also supervising PhD students. Her industrial research includes contracting with national and multinational companies. Her international collaborations include laboratories in Ireland, Canada, Germany and Poland.



LE STUDIUM CONFERENCES

Future strategies in electrochemical technologies for efficient energy utilisation

The conference was focused on electrochemical technologies for energy storage applications. It saw the participation of subject experts from all around the world including but not limited to USA, Canada, Europe, India, Japan and Singapore. Organization of such a conglomeration of global experts is ideally suited for the exchange of ideas and for learning about the pioneering work happening globally from the leaders. It is also highly beneficial for the ongoing development work in storage technologies in PCM2E while attracting global attention towards the region. Energy storage is widely used in many applications all spheres of our life. As we are continuing to use these energy storage devices in an ever increasing way, there is also a perceived demand for the enhancement of the performance metrics of all storage devices. This includes a high life-cycle, depth of discharge improvement, power and energy density, a wide operating temperature range and reduced cost while improving the safety and reliability of the systems. In this conference we had more than 20 invited global experts and leaders to discuss the progress and future outlook in their respective technologies of focus. The objective of the conference was to encourage the sharing of knowledge and ideas from related fields in order to promote innovation and growth. The PCM2E laboratory was able to initiate several fruitful collaborations with many of the participating experts along new research directions.



LE STUDIUM LECTURES

L'énergie disponible à tout moment : produire, économiser, stocker

Par Dr Anne De Guibert, Directrice de la recherche, SAFT

Due to the increased deployment of renewable generation, the storage of energy has become very important. This is because all renewable resources such as wind and solar power are variable which necessitates the need of storage (or batteries) for supplying continuous and reliable power to our homes and industries. However, for widespread application, existing well-developed battery technologies struggle to meet all the requirements of durability, high power, roundtrip energy efficiency, and cost. This talk focused on a novel battery system named liquid metal battery (LMB) which has suitable performance characteristics for deployment as a grid-scale electrochemical energy storage device with long lifetime and low cost.

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LABORATORIES IN LIFE & HEALTH SCIENCES

CBM - CENTRE DE BIOPHYSIQUE MOLÉCULAIRE (CBM) - UPR 4301 - CNRS



CBM is a key participant in the development of biophysics in France, and is one of the largest research laboratories in the region Centre-Val de Loire. It was founded in 1967 to set up interdisciplinary collaboration between chemists, biologists and physicists. Researchers at the CBM are investigating the structure, dynamics and interactions of biomacromolecules from the atomic level to the cell and organism. This approach entails searching for the molecular causes of biological dysfunctions which trigger the development of diseases. The center is also recognized for its research in biomedical imaging. The laboratory has excellent facilities for small animal imaging. One key goal of CBM is to conceive new strategies in human therapy by combining innovative approaches in peptide/protein synthesis, biochemistry, bio-physics, molecular and computational biology. For this purpose, biomolecular interactions involving DNA, RNA, proteins and ligand are studied at the atomic and molecular level using a variety of experimental techniques. Moreover, some research projects are dedicated to the identification of new therapeutic targets and the development of innovative delivery systems for therapeutic agents in various pathologies such as cancer, cystic fibrosis and musculoskeletal defects. Biological targets are identified through the delineation of specific signalling pathways. Novel therapeutic strategies are developed using original nucleic acid delivery systems that combine chemical vectors and physical methods. One main area is the optimization of innovative vaccination based on messenger RNA coding for tumoral or viral antigens for cancer and viral infection, respectively.



INSTITUT DE CHIMIE ORGANIQUE ET ANALYTIQUE (ICOA) – UMR 7311 – UNIVERSITÉ D'ORLÉANS, CNRS



The host laboratory is part of the Institute of Organic and Analytical Chemistry of CNRS and University of Orléans: ICOA UMR CNRS 7311, directed by Pr Pascal Bonnet. The main objective of the laboratory's research activities is the discovery of novel bioactive molecules having potential applications as drugs or as components of cosmetic formulation. The scientific approaches to these new molecules involve design by molecular modelling techniques, preparation by organic synthesis, with a particular emphasis on heterocyclic compounds, carbohydrate derivatives and nucleoside analogs, extraction from plant material using high performance separation techniques and mass spectrometry analysis, and by chemo-enzymatic methods. ICOA has numerous collaborations and partnerships in the region Centre-Val de Loire, with other research laboratories such as CBM (CNRS UPR 4301), forming with this laboratory a Research Federation (FR2708), with CEA (ICOA is correspondent academic laboratory LRC M09), with many companies and through Clusters of Competitiveness. A few years ago, a new branch of ICOA has been established in the field of biochemistry: the unit of Enzymology and Glycobiology, under the responsibility of Pr Richard Daniellou. The group is focused on the understanding the mechanisms and structures of enzymes involved in synthesis (Glycosyltransferases), or breaking (Glycosidases) of carbohydrates. Moreover, these enzymes can serve as biocatalysts to synthesize original carbohydrate-containing compounds: thioglycosides (or S-glycosides). These compounds are more stable towards degradation than their natural O-glycosides analogues which make them potentially usable in therapeutics or cosmetics. To understand more deeply the catalytic mechanism of these enzymes, as well as their molecular recognition of sugars or derivatives, structural studies are conducted using either macromolecular crystallography or molecular modeling.





LABORATORIES IN LIFE & HEALTH SCIENCES



IMAGERIE ET CERVEAU (IC) - UMR U930 - INSERM, UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS



"Imagerie et Cerveau" at Université François-Rabelais of Tours and Inserm is composed of 5 research teams. The Imaging and Ultrasound team led by Dr Ayache Bouakaz, dates back to the early 1970s with the pioneering work of Professor Léandre Pourcelot on clinical Doppler vascular imaging. Over the years, the team has developed various industrial and medical ultrasound diagnostic imaging systems. Today, the activities of the Imaging and Ultrasound team are multidisciplinary and are primarily influenced by clinical need. Indeed the team's research goals which are concerned with the technical aspects of ultrasound diagnostic imaging and therapy are founded on strong theoretical (ultrasound propagation and generation, signal processing, interaction of ultrasound and complex media) and experimental (instrumentation, electronics) background. The objectives of Inserm U930 as a whole are concerned with normal and pathological brain development, from the perinatal period to adulthood. Their mission is the development, validation and use in clinical research, functional and structural brain imaging methods (MRI, PET, SPECT, EEG and ultrasound), in order to better characterise brain development and functioning, as well as understands and treat or alleviate brain disorders



GÉNÉTIQUE, IMMUNOTHÉRAPIE, CHIMIE ET CANCER (GICC) - UMR 7292 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



The GICC laboratory is labelled by the National centre for scientific research (CNRS) since 2008. It is a mixed joint unit (CNRS/university) focusing on the pathophysiological mechanisms of diseases, in order to set up and personalize therapeutics. Its current director is Gilles Paintaud (2012-2017). The team PATCH (Pharmacology of Therapeutic antibodies in Human) aims at studying the mechanisms of action of monoclonal antibodies in the context of chronic diseases, by combining biology and mathematics. This quantitative systems pharmacology approach evolves a pathophysiologic system, in combination with a mathematical model, to understand the mechanism of action of monoclonal antibodies that are used in immune-inflammatory diseases and in cancer.



NUTRITION, CROISSANCE ET CANCER (N2C) - UMR 1069 - UNIVERSITÉ FRANÇOIS - RABELAIS DE TOURS, INSERM



The mixed research unit of Inserm and the University François-Rabelais of Tours has international recognition in research at the interface between cancer and nutrition. The team was the first to link diet-related changes in the lipidome of breast associated adipose tissue to breast cancer development and metastasis. The role of lipids on cancer development and progress is examined at the structural, metabolic and physiological levels. The laboratory is specialized in lipid biochemistry and metabolism as well as in breast and prostate cancer, cancers frequently associated with bone metastases. The research is multidisciplinary and focuses on the transversal interaction between medicine, pharmacology and sciences. The N2C researchers explore different modes of molecular and cellular actions and, the impact of specific lipids on mitochondrial function, cancer cell lines and, the relationships between tumor and its host. This knowledge may benefit patients who have chemical-resistant and/or metastasized cancers.



NANOMÉDICAMENTS ET NANOSONDES (NMNS) - EA6295 - UNIVERSITÉ FRANÇOIS RABELAIS DE TOURS



The Nanomedicine and nanoprobe laboratory is located in the faculty of pharmacy of Tours. It is directed by Pr I. Chourpa and groups 9 permanent senior researchers, also all university lecturers. The research group started in 2008 and obtained his independency as an "Equipe d'Accueil" in 2012. The main research topics of the team are the development of nanotechnologies for health and the development of analytical methods based on advanced separative or spectroscopic techniques. The first works were dedicated to the design of nanovectors able to deliver anticancer agent specifically to the tumor cells, leading to the decrease of the side effects of chemotherapy. Over the years, the group diversified its activities and skills. Among the current funded projects, can be cited the development of theragnostic nanovectors dedicated to the diagnosis and treatment of breast cancer (InCA, Ligue contre le Cancer), the development of multimodal imaging nanoprobe (ERA-NET) or the development of encapsulation systems to increase the delivery of active molecules to the skin (Cosmetosciences program). The team also focuses an important part of its energy on consolidating its national and international network, with academic or industrial actors.



PHYSIOLOGIE DE LA REPRODUCTION ET DES COMPORTEMENTS (PRC) - UMR 085 - CENTRE INRA VAL DE LOIRE, UNIVERSITÉ FRANÇOIS - RABELAIS DE TOURS, CNRS, INSTITUT FRANÇAIS DU CHEVAL ET DE L'ÉQUITATION

The Reproductive Physiology and Behaviours Laboratory is affiliated to INRA, CNRS, University Francois-Rabelais of Tours and IFCE. The Biology and Bioinformatics of Signalling Systems (BIOS) group uses systems biology approaches, including mathematical modelling and bioinformatics, to decipher G protein-coupled receptors (GPCR)-induced signalling and develops new pharmacological strategies targeting these receptors. A particular emphasis has long been put on the receptors for follicle stimulating and luteinizing hormones (FSHR and LHR) that are centrally involved in the control of reproduction. Capitalizing on the dynamics initiated in region Centre-Val de Loire in the framework of the MablImprove LabEx and the ARD 2020 "Biopharmaceuticals", the BIOS group is currently developing GPCR-specific antibody fragments displaying pharmacological efficacy *in vivo*.



JUNE 2015

JUNE 2017



DR SOHAIL AKHTER

LE STUDIUM Research Fellow - ARD 2020 BIOPHARMACEUTICALS

From: U.S. Food and Drug Administration, USA

In residence at: CBM, Orléans

Dr Sohail Akhter is a professional Pharmacy graduate with specialization in Pharmaceutical nanomedicines. His past experience include senior Postdoc positions at U.S. Food and Drug Administration (US-FDA)/The Centre for Drug Evaluation and Research (CDER)/DPQR, USA and the Department of Pharmaceutics, Utrecht Institute of pharmaceutical sciences, Utrecht University, Netherlands. He received team excellence award-2015; U.S. Food and Drug Administration (US-FDA)/CDER/DPQR for his work on novel non-destructive chemometric method/PAT tools and Nanomedicine European technology platform fellowship, 2013. Dr Akhter has authored more than 50 papers in high impact journals. His research interests involve nanomedicines design, application of bio-materials in drug delivery & targeting, biopharmaceutics, drug/nanoparticles metabolism/biodistribution and bioanalysis.

SYNTHESIS AND BIOSYNTHESIS OF MOLECULES- DEVELOPMENT OF MRNA CELLULAR FACTORIES

Dr Sohail Akhter is working as Le Studium Research Fellow under ARD 2020 Biopharmaceutics framework on the project entitled "Synthesis and biosynthesis of molecules-development of mRNA cellular factories" in a specific area "Intracellular delivery of nucleic acids to the dendritic cells (DCs) by non-viral nano-vectors". The goal of this research is to develop and optimize the non-viral nano-carriers (for example-lipidic and polymeric nanoparticles) for selective intracellular delivery of mRNA to the dendritic cells to achieve specific anti-tumor immune responses. The final goal is to develop novel biopharmaceutics that could be used for therapeutic vaccination against cancer. It is established that dendritic cells (DCs) play a key role in the development of immunotherapy against cancer. As sentinel of the immune components, DCs take up and process antigens to present them on either MHC class I, MHC class II molecules or both to T cells depending on the type of antigens. When DCs are modified to present tumor-associated antigens (TAAs), specific anti-tumor immune responses can be evoked. Messenger RNAs or plasmid DNA that encodes tumor antigens have been found as a safe mode of induction of tumor-specific immune responses after efficient transfection to the DCs.

mRNA being translated in the cytosol, it does not to be imported inside the nucleus and allows better transfection efficiency over plasmid DNA. The loading of mRNA to the DCs is challenging and requires the development of robust and smart delivery systems capable to reduce mRNA doses and/or side effects. The nucleic acid delivery efficiency of viral vectors are, in general, higher to that of non-viral carriers. However, potential immunogenic adverse effects aftermath associated with viral vectors increasingly making non-viral gene delivery systems still relevant for gene therapy. In our study, we are screening the transfection efficiency of mRNA lipoplexes and lipo-polyplexes made of different histidylated lipids and histidylated polymer to optimize a nanomedicine that can efficiently transfect and lead to high protein expression in large number of dendritic cells. We prepared new nanoformulations and evaluated the transfection efficiency of weakly basic imidazole with other N-head group variance containing amphiphilic lipids for improved mRNA & pDNA transfection in dendritic cells intended for cancer vaccination. Cationic liposomes in a certain molar ratio of lipids were prepared by film hydration followed by sonication for the size reduction. The nano-sized lipid vesicles had the size varied in between 80nm-150nm



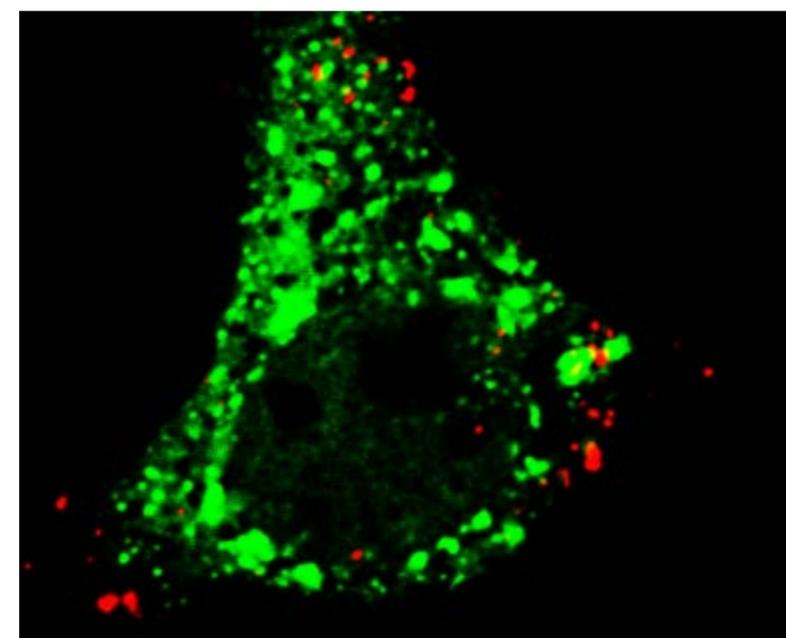
Pr Chantal Pichon

Laboratory Host Scientist

Dr Chantal Pichon is a full Professor in Molecular and Cell Biology at the University of Orléans. She is currently the head of the Institute of Life Sciences and Chemistry for Life at the University of Orléans (6 lab units and 4 master degrees). She is performing her research activities at the Center for Molecular Biophysics of CNRS (Orléans, France) where she is leading the team Cell Biology and innovative therapies. One of main focus of the team is the development of chemical-based vectors for DNA, RNA (messenger RNA, replicons) and siRNA. The team is the pioneer of histidine-based nanomedicines for cellular transfection. In parallel with those investigations, the team is also involved in establishing specific cell tools and the identification of new targets for cancer and musculoskeletal tissue regeneration. Chantal Pichon has a track-record of 107 peer-reviewed publications, 10 patents and 21 grants including regional grants (ARD 2020, APR), academic funding (ANR), European grants and funding from private companies.



with the polydispersity index within 0.2. Their zeta potential was ranging from 50mV to 80mV. The capacity of these formulations to complex with mRNA and pDNA were evaluated by gel retardation assay and ultimately their transfection efficiency in dendritic cells (DC2.4 cells) measured by flow cytometric analysis. The change in the size and shape/topography of lipoplex were observed by TEM and AFM and compared to cationic liposomes. We observed that imidazole or histidine-containing lipids and polymer significantly improve the transfection up to 62%. Particularly, the expression of eGFP protein in these transfected cells goes remarkably high up to 1200 (indicated as MFI). Further evaluation in animal (mice) showed that the in-vivo transfection is remarkably high and specific to the organs which are significant in immunotherapy. It indicates that our lipid and or polymer composition was efficient to overcome intracellular barriers and could be an excellent nanomedicine for DCs targeted based cancer immunotherapy.



MessengerRNA

At this stage, we are able to conclude that the tested lipids could be good candidates in designing cationic liposomes for mRNA and DNA delivery in dendritic cells.

AROUND THE PROJECT

ORAL COMMUNICATIONS

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Akhter, S. Cardio-protective effect of fish oil based Thymoquinone Nanoemulsions, 2nd International Conference On quality In Prophetic Medicine, King Abdulaziz University Faculty of Medicine, Jeddah (Saudi Arabia), April 5-7, 2016.

POSTER

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DR MOHAMMED AYOUB

LE STUDIUM Research Fellow - ARD 2020 BIOPHARMACEUTICALS / AgreenSkills
From: King Saud University, Saudi Arabia
In residence at: PRC, Nouzilly

Mohammed Ayoub did his PhD at the Cochin Institute (Paris) on the Oligomerization of the melatonin receptors. He has held postdoctoral positions at the Institute of Functional Genomics in Montpellier and the Institute of Medical Research in Western Australia, working on the molecular pharmacology of GPCRs. He then held an academic/research position at King Saud University in Saudi Arabia (2012-2014). Recently, he has been awarded the prestigious AgreenSkills Plus Fellowship (in the frame of Marie Skłodowska-Curie Actions), which cofunds his current position. His scientific career has as a major research axis the study of the biology and pharmacology of the receptors present at the surface of cells. He has focused his research interest and career plans on the development of new technologies and assays to study the different aspects of GPCRs.

DEVELOPMENT AND CHARACTERISATION OF NEW GENERATION OF GPCR THERAPEUTICS TARGETING OF G PROTEIN-COUPLED RECEPTORS BY MODULATOR ANTIBODIES

G protein-coupled receptors (GPCRs) represent the key cell membrane receptors involved in all physiological and pathophysiological processes. Their importance is illustrated by the fact that they represent the targets of ~40% of the currently marketed drugs and a double recognition by Nobel Prizes awarded in 1994 and 2013 to scientific works related to GPCRs. Since their discovery our understanding of GPCRs has significantly evolved with the emergence of new concepts that will certainly help to understand their implication in human diseases and the design of safer and more efficient therapeutics.

This project deals with a new generation of biologicals based on small antibodies generated from camelids, called nanobodies. The aim is to develop selective nanobodies targeting GPCRs, one of the major families of protein receptors present at the surface of the human and animal cells. In the framework of the ARD 2020 Biopharmaceuticals, a pharmacological study and a functional characterisation of GPCR - selective nanobodies is being undertaken with the aim to discover nanobodies that could be used as therapeutics in both humans and animals. GPCRs to be targeted will be obtained in collaboration with Synthelis, a small company specialized in the production of membrane proteins which is launching a laboratory within the PRC Unit to work on the project.

Nanobodies will be selected using phage-display libraries generated in the BIOS group. Dr Ayoub is in charge of developing a battery of molecular, biochemical, and pharmacological assays that will be instrumental for both the screening and the detailed characterisation of the nanobodies. The selection of the nanobodies will be performed depending on the nature of the effect observed on the receptors. Thus, the GPCR activating (agonist) and inactivating (antagonist) nanobodies will be selected and tested both *in vitro* (in cell cultured in the laboratory) and *in vivo* (in animals) to assess their potential for clinical and agronomic applications.

Bioinformatics will be a key element of the project since the BIOS group has developed a docking algorithm, which allows predicting with a great accuracy the epitope recognized by a nanobody, knowing only its nucleotidic sequence. Ongoing developments aim at taking advantage of the algorithm for *in silico* maturation of nanobodies (i.e. improving their selectivity and/or affinity).

To date, almost all the cellular and molecular tools required for the development and characterisations of antibodies have been



Dr Eric Reiter

Laboratory Host Scientist

Eric Reiter is research director at INRA Nouzilly. He has a long-standing experience of GPCR biology and pharmacology. He received his PhD in Molecular Biology from University of Liège, Belgium in 1996. The same year, he took a position of researcher at INRA, Nouzilly, France. He visited Robert J. Lefkowitz's laboratory at Duke University for two years between 2003 and 2005. He was group leader in the PRC Unit from 2006 to 2011. In 2009, he co-founded ReproPharm, of start-up from INRA. He has published 67 peer-reviewed papers that have been cited more than 3150 times. He has mentored numerous students and coordinated research projects funded by Région Centre, ANR and INRA. He has acted as an expert for national and international agencies (AERES, ERC, ESF, BBSRC,...). He organised 1 international congress and 2 workshops and maintains sustained editorial responsibilities for a number of journals. He is a WorkPackage leader in MAbImprove LabEx and coordinates the GPCRab project in the framework of ARD 2020 Biopharmaceuticals.

assembled. This includes the cell lines, the different cDNAs (genes coding for the proteins of interest), the assays and systems to generate and to select the nanobodies, the pharmacological and functional assays, as well as the instruments to be used. Phage libraries have been prepared from the blood naive animals (i.e. animals that have not been immunized with the targeted GPCR) and will soon be compared with phage libraries prepared from immunized animals.



LE STUDIUM CONFERENCES

Antibodies Targeting G Protein-Coupled Receptors, Recent Advances and Therapeutic Challenges

LE STUDIUM conference has been organized as a satellite workshop of the 5th meeting of the French GDR 3545 on "G Protein-Coupled Receptors (GPCRs) - From Physiology to Drugs" also held in Tours, 22-24 November 2016. The conference gathered speakers from academia and industry those are considered as world-leaders in the molecular pharmacology and signaling of GPCRs as well as the development of GPCR antibodies. During two days, the speakers focused on new advances and challenges in the development of antibodies targeting GPCRs and their potential applications in the study of GPCR structure and function as well as their implication in pathophysiology. Indeed, many examples of *ex vivo* and *in vivo* studies have been presented using GPCR antibodies and their promising applications in pathophysiology.

LE STUDIUM LECTURES

Peut-on breveter le vivant ?

by Angélique Dacheux, IPforS

In parallel to the scientific conference on GPCR antibodies, le STUDIUM public lecture was given by Dr Angélique Dacheux on the topic "Can we patent life?" on 24th of November 2016 at the Lycée Descartes in Tours. Dr Dacheux is an expert and consultant in intellectual property and patent rights. In 2012, she founded her consulting company IPforS (intellectual property for the service of scientists) which consists in guiding project investigators and scientists willing to create their start-ups/spin-off companies to adequately establish their IP strategies. The lecture gave a thorough introduction to the different necessary steps to protect and patent knowledge and scientific discoveries. The lecture was followed by an interesting debate among both scientists in different fields and civil society participants.

AROUND THE PROJECT

ORAL COMMUNICATIONS

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POSTERS

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DR CRISTIANO DE MICHELE

LE STUDIUM Research Fellow - PRESTIGE
From: Sapienza University of Rome, Italy
In residence at: CBM, Orléans

Cristiano De Michele is assistant professor at the Physics Department of «Sapienza» University of Rome doing research in the field of Theoretical Physics of Matter. He received his Master in Physics from the University of Pisa in 1998 (*summa cum laude*) and his PhD from University of Naples-Federico II in 2003. After having worked on glassy and colloidal systems, recently he has started studying both theoretically and numerically the aggregation processes and liquid crystal phases of DNA-based colloids using suitable coarse-grained models. His position as a LE STUDIUM Research Fellow is cofunded by the PRESTIGE Programme (Marie Skłodowska-Curie Actions COFUND).

COARSE-GRAINED MODELS OF BIOLOGICAL SYSTEMS

The cell interior is an amazingly complex and crowded medium. Up to 40 % of its available volume is swarming with hundreds of thousands of biomolecules of all type and size, highly structured in specific compartments separated by different membranes and filled up with small organelles and a tight web of cytoskeletal structures. How proteins can possibly manage to find their unique binding partners in such an environment of mind-boggling complexity, looking more as a bustling city than a dull biological background, is still one of the most elusive puzzles in science. Thanks to the most recent technical advances in imaging and

single-particle tracking techniques, paralleled by tremendous progress in computational approaches, it is now generally believed that the environment itself is a key factor in shaping the biochemical processes that it hosts. However, it is very difficult to interpret experiments on biomolecular transport and association performed in living cells, due to the plethora of unknown and spurious effects that are likely to affect the measurements, arising from all the processes running in parallel to the one under scrutiny and most probably intertwined with it in unknown ways. The common solution to these strongly impeding disadvantages is the test tube. However, in order to perform experiments under the required conditions, one pays the price of studying a pale copy of the process of interest, distilled to such dilute and controlled conditions to become with great probability an utterly different process. The present project aims at taking an intermediate step from the test-tube to the cell stopping half-way, in the realm of colloids. Drawing on concepts and methods from the physics of colloids, we will build computational tools to simulate biomolecular association in complex environments. Biomolecules will be modelled as hard convex objects (HCO) or collections of freely hinged HCOs. The environment will be replenished of crowding agents of different shape (shape matters), size (exploring the effect of specific mixes) and concentration (crowding). Enthalpic interactions will be allowed for through sticky spots (local piece-wise constant potentials), thus enabling us to explore crowding effects on biomolecular association along the brim of subtle enthalpy/entropy trade-offs.

AROUND THE PROJECT

ORAL COMMUNICATIONS

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SCIENTIFIC PUBLICATIONS

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Pr Francesco Piazza
Laboratory Host Scientist

Francesco Piazza is Professor at the CNRS laboratory, Centre for Molecular Biophysics, affiliated with the University of Orléans. A physics graduate of the University of Florence in Italy, he obtained his PhD at Heriot-Watt University, Edinburgh, UK in 2002. He was a research and teaching associate at the Ecole Polytechnique Fédérale de Lausanne in the Statistical Biophysics group, from 2003 to 2009. Professor Piazza uses quantum biology to elucidate the functioning of efficient light-harvesting molecular complexes; studies allosteric communication in proteins using coarse-grained models of protein dynamics; models diffusion-limited reactions among complex macromolecules or within complex environments and studies macromolecular crowding where the interior of the cell shares many properties with the liquid state of matter.

DR SIVAKUMAR PONNURENGAM MALLIAPPAN

LE STUDIUM Research Fellow - ARD 2020 COSMETOSCIENCES
From: RIKEN, Japan
In residence at: NMNS, Tours

Ponnurengam Malliappan Sivakumar was awarded doctorate degree from the Department of Biotechnology, Indian Institute of Technology Madras, India. Currently he is a Le Studium Fellow at the Institute of Advanced Sciences, Orléans, France. He has also received prestigious postdoctoral fellowships like JSPS (Japanese Science Promotion Society) research fellow and FPR (Foreign Postdoctoral Researcher), worked at RIKEN laboratories, Wako-shi, Japan. He also acquired postdoctoral trainings from University of Pisa, Pisa, Italy and Indian Institute of Technology Madras, Chennai, India. At present, he also serves as editorial board member and as reviewer for several journals. His major research interests include nanoparticle synthesis, drug delivery, biomaterials and biofilm prevention. He authored and co-authored more than 38 internationally peer reviewed journal papers, edited 3 books with international publishers and contributed to ten invited book chapters.

INNOVATIVE NANOCARRIER DELIVERY SYSTEM FOR ACTIVE COSMETIC INGREDIENTS (ACI) AND *IN VITRO* MODEL DEVELOPMENT FOR EPIDERMIS

Stratum corneum is considered to be a barrier for the diffusion of drugs. The stratum corneum is found to be of approximately 15 μm thickness and contributes to the Outer most part of the epidermis. Stratum corneum contains fatty acids in free form, cholesterol and ceramides as lipid multilayers which limits the penetration of the drug molecules. Nano delivery systems can be used to improve the drug penetration to the skin. Intracellular lipid route is important for the nanoparticle

based drug delivery.

Nano delivery system for Active Cosmetic Ingredients (ACI) has been used as nanomaterials in order to:

1. improve their UV protection,
2. skin penetration,
3. site directed delivery of ingredients,
4. long term persistence/ controlled release of ingredients,
5. Stability of ingredients
6. solubility,
7. and to minimize toxicity etc.

Several physicochemical characteristics are pre-requisite for the nanocarrier delivery systems like hydrophobicity, rigidity, size and their mechanism of skin penetration. Polymeric nanoparticles are stable due to their rigid matrix; their size and hydrophobicity are tunable. Hence we propose polymeric nanoparticles as nanocarrier system for Active Cosmetic Ingredients. Our objective is to develop a novel nanocarrier delivery system for Active Cosmetic Ingredients (ACI) and evaluation of their effective delivery/penetration to stratum corneum by developing *In vitro* epidermis model. This project includes two steps namely,

1. Development of novel nanocarrier system using polymeric nanoparticles and
2. *In vitro* model development for epidermis. The prepared and evaluated nanoparticles are then used for cosmetic applications.

AROUND THE PROJECT

SCIENTIFIC PUBLICATIONS

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ORAL PRESENTATIONS

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Sivakumar P.M. Characterization and Prevention of Medical Biofilms, RTM-2016 International conference, Alagappa University, Karaikudi (India), December 20-21, 2016.



Dr Emilie Munnier
Laboratory Host Scientist

Emilie Munnier is an assistant professor in pharmaceutical technology and cosmetology at the faculty of Pharmacy of Tours and a senior researcher in the research team EA6295 Nanomedicines et Nanoprobes. After her Pharm D, she obtained a PhD in Life and health sciences at the University of Tours, dealing with nanotechnologies applied to cancer treatment, and finally her HDR in 2016. Using her skills in formulation and analytical chemistry, she now dedicates herself to the encapsulation of active molecules to improve their delivery in the skin and their interaction with the skin or with the ingredients of a pharmaceutical/cosmetic final product. She has been the coordinator of several national research projects implying actors of the cosmetic industry, among them the COSMICC project, part of the Cosmetosciences regional research program. The aim is to first to develop innovative stimuli-responsive encapsulation systems for the delivery of cosmetic ingredients, then to improve the analysis of biological tissues by vibrational spectroscopy methods to elucidate their mechanism of action and measure their efficacy.



DR JORGE GUTIERREZ

LE STUDIUM Research Fellow - ARD 2020 BIOPHARMACEUTICALS
 From: Columbia University, New York, USA
 In residence at: NCC, Tours

Jorge L. Gutierrez-Pajares worked at Columbia University (New York, USA) conducting cancer research in a multidisciplinary environment. His collaborative work with the Institute for Cancer Genetics, the Stem Cell Initiative, the Molecular Genetic Pathology, and the Center for Computational Biology and Bioinformatics has allowed him to gain experience in the fields of cell signaling, epigenetics, high-throughput sequencing, and system biology focused on understanding the behavior of complex biological networks. His research takes advantage of epigenetic and genomic analysis of cancer tissues and established gastric cancer cell lines. He was awarded a Columbia University - University of Glasgow fellowship to the Institute of Cancer Sciences (Glasgow, UK). In 2009, he was also awarded a fellowship from American Association for Cancer Research - Avon presented at 100th Annual Meeting of the AACR in Denver, USA.

CHOLESTEROL AND CANCER , LIPIDS AS MODULATORS OF THE RESPONSE TO BIODRUGS

The team's scientific project is multidisciplinary (biology, biochemistry, physiology, metabolism, nutrition and cancerology) and focuses on the transverse interaction of resources for research (medicine, pharmacology, sciences, University Institute of Technology). We investigate the different modes of molecular and cellular actions and the impact of specific lipids on mitochondrial function, cancer cell lines, and the relationship between tumour and its host. The goals of the project are to better understand the metabolism of cholesterol and use this knowledge to develop new methods to target the development of tumors.



This project provides the opportunity to work in a network of nationally and internationally recognized laboratories of the region. Benefiting from the international scientific environment of region Centre-Val de Loire and work under the leadership of the UMR 1069 «Nutrition, Growth and Cancer» research unit, University Francois-Rabelais in Tours. During this year we started the development of a biopharmaceutical composed of

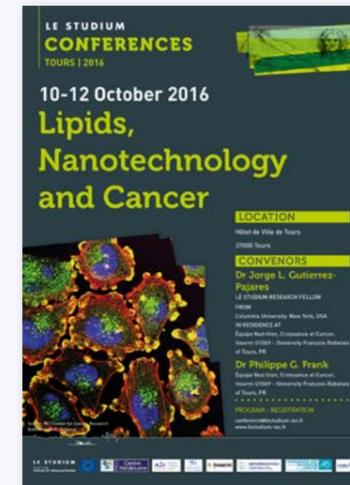
apolipoprotein AI (ApoAI), phospholipids and cholesterol or phytosterols (PS), named reconstituted high-density lipoproteins (rHDL). Given that breast cancer over-expresses the SR-BI receptor that specifically binds to ApoAI, this rHDL will be specifically delivered to breast cancer tumors.

We hypothesise that PS will compete with endogenous cholesterol and interfere with key cellular processes, such as migration and proliferation. We were able to demonstrate that, two of our new rHDL were able to block breast cancer cell migration.



Dr Philippe G. Frank
 Laboratory Host Scientist

Philippe G. Frank obtained his PhD in 1998 at the University of Ottawa, in Ontario, Canada in lipoprotein studies. He then joined the Albert Einstein College of Medicine as a post- doctoral fellow. There, his work focused on the role of caveolin proteins in cancer and atherosclerosis, in addition to lipoprotein and cholesterol metabolism. In 2006, he joined the Kimmel Cancer Center as Assistant Professor at Thomas Jefferson University in Philadelphia, Pennsylvania where he started a program to examine the role of lipoproteins and cholesterol during cancer development and progression. Recently, he was appointed as a senior research investigator at the University Francois-Rabelais of Tours to build on and extend the ARD 2020 Biopharmaceuticals funded initiative of Region Centre-Val de Loire, in the research project entitled «Lipids as modulators of the response to biodrugs». His research project is hosted within the Nutrition, Croissance et Cancer (N2C) Inserm research team of Professor Stephane Chevalier. He is currently serving as Associate Editor of The American Journal of Pathology and of Frontiers in Cardiovascular Medicine (Lipidology and Metabolism).



LE STUDIUM CONFERENCES

Lipids, Nanotechnology and Cancer

The objectives of this conference were :

- Gather experts in different areas of lipid research to share their expertise with researchers and students of the Val-de-Loire
- Define novel strategies to counteract tumor growth and decrease malignancy that could be presented in future grant applications

The expected outcomes of this event were :

- Novel ideas and strategies were presented and discussed
- New opportunities for future international collaborations were established.

This scientific meeting brought specialists in several areas of lipid research. A great view and future perspectives were presented in relevant areas in cancer: bioactive lipids (Dr Marc Poirot, Dr Silvère Baron, Pr Faustino Mollinedo) , Lipid metabolism and Cellular Signaling (Pr Johannes Swinnen, Pr William Griffiths), Nutrition and cancer (Pr Philip Calder), Nanotechnology for the treatment of cancer - Targeting Lipid Metabolism (Dr Alan T. Remaley, Dr Claire Wilhelm, Dr Ronald Barbaras).



LE STUDIUM LECTURES

Les lipides et le risque de cancer du sein

By Pr Stephan Chevalier, Director of the research unit Nutrition, Croissance et Cancer Inserm UMR1069 at the University François-Rabelais of Tours.

The composition of fatty acid in the mammary adipose tissue is recognized as qualitative marker of the amount of lipid intake but also may reflect nutritional sign of risk or prognostic of breast cancer. Therefore, having in mind the need of personalized medicine, the determination of the composition of fatty acids in breast cancer patients opens the door for a nutritional intervention towards determining the best treatment for each patient as well as improving a better response to the treatment. In this lecture, Pr Chevalier presented non-invasive methods to determine the lipid composition in adipose tissue of cancer patients.

JANUARY 2016

DECEMBER 2016

DR FERENC KÁLMÁN

LE STUDIUM Research Fellow - PRESTIGE
From: University of Debrecen, Hungary
In residence at: CBM, Orléans

Dr Ferenc K. Kálmán received his Ph.D. (2008) from the University of Debrecen studying under the supervision of Pr Dr Ernő Brücher. In 2007, he joined the group of Pr Silvio Aime at the University of Torino as a postdoctoral fellow. After 3 years, he returned to the UD as a scientific researcher. Ferenc K. Kálmán is an author of 24 journal publications and 4 patent applications. He was awarded the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (terms 2015–2018) and Innovation Award of the University of Debrecen (2016).

MN(II)-BASED SMART CONTRAST AGENTS: SYNTHESIS AND PHYSICO-CHEMICAL CHARACTERIZATION

Nowadays, the paramagnetic Gd(III) ion is the most widely used relaxation enhancing agent in Magnetic Resonance Imaging (MRI). A newly identified disease called Nephrogenic Systemic Fibrosis (NSF) has pointed out that the Gd(III)-based contrast agents considered safe can cause serious problems in special circumstances. The paramagnetic Mn(II) is believed to be a good candidate to replace Gd(III), since the Mn(II) ion is an essential element, thus it is better tolerated *in vivo*. More recently, there is a growing interest to gain information at the molecular level by visualizing the bioactive species or monitoring the physico-chemical parameters of the tissues which can be achieved by applying responsive probes a.k.a. smart contrast agents. The goal of the research project was to investigate the ligands PC2A-SA, PC2A-3Py and PC2A-Bp and their complexes formed with essential trace metals (Mg(II), Ca(II), Zn(II), Cu(II) and Mn(II)). First of all, we wanted to prove that the ligands form sufficiently inert complexes with the Mn(II) ion which is required for the *in vivo* application. On the other hand, we wanted to investigate the capabilities of the designed Mn(II) complexes of sensing tissue pH or Zn(II) concentration as well as their ability of being good blood pool agents. The synthesis and characterization of the PC2A-BP and PC2A-SA ligands and their metal complexes have been carried out. A detailed thermodynamic investigation was performed in both cases by using pH-potentiometric and spectrophotometric techniques to determine the stepwise protonation constants ($\log K_i^H$) of the ligands and possessing those, the stability constants of the complexes. The stability constants of the [Mn(PC2A-BP)] and [Mn(PC2A-SA)] complexes were found to be high enough to ensure that the complex formation occur at 100% extent near physiological conditions, which is also important for the *in vivo* application. The kinetic investigations have revealed that the dechelation reactions of the investigated complexes can only occur through the so called proton-assisted pathway and the rate constants of that (k_{ip}) were found to be 17.1 ± 0.3 and $4.8 \pm 0.2 \text{ M}^{-1}\text{s}^{-1}$ for the [Mn(PC2A-BP)] and [Mn(PC2A-SA)], respectively. With the use of k_{ip} , it is possible to calculate the half-life ($t_{1/2}$) of the *in vivo* dissociation of the Mn(II) complexes and the percentage of these complexes that would be dissociated in the human body after iv. administration. The calculated $t_{1/2}$ values are 60 and 200 hours at 37 °C and pH=7.4 for the [Mn(PC2A-BP)] and [Mn(PC2A-SA)] complexes result in nearly 3 and 1% of *in vivo* dissociation which is more than acceptable. The relaxivity values of the [Mn(PC2A-BP)] complex were determined in the absence and presence of Human Serum Albumin (HSA) at 37 °C, 20 MHz and those were found to be 3.8 and 23.5 $\text{mM}^{-1}\text{s}^{-1}$, respectively. The increase of the relaxivity in the presence of the HSA indicates a strong interaction between the complex and the protein which is essential property for an angiographic agent. To prove concept tangiographic MRI investigations were performed with our [Mn(PC2A-BP)] complex in mice in which we could reach a significant improvement in MRI contrast even at very low complex concentration (25 $\mu\text{mol/kg}$). Based on these facts, one can conclude that this compound is good for *in vivo* application. The relaxivity of the [Mn(PC2A-SA)] complex was also recorded as a function of pH to gain information about its pH-sensing capability. Unfortunately, the [Mn(PC2A-SA)] complex senses the change in pH only above pH 8 which needs to be lowered



Dr Éva Jakab-Tóth
Laboratory Host Scientist

Dr Éva Jakab Tóth (DR1 CNRS) is expert in the design, synthesis and characterization of metal chelates related to imaging applications. After a PhD from the University of Debrecen (Hungary) in lanthanide coordination chemistry, she occupied research positions at the Federal Institute of Technology of Lausanne, Switzerland and was appointed as DR CNRS in 2005. Since 2012, she is the director of the Centre of Molecular Biophysics. She has solid experience in designing highly efficient and smart MRI imaging probes. She published over 140 original papers and was editor of "The Chemistry of Contrast Agents in Medical Magnetic Resonance Imaging", Wiley, 2001 and 2013. She was the chair of the European COST Network "Metal-Based Systems for Molecular Imaging Applications". Her recent research focuses on imaging probes to detect enzymatic activities, neurotransmitters, extracellular calcium and amyloid peptides.

in order to be able to sens pH near physiological conditions. However, owing to its high relaxivity and remarkable kinetic inertness the [Mn(PC2A-SA)] can be suggested as an extracellular contrast agent.



LE STUDIUM CONFERENCES

Being Smart In Coordination Chemistry: Medical Applications

The conference intended to bring together different actors of the research and medical application of metal complexes, including chemists, biochemists and physicians in the objective of confronting different views, exploring chemical needs and potential responses. One of the cornerstones of successful therapies is the early recognition of diseases which can be accomplished by the visualization of the molecular events in biological processes, from the homeostasis of a simple metal ion to the complex functioning of biomolecular assemblies is essential. For this, even the most sophisticated instrumentation tools like MRI, PET, SPECT or optical imaging need to be complemented with the appropriate chemistry which is also true for numerous therapeutic applications relied on metal ions. We invited physicians/end-users such as Pr Ervin Berényi who is an internationally recognized radiologist, to obtain information about their special view in the field of the metal-based diagnostic and therapeutic agents. We also invited numerous experts to give plenary lectures in the field of diagnostic (Pr Silvio Aime, Pr Frank Denat) and therapeutic (Dr Kristina Djanashvili, Pr Olivier Tillement) application of metal complexes. In addition, several presentations were given by young researchers with an aim to facilitate new collaborations between laboratories working in different but interknit fields of potential metal-based agents for human practice.

LE STUDIUM LECTURES

Chimie & Métaux: du diagnostic médical aux thérapies

By Pr Franck Denat, Université de Bourgogne, UFR Sciences et Techniques, ICMUB - UMR CNRS 6302

Pr Franck Denat is the head of the Institut de Chimie Moléculaire de l'Université de Bourgogne, Dijon. His research interests concern the synthesis and the chemistry of macrocyclic polyamines, the design and synthesis of multifunctional chelating agents for labeling biological vectors for medical imaging. The presentation intended to show the role of the metal ions and their complexes in the modern diagnostic and therapeutic applications, the importance of the coordination chemistry in the development of these materials and several diagnostic tools were also introduced to the audience such as MRI relying on the use of paramagnetic compounds, the PET and SPECT techniques using the complexes of radionuclides or the optical imaging employing luminescent lanthanide complexes emitting visible or infrared light. On the other hand, the talk was also focused on the basis of the coordination chemistry giving a special insight for the people being not familiar with this field.

AROUND THE PROJECT

ORAL COMMUNICATIONS

Kálmán, F. K. The wonderful world of metal ions: Manganese as a possible solution, Le Studium Thursday, Orléans (France), June 2, 2016.

Kálmán, F. K.; Nagy, V.; Regueiro-Figueroa, M.; Garda, Z.; Póta, K.; Tóth, E.; Platas-Iglesias, C.; Tircsó, G. Mn²⁺ Complexes as potential mri contrast agents, EuroBIC 13, Budapest (Hungary), August 28 – September 1, 2016.

Kálmán, F. K.; Nagy, V.; Balázs, V.; Tóth, E.; Tircsó, G. Results of a detailed investigation on a Mn(II)-based "smart" MRI contrast agent candidate for angiographic investigation, Le Studium conference "Being Smart In Coordination Chemistry: Medical Applications", Orléans (France), September 26 – 28, 2016.

Kálmán, F. K. The lovable coordination chemistry, sSminar at the Institut de Chimie Moléculaire de l'Université de Bourgogne (ICMUB) - UMR CNRS 6302, Université de Bourgogne, Dijon (France), November 18, 2016.

SCIENTIFIC PUBLICATIONS

Garda, Z.; Forgács, A.; Do, Q. N.; Kálmán, F. K.; Timári, S.; Baranyai, Z.; Tei, L.; Tóth, I.; Kovács, Z.; Tircsó, G. Physico-chemical properties of Mn(II) complexes formed with cis- and trans-DO2A: thermodynamic, electrochemical and kinetic studies, *J. Inorg. Biochem.*, 2016, 206–213



JULY 2016

JULY 2017



PR SALVATORE MAGAZÙ

LE STUDIUM Research Fellow - ARD 2020 COSMETOSCIENCES

From: University of Messina, Italy

In residence at: CBM, Orléans

Salvatore Magazù is a Professor in Experimental Physics and Head of the research group in Structure of Matter and Biophysics at the Physics and Earth Sciences Department of the University of Messina, Italy. S. Magazu is author of more than 300 articles in international journals; more than 40 invited communications and more than 200 communications in conferences. His research is focused on the molecular mechanisms of biological processes, such as bioprotection, denaturation and stabilization of biomolecules, investigated by the use of complementary spectroscopic techniques, such as light and neutron scattering. He has received several international and national awards, including the 2000 Scientia Europaea Prize awarded by the French Academy of Sciences and Aventis.

FROM SUGARS AND POLYOLS TO INNOVATIVE COSMETIC FORMULATIONS AND TECHNOLOGIES: MOLECULAR MECHANISMS AND NANOSCOPIC CHARACTERIZATION

The project is mainly focused on innovative cosmetic formulation processes based on natural molecules, as oligosaccharides (e.g. trehalose and its homologues maltose and sucrose) and polyols (e.g. glycerol and sorbitol). Such natural molecules have received in the last years a growing attention both from the scientific and applicative points of view. The interest is due not only to their effectiveness as bio-protecting systems conferring to biomolecules a higher stability and resistance under stress conditions but also to their nature of glass-forming systems characterized by phases of different specific density and entropy but identical composition (polyamorphism).

The project is based on two main interplaying driving directions:

1. the understanding of the chemical physical mechanisms responsible for the bioprotectant function of natural molecules;
2. the nanoscopic characterization of confinement and crowding effects of such natural active ingredients when encapsulated in delivering systems.

The research activity has been so far mainly focused on the study of structural and dynamical properties of disaccharide and polyol mixtures of cosmetic interest by spectroscopic techniques. A special attention has been paid to large scale facilities, such as neutron and synchrotron radiation spectroscopy facilities, whose instrumental performances provide an added value to the cosmetic field.



Pr Francesco Piazza
Laboratory Host Scientist

Francesco Piazza is Professor at the CNRS laboratory, Centre for Molecular Biophysics, affiliated with the University of Orléans. A physics graduate of the University of Florence in Italy, he obtained his PhD at Heriot-Watt University, Edinburgh, UK in 2002. He was a research and teaching associate at the Ecole Polytechnique Fédérale de Lausanne in the Statistical Biophysics group, from 2003 to 2009. Professor Piazza uses quantum biology to elucidate the functioning of efficient light-harvesting molecular complexes; studies allosteric communication in proteins using coarse-grained models of protein dynamics; models diffusion-limited reactions among complex macromolecules or within complex environments and studies macromolecular crowding where the interior of the cell shares many properties with the liquid state of matter.

OCTOBER 2016

OCTOBER 2017



DR MAURO MANNO

LE STUDIUM/Marie Skłodowska-Curie Research Fellow

From: National Research Council of Italy

In residence at: ICOA, Orléans

Mauro Manno is researcher at the National Research Council of Italy, Institute of Biophysics, Palermo. He is author of one patent, and several I.S.I. publications, most as first or corresponding author, as well as book chapters, abstract or articles on conference proceedings, invited talks. In the last 5 years, he was involved in different projects, and responsible of two projects related to Serpinopathies funded by Telethon Foundation (Italy) and Cariplo Foundation (Italy). He worked on several projects at large European facilities: ILL (Grenoble), synchrotron Soleil (Paris), Elettra (Trieste), ESRF (Grenoble). Current research focuses on the thermodynamic and conformational stability of protein in solutions and on the common pathways of self-assembly leading to different biologically relevant structures, including amyloid fibrils, proteins clustering on the membrane of extracellular vesicles, polymers of serpin proteins.

THE ROLE OF GLYCOSYLATION IN THE FUNCTIONAL ACTIVITY AND PATHOLOGICAL CONSEQUENCES OF SERPIN PROTEINS

The goal is to shed light into the molecular basis of a peculiar class of conformational diseases, called Serpinopathies, with a special emphasis to glycosylation, an important post-translational modification which rules the functional and pathological behaviour of the proteins responsible for the diseases. Serpinopathies are a class of genetic diseases related to the deficiency of a serpin (SERin Protease Inhibitor) and/or its accumulation as polymer chain in the cell of synthesis. For instance, the best-known α -antitrypsin deficiency is caused by mutations in alpha1-antitrypsin determining polymer accumulation in the hepatocytes and lack of inhibition of lung proteases; the Hereditary Angio-Edema is caused by a poor activity of mutated C1-Inhibitor; and the Familial Encephalopathy with Neuroserpin Inclusion Bodies (FENIB) is related to the accumulation of neuroserpin polymers within neuron endoplasmic reticulum. FENIB and in general all serpinopathies are incurable disorders also due to the incomplete understanding of polymer structure and formation, which makes it difficult to develop a successful therapeutic approach based on polymerisation inhibitors. To date, all the biochemical and biophysical research performed on neuroserpin has been carried out using recombinant neuroserpin expressed in bacteria, thus non-glycosylated. However, our recent data indicate that neuroserpin polymerisation is hindered by the presence of glycosidic chains at two sites that are glycosylated when expressed in mammalian cells. Also, preliminary experiments show that N-linked glycosylation relates to the stability and polymerization of alpha1-antitrypsin *in vitro*, as well as to the molecular conformation of the unstructured domain of C1-inhibitor. The main aim of the present project is to highlight the role of glycosylation in the conformational stability, functional activity and polymerisation propensity of neuroserpin and C1-inhibitor. This will be pursued by implementing an expression system to produce glycosylated proteins

AROUND THE PROJECT

ORAL COMMUNICATIONS

Randazzo, L.; Noto, R.; Raccosta, S.; Longo, A.; Marrate, M.; Panzeca, S.; Manno, M.; Martorana, V. Diffusion, stability and activity of neuroserpin in crowded media, National Conference of the Italian Society for Pure and Applied Biophysics, Cortona (Italy) September 18-21, 2016.

Raccosta, S.; Randazzo, L.; Noto, R.; Martorana, V.; Manno, M. Serpin conformational diseases: From molecular studies to therapeutic intervention, National Conference of the Italian Society for Pure and Applied Biophysics, Cortona (Italy) September 18-21, 2016.



Pr Richard Daniellou
Laboratory Host Scientist

Internationally recognized expert in Glycosciences, Pr Richard Daniellou received a degree in Biochemistry and a PhD (2003) in Organic Chemistry from the University of Paris XI. After two years as a postdoctoral researcher at the University of Saskatchewan (Canada), he was offered an Assistant Professor position at the ENSC of Rennes (France). In 2010 he defended a habilitation and was promoted Full Professor of Biochemistry at the Organic and Analytical Chemistry Institute of Orléans (France) in 2011. His main interest for carbohydrate-active enzymes as biocatalysts for chemo-enzymatic synthesis of glycoconjugates led him to the creation of the research group named Enzymology and Glycobiochemistry. He is currently co-author of 55 publications and 3 patents. He was awarded in 2016 the prize of the French Group of Glycosciences in recognition of his young but talented career.

and performing a detailed biochemical and biophysical characterisation, exploiting different biochemical and biophysical techniques, including sitedirected mutagenesis, enzymatic digestion and mass spectroscopy, optical spectroscopies, chromatographic and scattering techniques. In the first two months the main routes to protein expression has been established. We have drawn the overall scheme to initiate the expression in parallel of three serpin proteins: neuroserpin, α 1-antitrypsin and c1-inhibitor. This strategy will allow us to optimise the schedule for the experimental work, and at the same time it will give us a comprehensive view of the problems we could face on analogous yet different proteins. We also have set up a collaborative network of people currently working on the proteins under study, including James Irving and David Lomas from University College London (for α 1-antitrypsin), Stefano Ricagno and Martino Bolognesi from University of Milan (for neuroserpin), Sonia Caccia and Marco Cicardi from Ospedale

DECEMBER 2015

JULY 2016

PR LEANDROS SKALTSOUNIS

LE STUDIUM Research Chair
From: University of Athens, Greece
In residence at: ICOA, Orléans

Leandros A. Skaltsounis obtained his PhD from the University of Paris V and spent six years on the academic staff in Paris. Since 1994 he has been a permanent member of the Faculty of Pharmacy in the University of Athens. His research group focuses on natural product-based discovery for various applications in therapeutics, functional foods, cosmetics and agrochemicals. His initiative for the exploration of Mediterranean biodiversity led to the creation of a library that contains 2500 plant species, 500 fungi, 300 marine organisms, 9500 extracts and more than 4000 unique isolated and synthesized compounds. Research activities of his team have resulted in 15 patents. His laboratory has implemented numerous research projects funded by EU and National authorities. Professor Skaltsounis is a member of the French Academy of Pharmacy.

APPLICATION OF STATE-OF-THE-ART GREEN TECHNOLOGY FOR THE DEVELOPMENT OF HIGH ADDED VALUE COSMECEUTICALS BASED ON PLANT NATURAL PRODUCTS

The goal of this project is to develop quality anti-aging cosmeceuticals by employing state-of-the-art environmentally friendly technologies and anti-aging biology. It involves the selection of plants from a unique plant-library and a collection of plants from various areas of the worldwide flora biodiversity. A number of pharmacological targets are used to assess their anti-aging activity. A molecular signature of each extract was developed to establish a direct link between the plant-extract and downstream biological properties. "Multi-functional" antioxidant extracts that activate pathways involved in genome and proteome maintenance and/or damage prevention were identified. The approach has combined phytochemistry and molecular-cellular biology of aging. The outcome will be innovative cosmeceuticals with significant economic and societal impact.

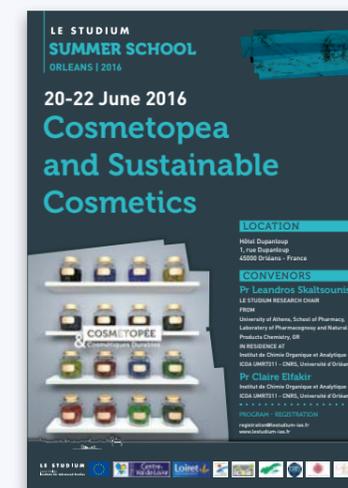
The work has proceeded with the exploitation of a unique plant-library; collection of plants from diverse areas of particular biodiversity interest; selection of plant-candidates as possible cosmeceuticals agents; application of emerging "green technologies" for extraction; initial selection on the basis of antioxidant activity and the Trolox equivalent antioxidant capacity assay and absence of toxicity; analysis of selected bioactive extracts with advanced phytochemical approaches along with extensive biological studies on a wide range of pharmacological targets in relation to aging, human cells lifespan/rejuvenation of senescent cells, suppression of genome and/or proteome oxidative damage, proteasome activities, autophagy-lysosome pathway activity and sirtuins activity.

Plant species were selected on the basis of potential anti-aging activity. Plants extracts were assessed for their antioxidant potential and the most promising analysed to identify non-cytotoxic concentrations and conferred protection against external oxidative stress. In parallel, these extracts are analyzed for their phytochemical profile and for their major constituent compounds. The effect of each extract on a particular pharmacological/ cosmeceutical target was scored in order to create its biosignature and establish a link between the plant-extracts and downstream anti-aging biological properties. Carefully designed clinical trials will further confirm the safety and efficacy of the final product(s).



Pr Claire Elfakir
Laboratory Host Scientist

Claire Elfakir is a Professor in Analytical Chemistry at the Institute of Organic and Analytical Chemistry, ICOA UMR 7311, University of Orléans-CNRS, France. Her scientific interest focuses on strategy in separation science, chromatographic development coupled to mass spectrometry and bioactive molecules in complex media. This knowledge is now applied to the development of new methods of isolation, characterisation, identification and quantitation of primary and secondary metabolites in plants, due to the privileged partnership between the University of Orléans and the Cosmetic Valley competitiveness cluster. She was the Head of the research team "Extraction, Analysis of Bioactive Molecules" at ICOA from 2009 to 2015 and currently, she is the scientific coordinator of the regional ARD 2020 Cosmetosciences programme which is in the framework of the EU Smart Specialisation Strategy for Region Centre-Val de Loire. She is also the director of the Research group (GDR 3711) Cosm'actifs created by CNRS in January 2015.



LE STUDIUM CONFERENCES

Olive Bioactives: applications and prospects

The olive tree, closely connected to the Mediterranean region, has provided a variety of goods. Research on the olive has started early but was proven inexhaustible revealing a vast array of nutritional, health and cosmetic properties. The aim of this workshop was to present a holistic research strategy towards the multifaceted exploitation of the olive tree, including activities such as extraction, fractionation, isolation, analysis of olive tree products as well as investigation of processes related to olive industry and valorization of by-products. The biological profile and the therapeutic potential of olive extracts and compounds were introduced as well as their possible applications as pharmaceuticals, nutraceuticals, dietary supplements and cosmetics agents. A visit to LVMH Research Centre closed down the 3-day event.



LVMH Research Centre

LE STUDIUM LECTURES

Les atouts santé de l'huile d'olive

By Dr Véronique Coxam, Unité de Nutrition Humaine (UMR1019 INRA/Université d'Auvergne), INRA Theix

The virtues of the olive products are recognized and exploited for a long time and are the basis of many traditional pharmacopoeias. More recently, advances in scientific knowledge in the field of preventive nutrition have corroborated the potential of olive oil for many biological targets. Indeed, epidemiological surveys reveal a disparity in the distribution of chronic degenerative pathologies at European level, with a lesser impact in countries around the Mediterranean. Thus, due to its proven benefits and its cultural importance, the Mediterranean regime (for which the fundamental contribution of olive oil is recognized) was included in the UNESCO World Heritage List. Indeed, adherence to a diet of this type is associated with a reduction in the risk of mortality from all causes combined. The virtues of olive oil are classically mentioned for chronic diseases since, due to its specific composition of fatty acids and phenolic compounds, it is capable of acting on a broad spectrum of biological targets. It thus represents an important strategic tool for the management of degenerative pathologies linked to age and to increase life expectancy without disability.

LE STUDIUM SUMMER SCHOOL

Cosmetopea and Sustainable Cosmetics

see next page

LE STUDIUM SUMMER SCHOOL COSMETOPEA AND SUSTAINABLE COSMETICS

OBJECTIVE



First Summer School of the Cosmetosciences Programme, the event was designed to attract key stake-holders in the cosmetic industry, including cosmetic manufacturers, ingredient and raw material suppliers, retailers and distributors, industry organizations and certification agencies. Moreover, the Summer School was open to researchers and academics working in Cosmetics. The three-day event gathered 50 participants in total.

Speakers have been selected from among regional and international researchers, and enterprises from the region Centre-Val de Loire and beyond.

The Summer School ran over 2 days with:

1. Formal presentations on scientific topics
2. Visit to ICOA laboratory at the University of Orleans for practical demonstrations
3. Exchanges time with and among enterprises

This event presented a session on the funding of European Projects, how to prepare competitive projects with industrial partners.



JANUARY 2015



JANUARY 2016



DR GYULA TIRCSÓ

LE STUDIUM Research Fellow
From: University of Debrecen, Hungary
In residence at: CBM, Orléans

Gyula Tircsó gained his PhD from the University of Debrecen, studying under the supervision of Pr Ernő Brücher. In 2004 he joined the group of Pr Dean Sherry at the University of Texas at Dallas (Richardson, Texas, USA) as a postdoctoral research associate. After nearly four years in this post Gyula made a return to academic research at the University of Debrecen where he was appointed a junior lecturer in 2008 and Associate Professor in 2010. Gyula is an author of 41 journal publications, 2 book chapters and 3 patents. Gyula was awarded the following awards/scholarships: the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (2016-2019), Innovation Award of the University of Debrecen (2016), Bolyai Plakett of the Hungarian Academy of Sciences (2015), Publication Award of the University of Debrecen (2015), Outstanding Tutor of the Faculty of Science and Technology, University of Debrecen (2012) and the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (2011-2014).

RATIONAL DESIGN, SYNTHESIS AND STUDY OF NEW MACROCYCLIC LIGANDS FOR BIOMEDICAL AND RADIOPHARMACEUTICAL APPLICATIONS

The main goal was to understand the mechanisms that govern the thermodynamic (stability) and kinetic properties (formation and dissociation kinetics) of metal complexes. These are important parameters to be considered for application of lanthanide(III) complexes in Nuclear Medicine. We are particularly interested in complexes formed with ligands belonging to a new class called "hybride" or "scorpionate type" chelators. In an effort to develop ligands with accelerated complexation kinetics toward metal ions used in radioimmunotherapy M. W. Brechbiel and co-workers have designed and studied some "hybride" ligands. However, despite the very promising features displayed by these chelators, (rapid complex formation with important isotopes often used in radiopharmacy, excellent serum stability and fast clearance of the radiolanthanide chelates), the detailed equilibrium, kinetic and structural characterisation of the complexes are still missing. As a first step on this avenue, the DEPA ligand (which can be obtained as a result of "marriage" of the DO₃A and the IMDA chelators) was synthesized by using a scheme that is similar to that in the literature. The detailed equilibrium studies performed on the complexes of some biogenic and Ln(III) ions indicate that the DEPA ligand forms slightly weaker complexes of [ML] composition than the parent DO₃A ligand. At the same time the [M(DEPA)] complexes were all found to form protonated complexes with protonation constants (log K[Gd(DEPA)]*H=7,34(3) relax, 7.18(8) pH) very similar to that of the free ligand (log K₃H =7,80(1)pH) and they also formed dinuclear complexes with stabilities very similar to the corresponding [Ln(IMDA)]⁺ complexes. In contrast to the published data it was proved by us using direct methods that the protonated [LnH(DEPA)] complexes (Ln=Ce³⁺ and Eu³⁺) form 3-4 times faster than the corresponding [Ln(DO₃A)] complexes. The kinetic inertness of [LnH(DEPA)] complexes (Ln=Ce³⁺, Eu³⁺ and Yb³⁺) were characterized by studying the rate of the metal exchange reactions occurring with Cu²⁺ ion. The results of these studies revealed that dissociation of [LnH(DEPA)] complexes occurs faster than the dissociation of the Gd complex formed with the parent DO₃A ligand. Based on our results one can conclude that the IMDA "tail" in the DEPA ligand is not involved in the complexation below pH=6.3 as it remains protonated and thus it cannot have much effect on the kinetics of complexation. On the other hand, the deprotonation of the given group opens up a possibility for the utilization [Gd(DEPA)] complex as a pH-responsive "smart" probe as its relaxivity responds to pH in the pH range of pH=7.18±1.0. The design and synthesis of a new ligand based on the rigid PCTA platform allowed us to shift the interval of the pH response by one pH unit lower which is more favourable for *in vivo* applications while the favourable thermodynamic and kinetic parameters were retained.



Dr Eva Jakab-Toth
Laboratory Host Scientist

Eva Jakab Toth (DR1 CNRS) is a leader in the design, synthesis and characterisation of metal chelates related to imaging applications. After a PhD from the University of Debrecen, Hungary in lanthanide coordination chemistry, she occupied research positions at the Federal Institute of Technology of Lausanne, Switzerland and in 2005 was appointed as Director of Research CNRS. Since 2012, she is Director of the Centre of Molecular Biophysics. She has extensive experience in designing highly efficient and smart MRI imaging probes. She has published over 140 papers and was editor of The Chemistry of Contrast Agents in Medical Magnetic Resonance Imaging, Wiley, 2001 and 2013. She was Chair of the European COST Network "Metal-Based Systems for Molecular Imaging Applications". Her recent research focuses on imaging probes to detect enzymatic activities, neurotransmitters, extracellular calcium, and amyloid peptides.

SONOPORATION FOR THERAPY: FROM *IN-VITRO*, TO *IN-VIVO* TO PATIENTS

PROJECT

Although cancer specialists can call on a plethora of treatment approaches, current treatment outcomes and patient survival rates remain modest. Sonoporation is a delivery technique for which high-frequency sound is used in conjunction with microbubbles to enhance the permeability of biological barriers while allowing coadministered therapeutic drugs or genes to be introduced into target tumours. Although sonoporation offers promise as a drug delivery tool with potential of alleviating the suffering brought on by the ravages of various disorders it has not been adopted as a clinical tool because its safety has not been evaluated and the relevant protocols leading to its efficient use in humans remains poorly defined and thus broadly unregulated. In this Consortium we propose to establish a framework for the safe and effective use of sonoporation as a tool for selective drug delivery in order to enhance drug bioavailability in tumor tissue.

To achieve this goal, we have mobilised a multidisciplinary team with the express purpose of creating a research network that will share research outcomes, generate new research supported by "Ideas Workshops" and manage research relationships. Research tackles key challenges facing clinical translation of sonoporation. We are first constructing a database of preclinical studies of sonoporation in animal to identify microbubble properties and ultrasound parameters leading to enhanced tumour drug biodistribution and bioavailability. Moreover, we will identify the imaging protocols necessary to evaluate sonoporation efficiency. As a part of this Consortium we will support targeted short-term research exchanges that effect knowledge-transfer and research training. Our Consortium is timely and will bring focus to an area of pressing clinical need by establishing the protocols needed to achieve quantifiable transient tissue disruption and absorption of drugs by targeted cells both safely and efficiently.

PARTNERS



Pr Mike Averkiou
University of Washington (USA)



Pr Nico de Jong
Erasmus University (The Netherlands)



Pr Chrit Moonen
University Medical Center Utrecht (The Netherlands)



Pr Hanneke W.M. van Laarhoven
Medical Oncology Academic Medical Centre (The Netherlands)



Dr Ayache Bouakaz
Consortium coordinator

Ayache Bouakaz is a Research Director and Team Leader at "Imagerie et Cerveau" joint research unit U930, Inserm, University François-Rabelais of Tours. His research focuses on imaging and therapeutic applications of ultrasound, microbubble contrast agents and transducer design. He graduated from the University of Sétif, Algeria, and obtained a PhD at the Institut National des Sciences Appliquées de Lyon, France. In 1998, he joined the Bioengineering Department at The Pennsylvania State University USA and later moved to the Erasmus University Medical Center, Rotterdam in the Netherlands. He is Associate editor for IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, a member of the editorial board of the Journal of Ultrasound in Medicine and Biology, and a Member of the technical committee of the IEEE Ultrasonics International Symposium. Dr Bouakaz was the General Chair of the IEEE 2016 International Ultrasonics Symposium Tours, France (18 - 21 September 2016).

POLISH-FRENCH SCIENTIFIC WORKSHOP ON LIFE SCIENCES

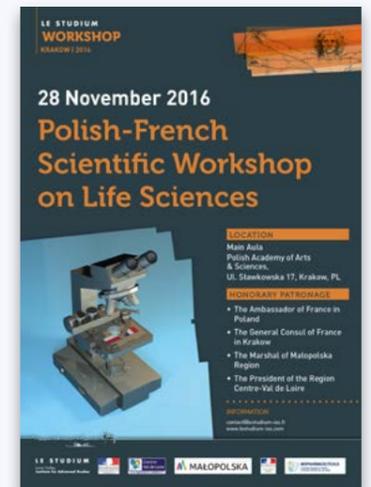
CONTEXT

On 27-30th November 2016, LE STUDIUM organised the visit of a delegation of scientists to Krakow, Poland. Laboratories and institutions from both regions Centre-Val de Loire and Malopolska had the opportunity to introduce their competences and activities. Successful face to face meetings developed into positive outcomes and potential collaborations.

OBJECTIVES

Following a visit to Matopolska region in Poland in 2014, the Centre-Val de Loire Regional Council drew up an inventory of scientific cooperation between the CNRS and the Jagiellonian University in Krakow and identified the potential for scientific cooperation in the future, in line with the intelligent specialisation strategies already designed in the two regions. The Regional Council mobilized all stakeholders around a concerted approach in the field of biotechnology and life sciences and confirmed its wishes to make decentralized cooperation a tool to mobilize favorable conditions for scientific and economic exchanges. The approach is based on three dimensions: higher education, research and innovation, technology transfer and economic development. LE STUDIUM Loire Valley for Advanced Studies, well advanced in the Matopolska region thanks to its activities related to the Biopharmaceuticals Programme was appointed to organise a Life Science Workshop in Krakow and a visit of a scientific delegation in November 2016. The main objectives listed for this Life Science Workshop were a better understanding of both regional actors on their specificities and expectations and the establishment of long-term scientific collaborations. After a full day of presentations and initial exchanges, participants were asked to imagine, with their Polish partners, the outline of a solid and lasting scientific collaboration thanks to various tools reminded to all the stakeholders: the LE STUDIUM Smart Loire Valley Programme, calls for projects of Regional Interest from the Centre-Val de Loire Regional Council, scholarships from the French Embassy in Poland, the Polonium programme,

etc... The 12 researchers from the University of Orléans, the University François-Rabelais of Tours, the Centre Inra Val de Loire, the CNRS, the Inserm had opportunities to visit and link with the Faculty of Biochemistry, Biophysics and Biotechnology and the Institute of Zoology of the Jagiellonian University, the AGH University of Science and Technology, the Jagiellonian University Medical College, the Matopolska Center for Biotechnology, the Institute of Plant Physiology of The Polish Academy of Sciences, the Krakow University of Agriculture, the Polish National Research Institute of Animal Production, the Jagiellonian Centre for Experimental Therapeutics. The delegation met with businesses and the Klaster Life Science and visited The Jagiellonian Center of Innovation (JCI) and SOLARIS – the Polish national synchrotron. Successful partnerships are already concluded or extended.



COSMO COSMETICS IN ORLEANS

PROJECT

The COSMO Consortium has enabled the formation of a virtual team of five internationally competitive researchers sharing the common research goal of planning and putting into action a series of initiatives to promote applied research at the interface with industries of the Pole of Competitiveness – Cosmetic Valley. It is well established that research plays a key role within Cosmetic Valley and in this framework COSMO closely interacts with actors from cosmetic enterprises and with research teams from universities. The basic assumption is that, in the cosmetics industry, innovation is in rapid turnover and only a structured research approach can allow the development of new cosmetic products that answer market needs while integrating the latest technological discoveries. Cosmeceuticals comprise a new category of products that rely on advances in skin biology and nanotechnology to deliver clinically proven active ingredients to the skin. There is ongoing debate about the efficacy and the safety of these cosmeceuticals so it is clear that research is necessary to understand the mechanism of action of these products. In this frame, COSMO is mainly focused on the optimisation of innovative cosmetics and cosmeceutic products, to the clarification of therapeutic aspects in cosmetics, to the characterisation of biomarkers and to develop new types of drug delivery system. As far as the research activities are concerned, these will follow these main lines:

1. Physical-chemistry in cosmetics and cosmeceutics;
2. Formulations;
3. Drug vectorization and targeting;
4. Biomarkers and safety;
5. Dermocosmetics and therapeutics.

More in detail, cosmetic products are composed of multiple ingredients of different physico-chemical properties (including solubility/miscibility, melting point, specific gravity, viscosity) that in the process of formulation lose their intrinsic identity. Cosmetics formulation is more than just simple mixing of all ingredients. Physics and chemistry allow all ingredients to take shape in a balanced way into a specific physical form, therefore the elucidation of the structural, dynamic and functional properties of the cosmetic products represent the three fundamental aspects in formulations. On the other hand, it is fundamental to develop submicronic systems (nanoparticles, liposomes) for bioactive molecule transport, which allows for optimal efficacy of the active ingredients and reduce side effects.

Four COSMO meetings have been so far held in Orléans where research activities, instrumentation development, collaborations to be activated, dissemination activities, and International proposals for public / private funding prepared.

PARTNERS



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CBM (CNRS Orléans)
France



Pr Beata Vertessy
Hungarian Academy of
Sciences Budapest Hungary



Pr Emma Sparr
Lund University - Sweden



Pr Vince Grolmusz
EÖTVÖS University Budapest
Hungary



Pr Juergen Eckert
University of South Florida
USA



Pr Salvatore Magazù
Consortium coordinator

Salvatore Magazù is a Professor in Experimental Physics and Head of the research group in Structure of Matter and Biophysics at the Physics and Earth Sciences Department of the University of Messina, Italy. S. Magazù is author of more than 300 articles in international journals; more than 40 invited communications and more than 200 communications in conferences. His research is focused on the molecular mechanisms of biological processes, such as bioprotection, denaturation and stabilization of biomolecules, investigated by the use of complementary spectroscopic techniques, such as light and neutron scattering. He has received several international and national awards, including the 2000 Scientia Europaea Prize awarded by the French Academy of Sciences and Aventis.

MONITORING OF MONOCLONAL ANTIBODIES GROUP IN EUROPE (MAGE) FOR INFLAMMATORY DISEASES

PROJECT

Biopharmaceuticals, in particular monoclonal antibodies, have radically transformed the course of various conditions, from malignancies to inflammatory diseases. Considerable inter-individual variability in the clinical response has been documented. It has been shown that pharmacokinetics (drug concentration versus time) is highly variable between patients and is related to clinical response, patients with high concentrations of the drug being more likely to respond than those who have low concentrations. Pharmacokinetic and pharmacokinetic- pharmacodynamic (PK-PD) modelling allows a description of the dose-response relationship to identify the sources of inter-individual variability, for both PK and PD-PD relationship. The team is seeking to explain this variability by studying the sources of the inter-individual variability that is observed in the response to monoclonal antibodies. Our work is based on both *in vitro* and preclinical models and on patient studies. Mathematical models are also used to quantify the influence of the individual sources of variability, to describe biological phenomena, and to design personalized dosage regimens for therapeutic antibodies. Over the last few years, academic groups have developed tools to monitor the pharmacological effect of therapeutic antibodies by means of measuring trough concentrations and biomarkers of disease activity. This practice called therapeutic drug monitoring (TDM), involves the measurement in sera of the concentration of the drug, often in combination with anti-drug antibodies (ADA) detection on the one hand, and the disease activity of patients on the other hand. TDM may help clinicians to adjust the dose regimen according to individual characteristics to improve clinical outcomes and avoid adverse events related to unnecessary overexposure. This strategy is relevant considering the economic burden of inflammatory chronic disease such as rheumatoid arthritis, Crohn's disease and multiple sclerosis. However, although TDM of biopharmaceuticals seems promising, its implementation in clinical settings deserves further research to develop reliable and standardized assays, mathematical modelling (population approaches to analyze databases, mechanistic PK-PD modelling, clinical trial simulation) and clinical expertise.

The main aim of the MAGE consortium is to examine the scientific bases of the TDM of monoclonal antibodies in inflammatory diseases. This will be facilitated

1. to standardize assays for drug measurement,
2. to perform analyses in partnership to develop models for TDM
3. to design comparative effectiveness research to validate these tools.

PARTNERS



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Pr Denis Mulleman
Consortium coordinator

Denis Mulleman is Professor of Rheumatology at the University François-Rabelais of Tours, member of the joint research unit of CNRS, UMR 7292 in the team — Antibodies, Fc receptors and clinical responses. His research aims to characterise the concentration-response relationship of monoclonal antibodies used in inflammatory diseases, to help clinicians to individualise dosages, enabling personalised therapeutic drug monitoring. He is involved in numerous research projects using anti- TNF mAbs and Fc-containing fusion proteins, among them an Innovative Medicine Initiative (IMI) European project dedicated to the immunogenicity of biopharmaceuticals. His group (head: Gilles Paintaud) has been deeply involved in the development of validated ELISA techniques allowing the quantification of serum concentrations of therapeutic antibodies. He is coordinator of designed clinical drug trials enabling population pharmacokinetic and pharmacokinetic-pharmacodynamic (PK-PD) modelling to quantify the different sources of the response interindividual variability.

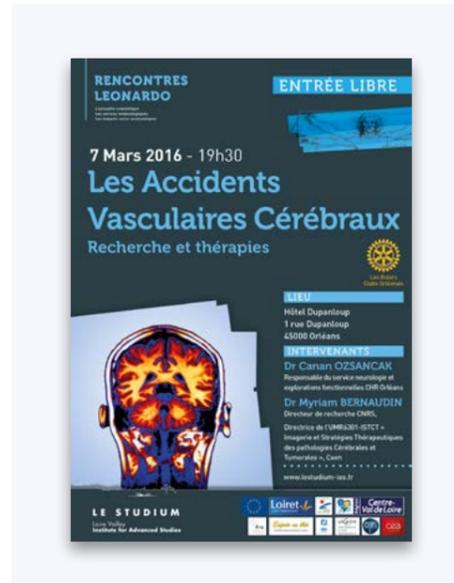
RESEARCH ON CEREBROVASCULAR ACCIDENT (CVA)

ABOUT

For the past 10 years, the Rotary International's Clubs launch an annual campaign «Espoir en Tête», an initiative that raises funds to support the Brain Research Foundation (FRC) research activities. Funds have been used to fund many equipments used in research for Alzheimer's disease, Parkinson's disease, multiple sclerosis, autism. LE STUDIUM is pleased to collaborate with the International Rotary Loiret Clubs to support their fundraising efforts and offer the general public instructive scientific conferences.

SPEAKERS

- **Dr Myriam Bernaudin**
Director of the laboratory Imaging and Therapeutical Strategies in Cerebral and Tumoral pathologies (UMR6301-ISTCT CNRS/CEA/ University Caen Normandy - Outstanding Female in Academics Award by CNRS/ AcademiaNet in April 2016.
- **Dr Canan Ozsancak**
Director of the Neurology and neurovascular Unit at the CHR Orléans



EVENT



Dr Myriam Bernaudin did an exhaustive presentation of therapeutical approaches in different post-stroke cellular reactions including neuronal death, reactional gliosis, inflammation but especially in the context of plasticity angiogenesis and neurogenesis. Dr Canan Ozsancak presented the different types of VCA and their immediate and different treatments. Cerebral strokes (80 to 85% are mainly the consequence of the occlusion of a cerebral artery by a thrombus (blood clot). The diseases causing cerebral strokes are very numerous but three dominate by their frequency: atherosclerosis, arteriosclerosis and certain heart diseases that promote the formation of a thrombus in the heart. Cerebral or meningeal hemorrhages (respectively 15% and 5% of strokes) are related to the rupture

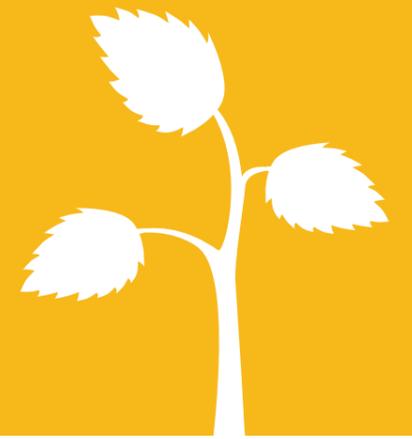
of a cerebral artery. This rupture most often involves an artery of small caliber, weakened by arteriosclerosis or by another disease of small arteries mainly encountered in the elderly: amyloid angiopathy. The rupture of a pre-existing cerebral vascular malformation or a coagulation disorder (often linked to the use of anticoagulant drugs) can also cause cerebral hemorrhage.

EARTH, ECOLOGY & ENVIRONMENT SCIENCES

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LABORATORIES IN EARTH, ECOLOGY & ENVIRONMENT SCIENCES



INSTITUT DE RECHERCHE SUR LA BIOLOGIE DE L'INSECTE (IRBI) - UMR 7261 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



The laboratory is devoted to the analysis of biological processes at all levels, ranging from the subcellular to the ecosystem, using insects as model organisms. Since its founding 50 years ago, work at the IRBI has been characterised by an integrative approach in which they typically apply the methods from multiple disciplines to the problems they study. The scientific staff of the institute includes specialists in molecular biology, chemistry, biochemistry, physiology, behavior, biophysics, mathematics, ecology and evolutionary biology, as well as technicians whose specific skills support projects in these various fields. Their integrative approach is mainly oriented towards the understanding of interactions between insects and their biotic and abiotic environment. While the main focus of the institute is basic research, several projects also address problems in applied research: e.g. sustainable agriculture and biological control of insect pests; development of alternative control strategies for invasive species in urban and natural habitats or for insect vectors of human disease; and transfer of knowledge towards bioinspired engineering.



UNITÉ DE RECHERCHE AMÉLIORATION, GÉNÉTIQUE ET PHYSIOLOGIE FORESTIÈRES (UAGPF) - UR 0588 - CENTRE INRA VAL DE LOIRE



The region Centre-Val de Loire host laboratory of the consortium DYNWOOD is INRA AGPF (Amélioration, génétique et Physiologie Forestières). AGPF depends on the INRA EFPA department (Ecologie des Forêts, des Prairies et des milieux Aquatiques), which coordinates environmental studies carried out on forests, grassland and fresh waters. INRA created this laboratory during the seventies with the aim of developing essential research lines associated with forest tree breeding. Today, tree breeding is still the heart of the AGPF activities. AGPF brings together specific skills in breeding, genetics, genomics and physiology applied to forest trees. The research promotes judicious scientific management of forest genetic resources in the context of sustainable forestry and global changes. The DYNWOOD project is part of the research activities developed by the "Genetics and Physiology of Adaptation" team of the AGPF research unit. The main objective is to study forest tree adjustment to global change: whilst in some cases forest users may benefit from these changes, they worry about many unfavorable consequences observed in different regions for different species. The general objective is to investigate the effect of unprecedented (on a human scale), environmental pressures on tree performances and to evaluate possible short and long-term responses involving both the individual and the population potential of adaptation.



CITÉS, TERRITOIRES, ENVIRONNEMENT, ET SOCIÉTÉS (CITERES) UMR 7324 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



CITERES (UMR 7324) Cités, TERRitoires, Environnement, et Sociétés was created in 2004 to reinforce and structure research potential at the University of Tours under the theme of "Cities and Territories." Its objective is analysis of the spatial and territorial dynamics of social groups. CITERES' four principal fields are urban research, environmental research, and studies of territories and of contemporary social recomposition. The research includes exploring the transformation of natural environments and human impact on the organization of space, and the study of the apparent paradox of the processes of deterritorialization on the one hand, faced with the reassertion of territorial concerns on the other. The city, in terms of material and cultural circulation in the urban space, is also a domain of research, with a special focus on the Arab world and the European Mediterranean.



UNITÉ DE RECHERCHE ZOOLOGIE FORESTIÈRE (URZF) - UR 0633 - CENTRE INRA VAL DE LOIRE



Until the late 1990's the topic of the lab was only centered on the understanding of population dynamics of forest pests with regard to their impact on wood production. In the early 2000's, it has progressively positioned itself on the responses of forest insects to global changes. The main topics are now biological invasions and responses to climate change, with a special interest in the role of ornamental plant trade in strengthening their impacts. The scientists begin to be also interested in the interactions between the different global changes (for instance the role of the landscape and land use changes on population dynamics of invasive / expanding forest pest species). They addressed these issues using the tools and the concepts of ecology, modeling and population genetics.



NOVEMBER 2016

NOVEMBER 2017



DR MAURO SIMONATO

LE STUDIUM/Marie Skłodowska-Curie Research Fellow

From: University of Padova, Italy

In residence at: URZF, Orléans

I obtained my PhD in Crop science - Plant protection at the University of Padova. I'm currently working on the different applications of genetic markers for the identification of different species of insects and for the characterization of the structure of their populations. In particular, I'm interested in the present and past biotic and abiotic factors that have led to the distribution of some of the main forestry and agronomic pest. I'm also interested in the molecular identification of bacterial symbionts associated with insects and in the reconstruction of the origin of this association.

TRACKING THE COLONIZATION PATTERNS OF AN EXPANDING FOREST PEST AND ITS NATURAL ENEMIES USING MOLECULAR MARKERS

The main aim of this project is to identify expansion patterns of one of the major pest of pine forests originated from Mediterranean countries, the pine processionary moth. During the last decades this species has naturally expanded both to higher latitudes and altitudes due to the recent climate change. In France, the northward expansion occurred in a few decades reaching up to date the north east part of the country. Both host tree distribution and accidental human transportation also seem to play a key role in the spread of the moth.

Samples from several populations of pine processionary moth (PPM) in the front expansion edge as well as from potential source populations in the native range will be genotyped using 22 microsatellite loci. The population genetic structure of these samples will be assessed in order to identify the main dispersal patterns of this species and the environmental factors such as host plant distribution determining the colonization routes.

The PPM dispersal patterns will be then compared with those of its main egg parasitoid, using, for this species, a first set of microsatellite loci to determine whether it can follow its host during the expansion. Finally, an assignment tool will be developed in order to genetically characterize both PPM and parasitoid individuals in new front populations and thus quickly identify the source of these new pioneer colonies through a comparison with the reference populations.

To date, I'm working on the genotyping of the PPM populations from the front of expansion area as well as on the identification genotyping of possible reference populations close to the main nursery areas in France, Italy and Spain.



Dr Jérôme Rousselet
Laboratory Host Scientist

Dr Jérôme Rousselet (URZF), PhD, is a population biologist and geneticist interested in the responses of forest insects to global changes since the 2000s. He obtained his PhD in population biology at the University of Tours in 1999. He got a permanent position in the INRA Forest Zoology Research Unit (URZF) in 2000. He has been particularly studying the recent evolutionary history, the population genetic structure and the climate-driven expansions of the pine processionary moth at various spatial and temporal scales. Currently, his work focuses on the role of ornamental trade in generating both long distance dispersal events and landscape connectivity accelerating range expansion of native or exotic pest species. He participated to several projects funded by the European Union, the French Ministries, the French National Research Agency or the Regional Council Centre Val de Loire and is author of 25 scientific articles in peer-reviewed international journals and four book chapters.

LE STUDIUM
CONSORTIUM

ECOHYDRAULICS AND DAM REMOVAL

PROJECT

The decline of the ecological integrity in rivers is a global problem, menacing water security for human beings and biodiversity at the same time. While there are great achievements concerning technologies for water quality improvement, the re-establishment of physical structures suitable for ecosystem functions remains a scientific problem. Which kind of river management and engineering can re-establish these conditions? Specifically, the issue of dam removal is currently in the focus of debate to improve the ecological continuity for sediment transport and migratory organisms. In France alone, about 60,000 obsolete weirs and dams have been identified. However, the scientific baseline for this activity is still weak.

In the context of the UNESCO Chair (Fleuve et Patrimoine), the consortium gathers scientists from Europe (France, Spain, Germany), Latin and North America (Argentina, USA) to review the state of the art and to develop new scientific approaches for evidence-based policies.

Researchers and engineers from the University of Tours have been studying the quantitative geophysical (sediment transport and morphology) and biological (abundances of benthic invertebrates and fish) effects of dam removal at the Maisons Rouges Dam (Vienne River) since 1998 on an annual basis. The Spanish-Italian team has monitored a large number (>20) dam removals in the past ten years and that of the USA is well-known for their work on geomorphology, endangered fish habitats and algae biomass in the Upper Colorado River. The Argentinian team has recently provided excellent studies on invertebrate-flow relationships. Gathering this expertise from different disciplines and the comparison of a one-site-long-term study with a many-sites-shortterm study will create an excellent setting to improve our knowledge about physical habitat management in rivers. The results of a series of workshops will be published and policy options will be debated in public.

PARTNERS



Pr Mercedes Marchese
Consejo de Investigaciones Científicas y Técnicas . CONICET



Pr John Pitlick
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Dr Askoa Ibisate González de Matauco
University of the Basque Country UPV/EHU



Dr Simone Bizzi
Institute for Environment and Sustainability - Water Resource Unit



Pr Karl Matthias Wantzen
Consortium coordinator

After studies on the Rhine (German Federal Institute of Aquatic Sciences) he moved to Brazil (Max-Planck-fellow) to perform his PhD on erosion impacts on streams, resulting in several restoration projects. 2007 Habilitation Thesis (HdR) on biodiversity, functioning and structural dynamics of river-flood-plain-corridors. Ca 100 publications. Since 2010 he is professor on aquatic ecology at the University François-Rabelais of Tours, where he teaches in the Engineering course GAE IMA and in IMACOF (River restoration and management), and researches in the IPAPE team (Landscape and urban ecology, and management) of the interdisciplinary research cluster CITERES (CNRS UMR 6173). 2014 he was awarded the UNESCO Chair on River Culture (Fleuve et Patrimoine). In January 2015, he was awarded "Talent de la Région Centre" acknowledging his scientific and conceptual achievements.

ECOLOGICAL ADAPTATION TO DESERT ENVIRONMENT (EADE)

PROJECT

The consortium is composed of ecologists and evolutionary biologists who have conducted numerous studies on the behaviour, physiology, evolution and ecology of the ant genus *Cataglyphis*.

This genus, which is distributed along the palearctic deserts, constitutes a particularly interesting model system to investigate organisms' adaptation to hot environments. Our aim is to bring together the information collected over the past 20 years by each laboratory on this genus and to develop coordinated investigations in order to better understand the evolution of life history traits in response to selection pressures exerted by extremely hot and dry environments. Hot deserts are among the harshest environments on Earth, imposing extreme temperatures, temperature variations, and hydric stresses on organisms. Human-driven climate change is now altering many temperate and sub-tropical habitats in arid and desert areas, making life increasingly difficult for local populations. In response to these new selection pressures organisms adapt, migrate or become extinct, which greatly transforms local ecological communities. Identifying species' adaptations to warm and dry habitats and determining the processes by which they evolve, constitutes an important question in biodiversity studies. *Cataglyphis* ants, because of their extraordinary mode of life, are a perfectly suited model system to study ecological adaptation to heat.

The objectives of our consortium are to:

1. Identify in which aspects of *Cataglyphis* biology important data are missing and try to fill these gaps in a coordinated research effort;
2. Reconstruct the most accurate phylogeny based on the analysis of molecular, chemical and morphological data using samples already present in each laboratory as well as new samples collected during further research expeditions;
3. Relate the phylogeny with life history traits and habitat characteristics in order to determine the genus evolutionary trajectory as well as possible tradeoffs among traits;
4. Establish a series of new questions that deserve future investigation. Based on our experience, we believe that integrated studies on single model systems may help obtain a clear idea of organisms' adaptation to desert environments.

PARTNERS



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Dr Xim Cerdá
Doñana Biological Station
Seville, Spain



Pr Serge Aron
Université Libre de
Bruxelles, Belgium



Pr Raphael Boulay
Consortium coordinator

Raphael Boulay is a Full Professor at the University François-Rabelais of Tours. His previous positions were in Spain at the University of Granada and the Doñana Biological Station of Seville. He teaches Ecology and Environmental Studies at Polytech Tours and conducts his research at the IRBI in evolutionary ecology. His current research interest is to understand the impact of environmental variables such as temperature and humidity and biotic interactions (competition and mutualisms) on species distribution at different spatial scales. To achieve set goals, he conducts studies both in the field (Spain, French Guiana and Morocco) and in the laboratory using molecular, behavioural and physiological approaches.

DYNAMICS OF WOOD FORMATION AND ADAPTATION OF FOREST TREES TO CLIMATE VARIATION

PROJECT

The first objective of DYNWOOD is to develop a pilot study to test, compare and validate the use of dendrometer data for the assessment of the phenotypic plasticity of cambial response to climate and to use this information to study adaptation of forest trees to climate. The second objective of the project is to use already available data of the same nature and of different origins to study and test the possibility to realize large-scale analysis of cambial response to climate. During the first meeting in January 2016, the concept of the low-cost dendrometers was presented to the partners and discussed. The partners selected two models of automatic point dendrometers and were taught how to install and run them. Seven copies (two species × three trees + one control) of each model of dendrometer were distributed to each partner. During the same meeting, the partners and the collaborators presented their previous experience with other dendrometer types and their achievements and interest in the general research line developed by the consortium. Data management and analysis process were also presented and discussed, as well as connections with other research groups and activities. Main outcomes: A common protocol for the installation of the dendrometers at each location. A plan for establishing a common database.

During the first experimentation period (2016), the dendrometers were installed at the six project locations (one in each country except two in Argentina) and the permanent data recording started. During the second meeting (October 2016), the partners reported and exchanged about their practical dendrometer experience. The problems observed during the first experimentation period were discussed and most of them were solved. The radial growth curves recorded with the dendrometers were inspected in detail and discussed. Complete radial growth curves were available for three countries, Canada, Switzerland and France. In the two other countries, the growth curves were incomplete, in one case for technical reasons and in the other case because the growing season was just starting at the time of the meeting. The first results showed that in the three locations with complete growth curves there was a great similarity between the curves recorded by the two types of dendrometers. The experimental design for the second year of the project was reviewed and validated. Several decisions were taken, in order to enlarge the study to other experiments and datasets: increment core collection in a larch altitudinal gradient in the Alps, methods for establishing norms of reaction for wood formation, data-sharing politics... Finally, the activity program of the second year was examined and new activities were proposed, discussed and scheduled.

PARTNERS



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**Dr Alejandro
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Agrícolas. Universidad
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Dr Luc Pâques
INRA, France

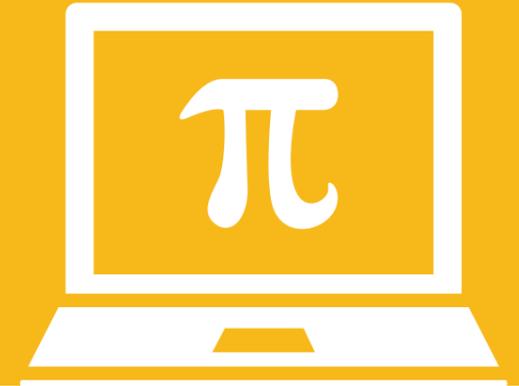


Dr Philippe Rozenberg
Consortium coordinator

Philippe Rozenberg, is a Research Director at INRA Val de Loire, Orléans. Originally a Forest Engineer from the former "Ecole Nationale des Ingénieurs des Travaux des Eaux et Forêts", he got a Master in ecology from the Paris VI University, a Phd degree on Forest Sciences from AgroParisTech (Paris) and an Habilitation degree from the University of Orléans. He is a research director at INRA Val de Loire, Orléans, the leader of the "genetic and Physiology of Adaptation" team of the research unit AGPF and a member of the INRA national scientific council. He develops a research program on "adaptation of forest trees to climate" in natural as well as in artificial forest tree populations. In this context, he investigates the evolutionary adaptation and the phenotypic plasticity of forest trees using original approaches based on tree-ring analysis and wood formation studies. He coordinated more than ten national and international research projects, directed eight PhD thesis and published more than fifty research articles in international scientific journals.



LABORATORIES IN COMPUTER SCIENCE, MATHEMATICS & MATHEMATICAL PHYSICS



PLURIDISCIPLINAIRE DE RECHERCHE EN INGÉNIERIE DES SYSTÈMES, MÉCANIQUE ET ÉNERGÉTIQUE (PRISME), UNIVERSITÉ D'ORLÉANS, INSA CENTRE VAL DE LOIRE



The name of the host scientist's laboratory is PRISME (Pluridisciplinaire de recherche en ingénierie des systèmes, mécanique et énergétique). It is a laboratory of University of Orléans and INSA Centre Val de Loire, labeled by the Ministry of Higher Education and Research (UPRES No. 4229). PRISME laboratory was created in January 2008 and brought together 106 researchers and 70 PhD students. The PRISME was merged by following laboratories:

- Laboratoire Vision et Robotique (EA 2078)
- Laboratoire D'électronique, Signaux, Images (EA 1715)
- Laboratoire de Mécanique et Énergétique (EA 1206)
- Laboratoire Énergétique, Explosions, Structures (EA 1205)

The main mission of the PRISME laboratory is multidisciplinary in the general field of sciences for the engineer on a wide spectrum of disciplinary fields including:

- Burning in engines, energy,
- Aerodynamics, the mechanics of materials,
- Signal and image processing,
- Automatic,
- The robotics.

The laboratory has chosen to structure itself with scientific clusters organized into thematic axes.



LABORATOIRE D'INFORMATIQUE FONDAMENTALE D'ORLÉANS (LIFO) – EA4022 – UNIVERSITÉ D'ORLÉANS, INSA CENTRE VAL DE LOIRE



The Laboratoire d'Informatique Fondamentale d'Orléans (LIFO) is a laboratory of the University of Orléans and the INSA Centre-Val de Loire, officially recognized and supported by the French Ministry of Research. The laboratory is located in Orléans and in Bourges in order to develop its collaborations and to offer a window to the research in computer science in region Centre-Val de Loire. LIFO created a research federation, Fédération Informatique Centre-Val de Loire, together with the Laboratoire d'Informatique from the University François-Rabelais of Tours. LIFO is a computer sciences research laboratory. Research projects conducted at LIFO include algorithmics, scientific visualization, machine learning, massive parallelism, model checking and system security. To provide another approach to the laboratory and to foster inter-team cooperation, the following cross-laboratory thematic areas are put forward:

- Massive data sets and high performance computation,
- Modelisation and algorithms, and
- Security and safety.



LABORATOIRE DE MATHÉMATIQUES ET PHYSIQUE THÉORIQUE, UMR 7350, UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



The LMPT is a joint research unit with about fifty permanent researchers that supervises about twenty PhD students. It is structured in two teams: a team of mathematics and a team of theoretical physics. The research is organized around seven axes: Algebra, Nonlinear analysis and EDP, Riemannian geometry, Probability and Ergodic Theory, Gravitation, Field theory, Integrable systems, classical and quantum dynamics of complex systems. At the present moment in the field theory part of the laboratory led by Dr Maxim Chernodub there are 6 permanent academic staff. There are also 6 permanent academic staff who work on various aspects of gravity. Both these directions of research are related to the content of the given project. Besides, there are 14 permanent academic staff who work in the area of integrable systems and Riemannian geometry. This area also has a certain relation to the content of the project since the corresponding mathematical structures were used actively in the work on the project.



APRIL 2016

JULY 2016



PR YIMING CHEN

LE STUDIUM Research Professor 2016-2019
From: Yanshan University, China
In residence at: PRISME, Bourges

Yiming Chen has been a Full Professor of the College of Science of Yanshan University since 1998. He was the Dean of the College of Science of Yanshan University for 14 years (from 1998 to 2012). Until now, Pr Chen has published about 140 international journal articles and international conference articles and contributed 5 co-edited special books. Moreover, he has achieved 5 research projects. He is the membership of Chinese Society of Induction and Applicative Mathematics, Chinese Society of Computing Mechanics and Chinese Society of Mathematics. Pr Chen has organized two international conferences in 2010 and 2011, respectively. Pr Chen has earned First Award of Science and Technology Progress of China Ministry of Mechanical Industry and Third Award of Education of Hebei Province in 1999 and 2000, respectively. In 2010, he has been certificated as a valued reviewer by ELSEVIER publisher.

OBSERVER DESIGN FOR DISTRIBUTED-PARAMETER SYSTEMS AND FRACTIONAL ORDER SYSTEMS

This project provides not only an opportunity of international collaboration between the laboratories in the region Centre Val de Loire and Yanshan University in China, but also an opportunity of inner collaboration among the researchers of two campus of INSA CVL. The proposed research project is on observer design for Distributed-Parameter Systems (DPSs) and Fractional Order Systems (FOSs). This is an interdisciplinary research project where the conception of observer is applied to DPSs and FOSs, and the obtained results will be applied to nonlinear acoustics and viscoelastically damped structures. New research activities are being developed, which are complementary to those of the teams involved in the project. Estimation of the states of DPSs and FOSs is important for engineers and scientists. However, research on observer design for these systems has not been as extensive as in the case of Lumped-Parameter Systems, especially in nonlinear case. Consequently, the achievements to date of this research project are outlined as follows with the involvements of the partners:

1. Development of the Nonlinear Observer Canonical Forms for nonlinear DPSs and FOSs in order to easily apply existing observer design methods (cooperation of Pr Chen,

Pr Boutat and Dr Liu);

2. Design of new observers for nonlinear DPSs and FOSs (with unknown inputs or not), such as proportional and integral observers, adaptive observers, and interval observers (cooperation of Pr Chen, Pr Boutat and Dr Liu);

3. Development of efficient numerical algorithm for considered equations, and new robust

differentiators using wavelets, etc. (cooperation of Pr Chen, Pr Boutat and Dr Liu);

4. Application of the concept of observer to solve nonlinear acoustics equations. The obtained results will also be applied to context of new ultrasonic "pulse-echo" imaging for Non Destructive Testing applications (cooperation of Pr Chen and Dr Dos Santos);

5. Study on various aspects of fractional models for damped structures, using observer design. In particular, the system parameters will be identified (cooperation of Pr Chen and Dr Serra).

AROUND THE PROJECT

ORAL COMMUNICATIONS

1. Chen, Y. Numerical solution study of fractional order and variable fractional order differential equations, Le Studium Thursday Interdisciplinary seminars, Bourges (France), May 5, 2016.

2. Chen, Y. Numerical methods based on wavelets and Bernstein polynomial with their applications, Seminar of Laboratory PRISME, Nouan le Fuzelier (France), June 27, 2016.

SCIENTIFIC PUBLICATIONS

Chen, Y.; Wei, Y.; Liu, D.; Boutat, D.; Chen, X. Variable-order fractional numerical differentiation for noisy signals by wavelet denoising, *Journal of Computational Physics*, **2016**, 311, 338-347.

Chen, Y.; Liu, D.; Boutat, D. Numerical study of a class of variable order nonlinear fractional differential equation in terms of Bernstein polynomials, *Ain Shams Engineering Journal*, **2016**, <http://dx.doi.org/10.1016/j.asej.2016.07.002>



Pr Driss Boutat

Laboratory Host Scientist

Driss Boutat has been a Full Professor in ENSIB since 2008, which developed into the INSA Centre Val de Loire in 2014. Since 2011, he is the leader of Control Team in PRISME Laboratory. In 2014, he was the dean of MRI and ERE Departments in INSA CVL. Until now, Pr Boutat has published more than 35 international journal articles and 70 international conference articles. Moreover, he is supervisor of 9 PhD students (6 have defended). He is selected as Associate Editor of Journal of Discrete Dynamics in Nature and Society, Associate Editor of Journal of Nonlinear Dynamics, Member of Editorial Advisory Board of Mediterranean Journal of Measurement and Control. Pr Boutat earned the National order of France: Order of Academic Palms Chevalier (Knight) since January 2010, the National Award for doctoral supervision and research from 2008 to 2012, and the French Excellent Scientist Award since 2012. In 2011, he was selected in Who's Who in the World. Recently, he received the Best Paper Award in the 7th International Conference on Bio-inspired Systems and Signal Processing.

JANUARY 2016

MARCH 2016



PR ERIC GOLES

LE STUDIUM Research Professor 2015-2018
From: Universidad Adolfo Ibáñez, Chile
In residence at: LIFO, Orléans

Eric Goles is Doctor honoris causa from the University of Orléans, 2012. From 1981 to 2000, he was in the Engineering School of the University of Chile where he lead the first group in Chile working on discrete mathematics and computer science and formed a group dedicated to modelling and industrial applications. He was instrumental in the creation of the Centre for Mathematical Modelling, inaugurated in 2000, of which he was the first director. From 2000 to 2006, Professor Goles was president of the National Commission in Charge of Financing Scientific Research. During this period, he created the Institute for Complex Systems in Valparaiso of which he was the first director. This institute is dedicated to the study of complex systems. Since 2006 he is Full Professor and researcher at the Universidad Adolfo Ibáñez, in Chile.

DISCRETE MODELS OF COMPLEX SYSTEMS: COMPUTATIONAL COMPLEXITY AND (UN) PREDICTABILITY, THEORY AND APPLICATIONS

Complex systems analyses investigate the emergence of complex global behavior through the local interactions of a large collection of well understood components. Interdisciplinary by nature, it encompasses problems encountered in the diverse disciplines of physics, economics, biology, mathematics, computer sciences, linguistics from which it borrows both models and tools. Discrete models of complex systems provide formal models that can be used both as modeling tools convenient for computer simulation to study particular complex systems and as a simple framework to study, define and characterize fundamental properties of complex systems. Theoretical Computer Science, through the theory of computation, provide valuable tools to design efficient algorithms or, when not possible, prove unpredictability or characterize the inherent difficulty of predictability in discrete models of complex systems like cellular automata, Boolean or regulatory genetic networks, social science models, sand piles and Ising like models. The purpose of this project is to contribute to the organization and development of the emerging research community on complex systems in the Loire Valley, disseminate tools and models from theoretical computer science among that interdisciplinary community and to confront other models to widen the scope of application of these tools. During his stay in 2015, Professor Eric Goles worked with his host scientist, Professor N. Ollinger, about freezing automata with PhD students from LIFO and DISC in Chile, on a model related with the origins of synonyms.

He participated as a keynote speaker at the first Atelier MISC (Maison Interdisciplinaire des Systèmes Complexes) in Orléans in January 2015 and gave a public Lecture at Les Turbulences FRAC Centre on Complexity and calculation, drawings and mathematics in February 2016.



Pr Nicolas Ollinger

Laboratory Host Scientist

Nicolas Ollinger is a theoretical computer scientist who joined LIFO in the University of Orléans in September 2011. His field of research includes theoretical computer science to discrete mathematics, covering topics like combinatorics on words, models of computation and complexity and decision problems for cellular automata and tiling. He connects to the complex systems community through his research both on classification of cellular automata according to their dynamics (bulking) and on decision problems on abstract formal discrete dynamical models, providing formal proofs of unpredictability. He was a PhD student in Lyon in research team MC2 when the IXXI Institute emerged, then a founding member of the team Escape (équipe systèmes complexes, automates cellulaires et pavages) in Marseille where he participated to the national ANR projects Sycamore and EMC devoted to the relation in between computational models and discrete complex systems. Since 2008, he is the scientific secretary of International Federation for Information Processing (IFIP) working group on Cellular Automata and Discrete Complex Systems.



MARCH 2016

JUNE 2016



PR GARY GIBBONS

LE STUDIUM Research Professor 2014-2017
 From: University of Cambridge, United Kingdom
 In residence at: LMPT, Tours

Gary Gibbons, Fellow of the Royal Society since 1999, is one of the rare universal theoreticians. He started his studentship, in Cambridge, under the supervision of D. Sciama and S. Hawking, two outstanding figures of relativity. It is under the direction of the latter that he defended his PhD in 1972, on Gravitational Radiation and Gravitation Collapse. Fruitful collaboration with S. Hawking has resulted in several top-level publications, which have practically shaped the understanding of modern Cosmology and Quantum Gravity. Subsequently, while maintaining his close contacts with S. Hawking, he managed to broaden his scientific horizon by making a profound contribution to String Theory. He not only knows about relativity, but also about dynamical symmetries in general and of soliton scattering in particular, group theory, topology and differential geometry applied to physics.

CLASSICAL AND QUANTUM SPACE-TIME AND ITS SYMMETRIES

In this project we study theoretically both the classical and quantum properties of space-time and its symmetries. In particular, we formulated certain inequalities for the geometric quantities characterising causal diamonds in curved and Minkowski spacetimes. These inequalities involve the redshift factor, which, we show explicitly in the spherically symmetric case, is monotonic in the radial direction, and it takes its maximal value at the centre. We suggest some possible applications of our results including comparison theorems for entanglement entropy, causal set theory, and fundamental limits on computation.

In addition, the last decade has witnessed an increased interest in non-Minkowskian spacetimes whose structures are invariant under boosts. These may be obtained by group contraction. The standard contraction of the Poincare group yields the Galilei group, for which pure Lorentz transformations become Galilei boosts. However what is less well-known is another rather unfamiliar limit, which yields instead a different but still boost-invariant theory. Levy-Leblond, who introduced this «degenerate cousin of the Poincare group», named it, the Carroll group, referring to the pseudonym of the author of Through the Looking-Glass. We define curved Newton-Cartan and curved Carroll spacetimes modelled on their flat versions.



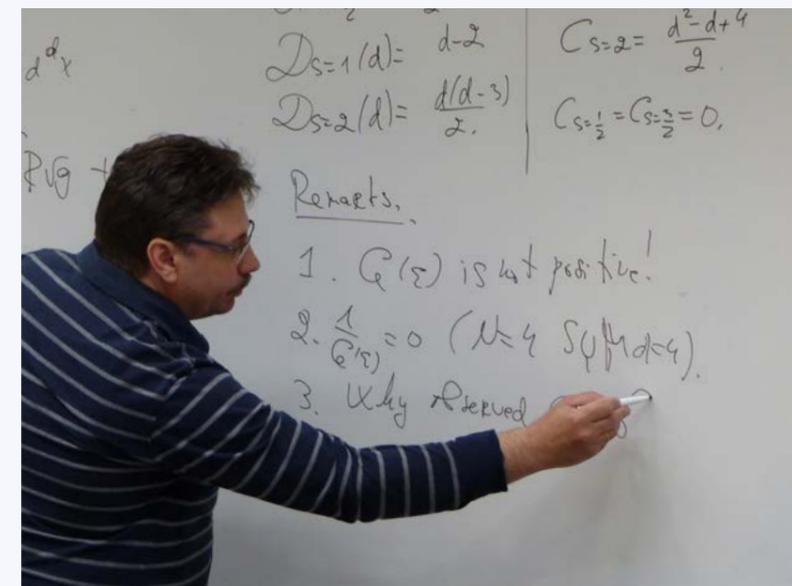
Pr Sergey Solodukhin
 Laboratory Host Scientist

Sergey Solodukhin studied physics at the Moscow State University where his PhD adviser was D. D. Ivanenko, the Soviet physicist who theoretically predicted synchrotron radiation. He held a postdoctoral position at the University of Waterloo as a NATO Postdoctoral Fellow and then moved to the University of Alberta in Canada. From Canada he moved to the University of Utrecht, in the Netherlands, where he worked in the group of Professor G. 't Hooft for two years during which time Professor G. 't Hooft received the Nobel prize in physics. He then moved to the Ludwig Maximilian University of Munich, Germany, where he worked in the group of Slava Mukhanov, and later to the University of Bremen, Germany. Since 2007 he has been at the University François-Rabelais of Tours, France where he is a professor in LMPT. In recent years, his work has focused on the study of entanglement entropy and its applications to conformal field theories and the black hole physics.



Classical and quantum black holes

I myself introduced the workshop with an overview entitled «Black Hole Theory, where is it going?» which reviewed the current challenges facing the subject. Notable among them are the fundamental modifications of the existing theory if one considers a new class of theories currently being intensively studied by cosmologists under the name of Horndeski theories. These theories have been introduced to account for the observation that most of the energy density making up our universe and causing an exponential expansion in its size is «Dark Energy». In order to avoid the occurrence of matter with negative energy density which is expected to be unstable and which appears conflict with the basic assumptions of quantum mechanics, Horndeski theories are based on partial differential equations with no higher derivatives than 2. However there is a cost to paid: our basic notions of causality and the very definition of a black hole no longer hold. This problem has been at the heart of my work in Tours. I have been in active discussion with Pr Solodukhin, Pr Volkov, Pr Horvathy and Pr Nicolis of LMTP and also with Pr Chris Pope of Texas A&M University who was a visitor in LMTP for a month on a Fellowship funded by the University of Tours as a result of an application made by Pr Solodukhin in connection with my presences as LE STUDIUM Professor and the LE STUDIUM workshop.



AROUND THE PROJECT

SCIENTIFIC PUBLICATIONS

Gibbons G. W.; Warnick, C.M. Spherical Photon and Anti-Photon Surfaces, *Phys. Lett.*, **2016**, *763*, 169.

Cvetic, M.; Gibbons, G. W.; Pope, C. N. Photon Spheres and Sonic Horizons in Black Holes, From Supergravity and Other Theories, *Phys. Rev.D*, **2016**, *94*, 106005.

Gibbons, G. W.; Volkov, M. S. Ring wormholes via duality rotations, *Phys. Lett. B*, **2016**, *760*, 324.

Cariglia, M.; Duval, C.; Gibbons, G. W.; Horvathy, P. A. Eisenhart lifts and symmetries of time-dependent systems, *Annals Phys.*, **2016**, *373*, 631.

Gibbons, G. W. The Jacobi-metric for timelike geodesics in static spacetimes, *Class. Quant. Grav.*, **2016**, *33*, 025004

Brody, D. C.; Gibbons, G. W.; Meier, D. M. A Riemannian approach to Randers geodesics, *J. Geom. Phys.*, **2016**, *106*, 98.

Cvetic, M.; Gibbons, G. W.; Pope, C. N. Compactifications of Deformed Conifolds, Branes and the Geometry of Qubits, *JHEP*, **2016**, *1601*, 135.





DR MIKHAIL ZUBKOV

LE STUDIUM Research Fellow
 From: Institute for Theoretical and Experimental Physics, Russia
 In residence at: LMPT, Tours

Dr M.A.Zubkov graduated from Moscow Institute of Physics and Technology (MIPT) in 1993. Since that time until now he works at the Institute for Theoretical and Experimental Physics (ITEP) as a researcher in the field of theoretical high energy physics. He obtained his PhD in ITEP in 1996. Until 2011 his studies were related mainly to lattice quantum field theory. These studies resulted in his Habilitation thesis, which was defended in ITEP in 2011. In addition to the scientific research M.A.Zubkov is engaged in teaching theoretical physics. In particular, during the years 2008 – 2010 and in the fall of 2015 he worked as a lecturer at MIPT. After 2011 the scientific interests of M.A.Zubkov were shifted to the two complementary directions of theoretical physics. Presently he works on the synthesis of relativistic quantum field theory and condensed matter physics. One of the objectives of this work is construction and investigation of the conceptually new Beyond Standard Model theory. The other objective is the investigation of emergent relativistic effects in condensed matter systems. Those effects include, in particular, the appearance of emergent gravity, emergent gauge fields, and chiral anomaly in Dirac and Weyl semimetals, He3, and graphene. Since autumn, 2013 till spring of 2015 M.A.Zubkov worked in Canada at the University of Western Ontario as an inviter researcher. In the summer of 2015 he worked for CNRS at the University of Tours, France. Starting from January, 2016 till December, 2016, M.A.Zubkov works as Le STUDIUM research fellow in the Laboratory of Mathematics and Theoretical Physics at the University of Tours.

ESTABLISHING LINKS BETWEEN GRAVITY, FIELD THEORY AND CONDENSED MATTER: DIRAC AND WEYL SEMIMETALS, SUPERFLUIDS, COMPOSITE HIGGS BOSONS

In the course of the project it was planned to work on the synthesis of condensed matter physics and relativistic quantum field theory. We were planning to investigate emergent relativistic effects in condensed matter systems. Those effects include the appearance of emergent gravity, emergent gauge fields, and chiral anomaly in Dirac and Weyl semimetals. The effects of chiral anomaly and the related phenomena (quantum Hall effect, chiral magnetic effect, etc) may have important features in the condensed matter systems. Besides, the objective was the construction and investigation of the conceptually new models of composite Higgs bosons. We intended to develop the modification of the top quark condensation models, where the 125 GeV Higgs boson is composed of the heaviest known fermion (the top quark). The constructions that are based on analogy with complicated condensed matter systems like He-3 superfluid may avoid experimental exclusions.

The discussed phenomena in Dirac and Weyl semimetals affect transport properties and may be observed experimentally. The results of this project may have an effect on the consumer electronics of the future.

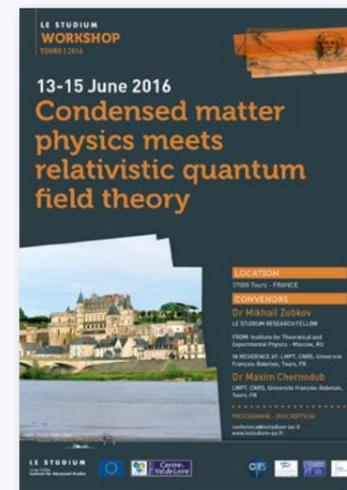
- It was demonstrated how momentum space topology may be applied to the analysis of the anomalous transport related to the non - dissipative electric current. We concentrate on the linear response of electric current to external electric and magnetic fields. The response to external electric field leads to the appearance of the quantum Hall effect while the response to external magnetic field was associated in certain publications with the equilibrium chiral magnetic effect. We show that the corresponding currents are proportional to the momentum space topological invariants. Our methodology is based on the derivative expansion applied to the Wigner transform of the two - point Green functions. This relation allows to describe the anomalous quantum Hall effect both in the 2 + 1 D and in the 3 + 1 D systems. Our analysis of the equilibrium chiral magnetic effect demonstrates that the corresponding topological invariant entering the expression for the CME current does not depend on the value of chiral chemical potential for the systems with compact Brillouin zone and without poles or zeros of the Green function. Therefore, we conclude, that the quantum field theory and the solid state systems do not possess the equilibrium bulk chiral magnetic effect.
- The pair production rate was calculated using the solution of the corresponding quantum mechanical problem. According to our point of view the dynamics of electrons in solids is exhaustively described by the multi - particle quantum mechanics. In the vicinity of the Fermi point in Dirac semimetals this quantum mechanics is described approximately by massless Dirac equation, that is the couple of the Weyl equations.



Dr Maxim Chernodub
 Laboratory Host Scientist

Maxim Chernodub received his PhD in ITEP, Moscow, Russia, in 1999. In 1991 – 2001 and 2003-2008 he was the researcher at ITEP. In 2001 – 2003 he was the JSPS postdoctoral fellow in Kanazawa, Japan. In 2008 he received his Habilitation degree in ITEP. Since 2008 he is the researcher of CNRS at the University of Tours, France. Since 2016 he is the director of Research at the University of Tours. During recent years his works are related to Quantum Chromodynamics in strong magnetic fields and to the anomaly related transport.

- The modified model of top quark condensation was considered. To calculate various physical quantities we restrict ourselves by the leading order in the $1/N_c$ expansion, that is in practise the one - loop approximation. We demonstrate, that the given model is able, in principle, to describe both the 125 GeV Higgs boson H and the additional more heavier composite scalar bosons.
- Various phases of the Standard Model of fundamental interactions (or its extensions) were considered as at the systems similar to the topological materials. The symmetric phase (the temperature is above the temperature of Electroweak transition) represents the topological semimetal with the Fermi point, which is protected by the topological invariants generated by the functional of the proposed form. At the temperatures below the Electroweak phase transition the SM (and its extensions) may exist in several phases, where the fermions are massive. Those phases resemble various phases of topological insulators and are characterized by the corresponding topological invariants in momentum space. At small enough temperature, pressure and chemical potentials the parity breaking interactions may be neglected, and the vacuum is topologically nontrivial being protected by the topological invariant protected by the matrix of CT transformation.



LE STUDIUM CONFERENCES

Condensed matter physics meets relativistic quantum field theory

This conference posed several important questions related to the chiral dynamics. For the first time the consensus was achieved on the absence of equilibrium chiral magnetic effect in the systems without superconductivity. At the conference, in particular, the following world - leading experts in the chiral dynamics and adjacent scientific fields took part: G. Volovik, D.Kharzeev, V.Miransky, M.Chernodub, M.Goerbig, M.Zubkov, M.Vozmediano, P.Buividovich, B.Rosenstein, P.Horvath, M.Stone, M.Volkov

LE STUDIUM LECTURES

Des théories d'Einstein aux matériaux les plus innovants

By Pr Mark Olivier Goerbig, Université Paris-Sud

In this lecture the relation between relativity and quantum mechanics was discussed in the application to the modern materials. An unexpected appearance of quantum mechanics in its relativistic version was recently observed in a very special material, graphene which consists of a graphite sheet of the thickness of a single atom. After its discovery in 2004, a large number of other materials have been identified that also require a quantum relativistic description of their electrons. In the lecture it is explained how those two theories throughout the last century found their way to the physics of new materials.

AROUND THE PROJECT

ORAL COMMUNICATIONS

Zubkov, M. A. Momentum space topology, anomalous quantum Hall effect, and problems with the equilibrium static chiral magnetic effect, Condensed matter physics meets relativistic quantum field theory, Tours (France), June 13 – 15, 2016.

Zubkov, M. A. Le boson de Higgs 125 GeV comme Pseudo Goldstone boson dans le modèle de la condensation du t-quark, Seminar of LMPT, Tours (France), October 6, 2016.

Zubkov, M. A. Emergent gravity in graphene and in Dirac semimetals, Seminar of APC, Paris (France), October 11, 2016.

Zubkov, M. A. Exchange of ideas between condensed matter physics and quantum field theory, Le Studium Thursday Interdisciplinary seminars, Tours (France), November 3, 2016.

SCIENTIFIC PUBLICATIONS

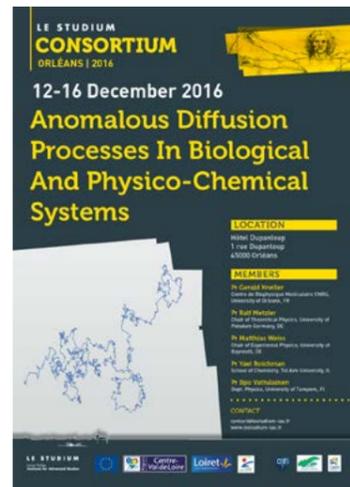
- Zubkov, M. A. Wigner transformation, momentum space topology, and anomalous transport, *Annals Phys.*, **2016**, 373, 298
- Zubkov, M. A. Absence of equilibrium chiral magnetic effect, *Phys. Rev. D*, **2016**, 93, 105036.
- Abramchuk R. A.; Zubkov, M. A. Schwinger pair creation in Dirac semimetals in the presence of external magnetic and electric fields, *Phys. Rev. D*, **2016**, 94, 116012.



ANOMALOUS DIFFUSION PROCESSES IN BIOLOGICAL AND PHYSICO-CHEMICAL SYSTEMS

PROJECT

Diffusion is one of the most fundamental transport processes taking place in biological and physico-chemical systems. The diffusing particles can be as small as water molecules or as big as pollen grains, whose erratic motions have been observed in the 19th century by the Scottish botanist Robert Brown. The theory of "normal" diffusion goes back to Fick and Einstein, and although most spatially unconfined diffusion processes are well described by Einstein's theory, there is an ever increasing number of observations of "anomalous" diffusion, in particular in biological systems, which are not in agreement with this theory. Corresponding generalizations are often of purely mathematical nature and lack physical interpretation.



The idea of this project for this Consortium is to improve the understanding of the physical origins of anomalous diffusion by gathering together specialists whose expertise in diffusion phenomena is largely complementary to each other. The partners have considerable expertise in stochastic processes, statistical

physics, large-scale computer simulations, and single particle tracking methods, and they have worked on anomalous diffusion considering very different length and time scales in fluids, soft matter, as well as in biological systems. Therefore, the added value expected to emerge from this network is profound. The first phase of the project serves to broaden and consolidate the knowledge of all partners. In the second phase the partners will establish a basis for fundamental physical concepts leading to anomalous diffusion (such as bulk memory effects, geometry, boundary conditions, etc.) and their relation to established models. In this context, the impact of coarse-graining in time and space will be particularly emphasized. The results of the project will be published in a booklet or in terms of a review article, and the last meeting of the Consortium would be ideally combined with a mini-colloquium on anomalous diffusion, including discussions of potential applications of the new knowledge generated in this project.

PARTNERS



Pr Ralf Metzler
University of Potsdam,
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Pr Matthias Weiss
University of Bayreuth,
Germany



Pr Yael Roichman
Tel Aviv University, Israel



Pr Ilpo Vattulainen
University of Tampere,
Finland



Pr Gerald Kneller
Consortium coordinator

Gerald Kneller is a Professor of Physics at the University of Orleans, Director of MISC and group leader at the Centre de Biophysique Moléculaire of the CNRS. He is a specialist in statistical physics, theoretical biophysics, and computer simulation he develops multi-scale models for the structure and dynamics of biomolecular systems. Gerald Kneller studied physics at the RWTH Aachen in Germany and he obtained a PhD in physical chemistry at the same university (1988). After a postdoc at IBM US, Kingston NY, in the group of Enrico Clementi (1989), he held the position of a research engineer at IBM France, working in a project on biomolecular dynamics and function with the Commissariat à l'Energie Atomique (CEA) in Saclay near Paris. In 1993 he returned to Aachen in order to pursue an academic career, working on the methodology of molecular simulation, in particular on constrained dynamical systems. In 1997 he obtained the Habilitation in Physics at the RWTH Aachen and since 1998 he holds the position of a professor at the University of Orleans. He leads the Theoretical Biophysics Group at the Centre de Biophysique Moléculaire of the CNRS (currently 3 permanent members, 3 PhD students, and one postdoc). In 2003 he was promoted professeur 1^{ère} classe and in 2012 professeur classe exceptionnelle.

COMPLEXITY AND CALCULATION / DRAWINGS AND MATHEMATICS

SPEAKER

Eric Antonio Goles Chac is a Chilean mathematician and computer scientist of Croatian descent. He studied civil engineering at the University of Chile before taking two doctorates at the University of Grenoble in France. He comes from the University of Adolfo Ibáñez University, Chile. In 2012 he was awarded a Doctor Honoris Causa 2012 of the University of Orleans. He is the creator of the Institute of Complex Systems in Valparaiso, Chile. He developed the Ph.D. in complex systems in Chile and was an international fellow of the Santa Fe Institute, USA. He holds a residence at the Laboratory of Computer Science of Orleans (LIFO) in the framework of a LE STUDIUM Research Professorship (3 months each year from 2015 to 2018). On February 25th, 2016, he held a presentation on complex systems at FRAC Les Turbulences using two concrete cases of complexity: one related to the classical aspects of complexity in computing, the limits of calculations in computer science, what one can or cannot calculate using a computer; and the other one related to complexity as an unexpected emergence of the dynamics (or functioning) of a system composed of a large number of simple units.

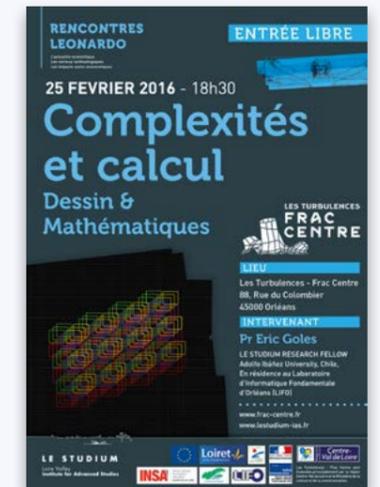
ABOUT

The first story is associated with the undecidability of the problem of shutting down a computer (a Turing machine). Although in appearance our modern computers are easy to turn off, it is actually very complicated for a computer, even the newest ones, to

know when all its tasks are completed. An analogy can be made with a painter who reproduces on his painting a model in permanent motion. How does this painter decide that his work is finished and that he can stop painting?

The second story related to the drawings that the professor made himself to spend time in long meetings. The question in this case is why was he drawing these drawings precisely. This question was answered by complex systems and led to a small theorem which he endeavored to explain in a dynamic and active manner.

The final story related to a plastician artist who decided to insert mathematical formulas in his very large art works. The problem encountered concerned the transport by air of his art works pieces and the need to find a way to fold the canvases without damaging them; the question led the professor to solve the problem of folding and paving the artist's canvases using mathematical formulas.





LABORATORIES IN HUMAN & SOCIAL SCIENCES

HUMAN & SOCIAL SCIENCES

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CENTRE D'ÉTUDES SUPÉRIEURES DE LA RENAISSANCE (CESR) - UMR 7323 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



The Center for Superior Studies of the Renaissance (CESR) is the Education and Research Unit (UFR) University François-Rabelais of Tours and Mixed Research Unit (UMR) 7323 affiliated with the CNRS. Set up through the initiative of Gaston Berger in 1956 and affiliated at that time with the University of Poitiers, the CESR became an integral part of the newly established University François-Rabelais of Tours in 1970. Successive agreements in 1983 and 1992 enhanced the institutional links between the CESR and the CNRS. In 1996 the CESR re-affirmed its commitment to interdisciplinary research into key themes of European patrimony (for instance, around musicology, art history and the history of the book), in an accord with the French Ministry of Culture, the CNRS and University François-Rabelais of Tours. The CESR celebrated its half-centennial in 2006. The CESR is an education and research centre, which welcomes students and researchers wishing to acquire an initial or additional university education in all domains of the Renaissance. The CESR's research programmes are structured according to disciplinary teams (history, history of art, French, neo-Latin and European literature, philosophy, musicology, history of science and techniques), research fields and team projects.



CITÉS, TERRITOIRES, ENVIRONNEMENT, ET SOCIÉTÉS (CITERES) UMR 7324 - UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, CNRS



CITERES (UMR 7324) Cités, TERritoires, Environnement, et Sociétés was created in 2004 to reinforce and structure research potential at the University of Tours under the theme of "Cities and Territories." Its objective is analysis of the spatial and territorial dynamics of social groups. CITERES' four principal fields are urban research, environmental research, and studies of territories and of contemporary social recomposition. The research includes exploring the transformation of natural environments and human impact on the organization of space, and the study of the apparent paradox of the processes of deterritorialization on the one hand, faced with the reassertion of territorial concerns on the other. The city, in terms of material and cultural circulation in the urban space, is also a domain of research, with a special focus on the Arab world and the European Mediterranean.





LABORATORIES IN HUMAN & SOCIAL SCIENCES



INTERACTIONS, TRANSFERS AND BREAKS IN ART AND CULTURE (INTRU) - EA 6301, UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS, FR



The InTRu research unit was created in 2008 by the art historians Eric de Chasse, Jean Baptiste Minnaert, France Nerlich and Pascal Rousseau (Université François Rabelais, Tours). The aim was to create a formal structure for the work they had started to carry out together with several colleagues based in other universities, and different institutions, such as museums, art schools and the Services de l'Inventaire (Inventory of Architectural Heritage), around the methodological issues and historical investigation of modes of circulation, cultural transfer and legitimisation strategies in the creative industries (visual arts, architecture, literature, etc.) and cultural practices using images.

The team decided to structure their collaboration around the following research themes: modes of cultural transfer (reception, influence, intertextualities), transmediation between the arts (visual arts, music, dance, architecture, literature) and hierarchies (image/ text, mass culture/ high culture, banal/ unique, etc.). The idea was to advance the study of cultural circulation, by looking beyond simple shifts from one medium to another, to consider the recycling, translation or transformation of images, and to look at practices and knowledge acquisition. With an emphasis on interdisciplinary approaches, the team decided the different themes should not be closed entities, but rather they should form the building blocks for thinking together about epistemological questions.



LABORATOIRE D'ÉCONOMIE D'ORLÉANS (LÉO) - UMR CNRS 7322 - UNIVERSITÉ D'ORLÉANS, CNRS



LÉO is a research center supported by the CNRS and the University of Orléans (France). It was created on 1 January 1996 following the merger of the Orleanais Institute of Finance (created in 1974) and the Center for Research on Employment and Production (created in 1984). Initially located in Orléans, LÉO is the only research center in Economics in the region Centre-Val de Loire. Since January 2013, it has been designed to welcome, in addition to Orleans colleagues, the researchers in Economics of the François-Rabelais University of Tours.

LÉO has about 42 permanent researchers (full professors and associate professors) and 37 PhD students. LÉO is specialized in three research areas: (1) Macroeconomics and Finance, (2) International Economics and Sustainable Development and (3) Econometrics.



POUVOIR, LETTRES, NORMES (POLEN) - EA 4710 - UNIVERSITÉ D'ORLÉANS



Emerging from the collaboration of literary historians belonging to the META research laboratory and the "Littératures et civilisations" and "Savoirs et pouvoirs de l'Antiquité à nos jours" research centres, the PoLeN (Pouvoirs, Lettres, Normes) research laboratory is a pluridisciplinary group of researchers from the fields of history, literature, linguistics, anthropology and law. It comprises three main research centres - on late medieval culture, early modern culture, and modern and contemporary culture - each of which is dedicated to the investigation of the ways in which texts from a range of historical periods engage with questions of power and authority, particularly as regards their role in the dissemination of the discourses that prescribe societal norms in any given period and in the potential resistance to these norms.



LABORATOIRE VAL DE LOIRE RECHERCHE EN MANAGEMENT (VALLOREM) - EA 6296 - UNIVERSITÉ D'ORLÉANS, UNIVERSITÉ FRANÇOIS-RABELAIS DE TOURS



The public service mission of VALLOREM is to support and promote research in the field of Management Science at the University François-Rabelais of Tours and the University of Orléans. To participate in the progress of scientific and technical knowledge in this field and develop Regional recognition of such research. VALLOREM is also the education structure that provides the platform for junior postdoctoral training and the support to research academics and university professors with Masters and PhD students in Management Science. In addition, VALLOREM is a host structure that welcomes French and foreign researchers and doctoral students, through the creation or participation in worldwide networks of inter-university exchanges. VALLOREM puts at the heart of its scientific studies the issue of relations between management and society by studying ways to improve the overall performance of organisations. The systematic research of the overall performance of organisations provides a prism of management practices and including innovative management. This research mainly involves small to medium enterprises, their market and non-market services, as determined by laboratory research interests. With research grant funding and research agreements with various public and private partners the research activities continue to develop. The VALLOREM team has the mission to link university research and practices to public or private organisations. VALLOREM develops its partnership relations with the socioeconomic actors of its territory and also favours research intervention to achieve desired socioeconomic outcomes.



AUGUST 2015

AUGUST 2016



PR PETER BENNETT

LE STUDIUM Research Fellow - PRESTIGE
From: Case Western Reserve University, USA
In residence at: CESR, Tours

Peter Bennett is an Associate Professor of Musicology at Case Western Reserve University (CWRU), Cleveland, OH, and Professor of Harpsichord at the Cleveland Institute of Music (CIM). His research focuses on the music and institutions of early modern France. He has published in major journals in the US, France and the UK, and given papers and invited presentations at international conferences. Recent highlights include a chapter in the *Cambridge Handbook to French Music* (2015) and an article for the *Journal of the American Musicological Society* (2016). As a performer, he established himself in the UK and Europe as director of Ensemble Dumont (1995-2003) with several famous CD recordings of French repertoire (Diapason, 5*, Gramophone Editor's, Critics' Choice). He now teaches in the historic performance programme at CWRU/CIM and performs, records, and tours with Apollo's Fire, the Cleveland Baroque Orchestra. His position as a LE STUDIUM Research Fellow is cofunded by the PRESTIGE Programme (Marie Skłodowska-Curie Actions COFUND).

LOUIS XIII'S PARIS AND PROVINCIAL ENTRÉES, 1610-43: MUSIC, LITURGY AND POWER

From the earliest years of his reign until 1628, Louis XIII faced frequent unrest and rebellion in the Huguenot cities and communities of the south-west and south of France. In order to subdue this unrest, the King would leave Paris in the spring, leading his army across country and dismantling the Huguenot power structures by besieging and ultimately entering many of these cities. Whether he entered a rebel city or a loyal city, however, Louis's arrival often took the form of a ceremonial entrée in which the local dignitaries welcomed the King outside the city walls before leading him through an elaborate display of triumphal arches and on to a ceremony at the cathedral.

This project focused on what then happened in the cathedral - the music performed, the liturgy followed, and their wider significance. It did this by following several lines of enquiry. Firstly, specific details of the ceremony in the cathedral are very rare, so the initial phase of the project surveyed the available printed and manuscript descriptions to collate the information on the music and liturgy performed. Secondly, a parallel investigation surveyed other types of materials that might provide information on the liturgy and music, in particular the local liturgical books that are preserved in municipal libraries: since many of these entrées took place in the Loire Valley, the libraries and archives of Tours, Orléans, Angers, Poitiers and Le Mans were a particularly rich source of information of this kind. Having established the basic content of the ceremony, the third part of the project involved recreating as much of the music as possible through the editing of important manuscript sources in Tours and Paris, and through the reconstruction of fragmentary printed sources in the Bibliothèque Nationale de France and elsewhere. Finally, the project assessed the significance of the music and liturgy by setting it in the wider historical, institutional, and political context of early 17th century France: at a time when jurists and clerics around Louis XIII were seeking to redefine the nature of kingship itself, Louis's participation in these sacred events, and the texts that were highlighted through musical settings, played a significant, and as yet overlooked, role in projecting and cementing his status as monarch.



Pr Philippe Vendrix
Laboratory Host Scientist

Philippe Vendrix is the former Director of the Centre d'Etudes Supérieures de la Renaissance (2008-2015). He obtained his PhD in 1991 in musicology with the highest distinction from the examination jury at the University of Liège. He has been a member of Council of the American Musicological Society, 2001-2004. Elected in 2010 to the Alumni College of the Belgian Royal Academy. He has editorial management responsibilities of various collections including Ricercar. He is on the editorial board of leading publications in musicology and a member of the Scientific Council of Répertoire International de Littérature Musicale, New York and the European Science Foundation. He is currently the president of the University François-Rabelais of Tours.



LE STUDIUM
CONFERENCES

Sacred/secular intersections in early-modern European ceremonial: text, music, image and power

This conference took as its starting point the sacred/secular divide in the historiography of early modern European ceremonial and was intended both to consider the early-modern festival as an event which may have actually occupied both sacred and secular spaces (and the liminal region between them), and to examine ways in which an exploration of this liminal region might enrich the understanding of scholars who approach the field from both sides of the divide. To that end we invited scholars from across the disciplines - musicologists, literary scholars, art historians, historians, liturgists - to give presentations related to all aspects of early-modern European ceremonies of power (festivals, processions, royal or episcopal entrées, Te Deums, masses, coronations) and to consider their associated artistic, musical, liturgical, visual, political, and theological dimensions. The conference resulted in many fruitful exchanges and culminated with a keynote presentation by Professor Iain Fenlon of King's College, Cambridge. The actes de colloque will be published by Classiques Garnier.

LE STUDIUM
LECTURES

La violence et le sacré dans l'entrée royale sous Louis XIII

By Dr Marie-Claude Canova-Green, Goldsmiths College, University of London - UK

The Le STUDIUM lecture, *La violence et le sacré dans l'entrée royale sous Louis XIII*, was given by Marie-Claude Canova-Green of Goldsmiths College, University of London. Dr Canova-Green is one of the foremost authorities on the *entrée* under Louis XIII and an interdisciplinary scholar who approaches the topic from the perspective of a literary historian, a historian, and a historian of theatre. The lecture addressed the various ways in which the king could make his entrée into a town or city depending on whether it had capitulated freely or whether it had opposed the king, and examined the king's displays of violence (which portrayed him as a strong military leader) or clemency (which portrayed him as a forgiving Christ-like figure) which followed. The lecture thus deepened our understanding of Louis XIII and provided much needed context for historians of Louis XIV.

AROUND THE PROJECT

ORAL COMMUNICATION

Bennett, P. Pour le Roy & tout son armée lors qu'il alloit à la guerre' : l'Exaudiat en musique, 1587-1643, France 1600: mutations musicales entre renaissance et baroque, Paris (France), May 20, 2016.

SCIENTIFIC PUBLICATION

Bennett, P. Hearing King David in Early Modern France: Politics, Prayer, and Louis XIII's Musique de la Chambre, *Journal of the American Musicological Society*, 2016, 69/1, 47-109



NOVEMBER 2015

FEBRUARY 2017



DR ANDREA GRIGNOLIO

LE STUDIUM Research Fellow - ARD 2020 BIOPHARMACEUTICALS

From: University of Rome La Sapienza, Italy

In residence at: CESR, Tours

*Andrea Grignolio (Rome 1974), PhD in history of science, focuses his research on the history of biomedical disciplines in twentieth-century western society, with special regard to immunology and molecular biology. In 2004 he studied at the Centre Cavallès of École Normale Supérieure in Paris, in 2006-2007 was a Post-doctoral Fellowship at the Center for Philosophy and History of Science, Boston University, and in 2009 was a visiting scholar at the Office for History of Science and Technology, UC Berkeley. He teaches History of Medicine at University of Rome «La Sapienza», is on the Editorial Board of the Series «Interfacing Science, Literature and Humanities» Vandenhoeck & Ruprecht (V&R) Unipress, Goettingen (Germany) and of the international journal "Medicina nei Secoli, Rivista di Storia della Medicina", University of Rome, "La Sapienza". He is the author of papers in international journals, of the 2016 book *Chi ha paura dei vaccini? (Who is afraid of the vaccines?)* and editor of the volume *Immunology Today. Three Historical Perspectives under Three Theoretical Horizons (Bononia University Press, Bologna, 2010)*.*

THE ACCEPTABILITY OF BIOMEDICAL INNOVATION: HISTORICAL APPROACH

This research looks at the historical origins of one of the first French producers of biopharmaceuticals (vaccines), Edmond Chaumier (1853-1931) who founded in 1887 the Institut Vaccinal of Tours. The laboratory locally produced from heifer calves a vaccine against smallpox through an original technique known as "vaccin de conserve" consisting of glycerinated vaccine stored in refrigerators, which turned out to be safer and storable in contrast to the "vaccin frais" then available in France. Produced during 1910- 1920's in collaboration with the "Istituto Vaccinogeno" (CNR) directed by Danete di Blasi at the University of Rome, Chaumier's vaccin de conserve spread throughout Europe, including France, United Kingdom, Italy, and in many African colonies.

A primary research goal is the analysis and acceptability of the original economic costs and social acceptability of biomedical innovations. This research offers a historical perspective of the social perception of risk applied to biomedical innovation. Scientific literature confirms that education and income correlate to longevity, suggesting a positive effect on health outcomes. In particular, more educated individuals have a better understanding of, and more rapidly absorb, information about medicine and health care. Less is known about the underlying mechanism through which these associations may occur. The controversy raised by vaccination against measles, mumps, and rubella (MPR) provides a useful case study for understanding individual behavioral responses to new information about risks or new medical technologies, suggesting that information processing, rather than simply access to education and income, is the key driver. Evidence shows that more educated and affluent parents are more selective/hesitant and more often choose not to vaccinate their child.

The second part of this research looks at why individuals making decisions under uncertainty and risk give undue weight to information indicating risk. Finally, a review of the biomedical literature to analyze the risk perception of biopharmaceuticals will be undertaken.



Pr Véronique Des Garets

Laboratory Host Scientist

Véronique Des Garets, a former student of the Ecole Normale Supérieure de Cachan, was awarded her PhD in Management Science in 1991. She was Associate Professor of Management Science in 1995. Professor Des Garets is at the Institute of Enterprise Administration, University François-Rabelais of Tours. She is the deputy director of the Loire Valley Management Science laboratory - VAL de LOire Recherche En Management - VALLOREM (EA6296) at the University François-Rabelais of Tours and University of Orléans. Professor Des Garets teaches business studies through business management simulations and marketing.

It will be first provided an analysis of the literature concerning vaccines discovery and production. Also a scrutiny of the archives at Sapienza University of Rome and at the State Archives will be conducted in order to find documents of the link between the Chaumier's laboratory and his Italian counterpart, the hygienist Dante De Blasi (1873-1956). Finally, a review of the biomedical literature to analyze the risk perception of biopharmaceuticals will be made.

AROUND THE PROJECT

ORAL COMMUNICATIONS

Grignolio, A. Avancement des recherches sur l'histoire de la vaccination entre Rome et Tours et sur les stratégies de communication des risques de la vaccination, 7ème réunion plénière. I.A.S., Orléans & Tours, Tours (France), March 21, 2016.

Grignolio, A. The evolution of oncological paradigm. Implications for cancer therapy, Le Studium Thursday Interdisciplinary seminars, Orléans (France), April 7, 2016.

Grignolio, A. Vérité et mensonges qui circulent sur le web: le cas des vaccins, Fête de la Science et philosophie, VI édition, Foligno (Italy), April 16, 2016.

Grignolio, A. L'éradication de la variole et d'autres vaccins, Festival de Bologne édition Medical Science II, Bologna (Italy), May 19, 2016.

Grignolio, A. Risques et décision. Les conseils des neurosciences et du comportement économique pour la communication de la vaccination, Conférence «Vaccinations Aujourd'hui» de la Fédération nationale italienne des médecins (Fnomceo), Rome (Italy), June 25, 2016.

Grignolio, A. The roots of the 1st international biopharmaceutical production in the Region Centre & the social resistance against vaccination: few suggestions from history, Le Studium Thursday Interdisciplinary seminars, Tours (France), Sept 1, 2016.

Grignolio, A. Mouvements contre les vaccins: l'histoire et la comparaison des stratégies cognitives, Vaccinations 2016. La valeur de la vaccination et de nouvelles opportunités pour la santé, Trento (Italy), September 24, 2016.

Grignolio, A. Pilules amères. innovations médicales entre les entreprises et la santé, Festival International de Ferrare, Ferrare (Italy), October 1, 2016.

Grignolio, A. Risque et Décision: Conseils pour la communication de la vaccination, Vaccinations entre la science et les préjugés - Fnomceo & Association la Cometa, Como (Italy), November 5, 2016.

POSTER

Grignolio, A. Histoire de la perception sociale des vaccins. Le rôle du concept de risque et incertitude des innovations technologiques, Symposium SHS Biomédicaments, Tours (France), November 29, 2016.

BOOKS OR BOOK CHAPTERS

Grignolio A., *Chi ha paura dei vaccini? (Who is afraid of the vaccines?)*. Codice Edizioni, Torino, pp. 118.

Cattaneo E., De Falco J., Grignolio A., *Ogni giorno. Tra scienza e politica (Every day. Between science and politics)*. Mondadori, Milano, 2016.

FILM

The history of biopharmaceuticals in Centre-Val de Loire region - November 2016



Dr Concetta Pennuto

Laboratory Host Scientist

Concetta Pennuto did her PhD studies at the University of Genève and is a historian of science and medicine. She is Assistant Professor at the Centre d'Études Supérieures de la Renaissance, University François-Rabelais of Tours and teaches at this Centre and the Faculty of Medicine. Dr Pennuto does research on the history of disease and the therapeutic relationship between doctors and patients in Early Modern and Modern-Contemporary Medicine. Her research focuses on women's health, childbirth and fertility, history of infectious and contagious diseases, such as syphilis, plague and fevers. She also studies medical gymnastics, music therapy and the links between astronomy and medicine.





DR SOPHIE HEYWOOD

LE STUDIUM/Marie Skłodowska-Curie Research Fellow
From: University of Reading, United Kingdom
In residence at: InTRu, Tours

Sophie Heywood is lecturer in French Studies at the University of Reading. Her research specialism is in the history of childhood, particularly children's literature, culture and publishing in France from a transnational perspective, and she has over four years experience working on international inter-sectorial collaboration and policy in the field of literary archives. Her research has been funded by the Carnegie Trust for the Universities of Scotland, the Institute of Historical Research, the Leverhulme Trust, and, most recently, a LE STUDIUM/ Marie Skłodowska-Curie Research Fellowship. She has published widely, in both French and English, on the subject of children's history and literature. Her monograph on the classic French children's author the comtesse de Ségur was published with Manchester University Press, and obtained a Faculty Prize for the best output of an early career scholar (2012). Rémi Saudray, editor of the Cahiers Séguriens, called it 'a magisterial essay [...] destined to become an essential reference in Ségur studies'.

THE CHILDREN'S '68

The global upheaval caused by the protest movements around 1968 revolutionised social structures, overturned cultural conventions, challenged political ideologies, and catalysed civil rights activism by women, gay people and ethnic minorities. Childhood historians stress the importance of this period in altering the authority structures that shaped children's lives. However, many of the fields driving these changes – children's media, childhood studies, children's heritage and art education – remain pushed to the margins within historical master narratives of 1968. These disciplines have had little chance to reflect on their own development, to draw the connections stemming from their shared heritage in 1968, or to trace the historical legacies that have shaped the assumptions underpinning them.

The overarching aim of this project is to analyse 1968 as a watershed moment in children's culture and its related disciplines, following Marwick's (1998) now canonical definition of 1968 as the crystallisation of the cultural revolution of the 'long sixties' (c.1958-c.1974). We are pursuing this objective through a new research collaboration with specialists from cognate fields in childhood studies, children's history and media, and practitioners involved in children's culture, heritage and art education, and historians of 1968.

By thinking about children's culture as a site for artistic and intellectual experimentation, at the centre of ideological activity across disciplinary boundaries and national borders, this project aims to open up new ways of understanding the 1968 liberation movements and their legacies. With the fiftieth anniversary of 1968 approaching, it is important that the children's perspective is finally brought to the fore of scholarly debate and public commemorations.

AROUND THE PROJECT

ORAL COMMUNICATIONS

Heywood, S. The Children's '68: the international publishing scandal of The Little Red Schoolbook, Le Studium Thursday interdisciplinary seminar, Tours (France), December 1, 2016.

Heywood, S. Le mai '68 des enfants, Intru seminar, Tours (France), December 13, 2016.



Dr Cécile Boulaire
Laboratory Host Scientist

Dr Cécile Boulaire is a lecturer in children's literature at the Université François-Rabelais, Tours, and in 2015 she obtained her professorial thesis [Habilitation à diriger des recherches]. Her research focuses primarily on two areas: first, the history of publishing for the young; and second, on the aesthetics of children's picturebooks. In 2008 she was awarded a large collaborative grant from the French National Research Agency [Agence Nationale de la recherche] to investigate the history of the Mame publishing house, the largest publisher for children in France in the 19th century. She most recent monograph (2016) studies the publisher's series 'Un Petit livre d'or', the French translations of the iconic American picturebooks series 'Little Golden Books', and reveals the close links between children's publishing, ideology and politics in the context of the Cold War. To date she has published 50 articles and 7 books or special issues of academic journals.

liberation movements and their legacies. With the fiftieth anniversary of 1968 approaching, it is important that the children's perspective is finally brought to the fore of scholarly debate and public commemorations.



PR MIHAI MUTASCU

LE STUDIUM/Marie Skłodowska-Curie Research Fellow
From: West University of Timisoara, Faculty of Economics and Business Administration, Romania
In residence at: LEO, Orléans

Mihai Mutascu is professor of economics at West University of Timisoara (Romania), FEBA, and associate researcher at the Laboratory of Economics of Orléans (LÉO), University of Orleans. He has PhD diploma in Economic Sciences - Finance (West University of Timisoara), Habilitation in Finance (Bucharest University of Economic Studies) and Habilitation in Economic Sciences (University of Orléans). Mihai was visiting researcher at GREThA (University of Bordeaux) and invited researcher at Oxford Brookes University, University Complutense de Madrid, Poznan University of Economics, and University of Auvergne. He received several prizes for research activity, such as: Prize 'Dumitru Mares' (2016) and Awards for Research Results (2013, 2014, 2015, 2016). His main research topics include macroeconomics and applied economics.

A WAVELET ANALYSIS OF GLOBALIZATION AND GROWTH IN EURO ZONE

The main objective of the project is to start and develop a research in the field of economics, concerning the relationship between globalization and economic growth, in the case of euro area. Actually, the aim is to investigate how the globalization explains the economic growth and vice-versa, by using the wavelet tool, for each euro zone country. Further on, a parallel analysis of country wavelet spectra will be done in order to illustrate if there are or not some 'common' features with respect to the behaviour of 'globalization-growth' countries at euro zone level. In order to perform the preliminary wavelet estimations regarding the nexus 'globalization-growth' in euro zone, the first research steps are focused on three main coordinates, chronologically ordered: the dataset construction, the preliminary estimations and the literature collection. As first step, a dataset with two time series has been performed, based on collected data: the trade, in term of imports and exports (as proxy for globalization) and the Gross Domestic Product - GDP (as variable which captures the economic growth). The sample includes following euro zone countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain (not available data for Estonia, Cyprus, Latvia, Lithuania, Luxembourg, Malta, Slovakia and Slovenia). The dataset has quarterly frequency and covers the period 1960Q1-2016Q2. The source of data is the Organisation for Economic Co-operation and Development (OECD) online database - 2016. The brut series, expressed in billions of US dollars, have been adjusted for any seasonal component by using Census X12 methodology. The final work series will be in natural logarithm form. We also dealt with stationarity property of the series, the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Zivot-Andrew with structural breaks tests having performed. Second, preliminary estimations have been generated by using the wavelet tool. It was tested different combinations of variables to capture the globalization: only exports, imports plus exports, and imports plus export as percentage of GDP. In those cases, the wavelet spectra and wavelet coherency reveal robust findings, excepting the case when the estimations are employed with different variable's order of integration. All these aspects can be a strong ground for the further research project steps. Finally, an extended collection of papers in the field was also employed by considering quasi all contributions which treats the impact of globalization on economic growth. The collection includes both theoretical and empirical papers, with different targeted areas, different periods of time and various used tools.



Pr Camelia Turcu
Laboratory Host Scientist

Camelia Turcu is Associate Professor HDR in Economics at the University of Orléans (France) and a research affiliate at the Laboratoire d'Économie d'Orléans (LÉO). Her major research areas are international macroeconomics, growth and trade, with a specific focus on the European case. She has published numerous articles in national and international journals, several book chapters and a book. Currently Camelia is the President of INFER (International Network For Economic Research). She is also involved in the management (Conseil d'Administration) of the French Regional Science Association (ASRDLF). She received the TIMTED Young Researcher Prize and the European Commission Thesis' Excellence Certificate. She regularly acts as expert for the European Commission and for different universities and research networks around Europe.

JANUARY 2016

DECEMBER 2016



PR DAVID KOESTER

LE STUDIUM Research Fellow - ARD 2020 LAVOISIER
 From: University of Alaska Fairbanks, USA
 In residence at: CITERES, Tours

David Koester is a social-cultural anthropologist specializing in the study of temporal processes in culture and society. He is professor of anthropology at the University of Alaska Fairbanks and served as head of the department 2012-2014. In the fall of 2014 he received a research award from the "Research in Paris" program of the Mairie de Paris for research on Russian Orthodoxy in the dynamics of Itelmen indigenous history. He has received numerous grants for research from the National Science Foundation, including most recently a multinational collaborative grant to support the integration of audio-visual materials with a comprehensive dictionary of the Itelmen language (Kamchatka, Russia). In 2011 the film that he co-produced with director Liivo Niglas, *Itelmen Stories* was awarded the Grand Prix at the International Festival of Ethnological Film in Belgrade. In 2009-2010 he was a visiting professor at the National Museum of Ethnology in Osaka, Japan.

SOCIAL VALUES IN THE VISION OF A HYDROGEN-BASED SOCIETY IN FRANCE: A COMPARATIVE, SOCIAL STUDY OF DISCOURSES AND INSTITUTIONS

The aim of the research has been to conduct a social study of the discourses and institutions associated with the introduction of hydrogen as a fuel in France with the goal of characterizing the vision of the hydrogen energy future. Analysis of this vision, in conjunction with an assessment of the current status of hydrogen projects in France, can provide some insights into the possible obstacles and opportunities that exist for the introduction of hydrogen as an energy vector. An additional goal of understanding the spatial and temporal aspects of hydrogen development emerged during the course of the research. The results of the research have been presented in five scholarly presentations during the fellowship year. Each of these presentations focused on different aspects of the research as it developed. The first level of analyses sought to explain the concepts underlying the discourse used in hydrogen technology promotion and development. The "leviers" and "obstacles" perceived by government, industry and the research community were analyzed and outlined.

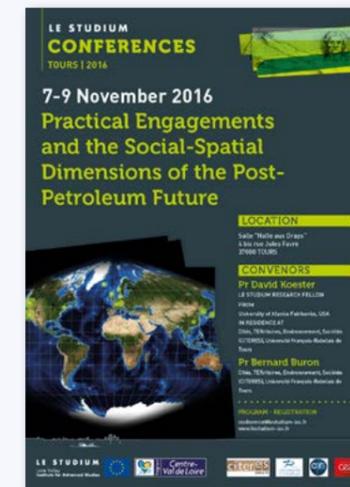
The second round of analyses focused on "Time and Energy," from the perspective of time as a social dimension in relation to technological development. The concept of "expectation" as understood and used in the social science literature was analyzed to elucidate its temporal dimensions. Socially and culturally defined expectations have been shown in the literature to have a significant impact on waves of technology investment, even while research and development continues independently by increments. The next level of analyses examined discourse about hydrogen in (1) public meetings and conferences, in (2) monographs about hydrogen futures, in (3) program and organization newsletters and in (4) news media. International monograph studies show the relative independence of French research on fuel cells and other hydrogen technologies from international trends. When French hydrogen monographs arrive on the scene in 2006, they set out a vision for a hydrogen future with a more prudent and pragmatic approach than their more visionary foreign predecessors.



Dr Bernard Buron
 Laboratory Host Scientist

Bernard Buron is a Senior Lecturer in sociology at the François-Rabelais University of Tours and a researcher in unit 7324 CITERES of the French National Research Center (CNRS). After having served as Director of the Arts and Human Sciences Education and Research Unit at the University of Tours for ten years, he will benefit from research leave for the entire year 2017. Overall, his research examines technological change and its effects on cultures and professional groups. It is oriented more and more toward the question of forms of energy and their social acceptability by populations, their appropriation, or not by different professional groups. He was scientific host for David Koester during 2016 and co-organizer of the international Le Studium conference Practical Engagements and the Social-Spatial Dimensions of the Post-Petroleum Future in Tours in November 2016.

Public oral discourse at conferences and meetings in 2016 differed from published discourse in that there was a noticeable concern with the notion of establishing a hydrogen technology "ecosystem". Speakers' usage of the term varied widely. The general notion is that a hydrogen technology ecosystem would be made up of social entities that interact in such a way as to preserve and develop the system. Each agent in the system has intentions and engages in activities that contribute particular functions or play particular roles in the system. Such a system is considered necessary for the hydrogen to assume its role in the energy transition (away from fossil fuels). Hydrogen enthusiast newsletters present hydrogen technology as a technology of the future. It was observed that as the discourse has matured, the focus of discussion has shifted from the justifications of the use of hydrogen as a source of energy to presentation of particular technological and industrial developments and their realization in demonstration and starter projects. This observation raises the question of whether there are, in general, discernible patterns in the evolution of technological discourse as technology itself changes.



LE STUDIUM CONFERENCES Practical Engagements and the Social-Spatial Dimensions of the Post-Petroleum Future

The LE STUDIUM conference was entitled: Practical Engagements and the Social-Spatial Dimensions of the Post-Petroleum Future. The aim of this symposium is to examine the social dimensioning of the energy transition with a special but not exclusive consideration of the case of introducing hydrogen and fuel cells into the energy arena. One of the objectives was to explore what roles regions, cities, and other spatial- demographic entities play in envisioning energy futures. At the same time, the discussion was to be practical and look at the concrete example of the unique place of hydrogen in some of those future visions. Highlights included unique contributions about spatial order, materiality and energy by Vanesa Castan-Broto and Stefan Bouzarovski and fascinating presentations of community dynamics by Sharon Klein, Alain Nadaï and Christèle Assémond. Excellent social studies of the technological world of energy, hydrogen and fuel cells by Fabienne Picard, Sangook Park, Béatrice Cointe, Hervé Flanquart and Dominique Pécaud were complemented well by the status reports on hydrogen deployment given by Sanne Østergaard Nielsen and Stan Osserman. Dominique Desjeux provided an excellent closing view on energy research.

LE STUDIUM LECTURES Paléo-énergétique : les oubliés de la transition énergétique By Côme Bastin, journalist

The topic is particularly important for the public today because technological changes are taking place so quickly that people have little time to reflect on the transformations taking place in their lives. Reflection on past technologies that could still have relevance in the contemporary world offers an opportunity to think more deeply and historically about choices that are being made and will need to be made as we face the energy challenges of tomorrow.

POWER AND THE PARATEXT IN THE MEDIEVAL MANUSCRIPT CULTURE

PROJECT

The chief aim of the Power and the Paratext in Medieval Manuscript Culture research consortium is to examine how paratext functions in multiple strands of the medieval sciences, taking the notion of a science in its broadest sense as a system of thought that organises, constitutes and disseminates a body of knowledge. Since the concept of the paratext was first formulated by Gérard Genette, who applied it to print culture from the early modern period to the present day, this topic has regularly attracted attention from scholars working on printed texts from different historical periods and on specific paratextual elements. The approach of our consortium not only pushes the chronological and methodological boundaries of Genette's original study of paratext but also differs from more recent projects on the subject in two significant ways: first, it focuses exclusively on works from the Middle Ages; second, and more importantly, it examines how the paratextual apparatus of the medieval manuscript both inscribes and gives visual form to the power relations between the producers and consumers of knowledge in this important period of intellectual history.

At our first meeting in June 2014, we discussed key critical readings in the field and organised a series of workshops which we each led in turn in order to establish how paratext relates to our particular research interests in fictional, historical, medical, legal, or liturgical texts, focussing on specific paratextual elements, such as prologues, glosses, rubrics, notes, and images. This was followed by a hands-on session at the Bibliothèque municipale in Orléans where we consulted a variety of manuscripts held in its collections. We also gave a group presentation on the work of the consortium to the Studium faculty.

At our second meeting in June 2015, we held another set of workshops so as to refine our methodology still further. Adopting both a synchronic and a diachronic perspective, we sought to define what paratextual features are common to manuscripts belonging to different branches of the medieval sciences and what are unique to any particular discipline, and to analyse how these visual expressions of power in organising and compiling thought on the written page are consciously applied, negotiated or resisted by the authors, scribes, artists, patrons and readers who produced, propagated and responded to these works. We also began planning of a major international conference, entitled "Inscribing Knowledge on the Page: Sciences, Tradition, Transmission and Subversion in the Medieval Book", which will take place in Orléans in June 2016. This aim of the conference, in which participation is by invitation only, is to widen out the consortium's scholarly dialogue on power and the paratext to an even more diverse group of medieval scholars whose work is in intellectual disciplines such as law, Latin and vernacular texts both secular and religious, liturgy, music, medicine and philosophy.

At our third meeting, in June 2016, we hosted this 3-day major international conference in Orléans. In addition to the sessions of the conference itself which showcased the work of a very diverse range of medieval scholars, the group also organized a public lecture, delivered by Pr Iolanda Ventura on "La pharmacie au Moyen Âge: la pratique et les livres", which was very well attended by members of the public and gave rise to a lively discussion afterwards. During the week of the conference, the consortium team drafted a prospectus for publication of the conference proceedings which has now



Pr Rosalind Brown-Grant
Consortium coordinator

Rosalind Brown-Grant is Professor of Late Medieval French Literature at the University of Leeds, UK. She is the author of *Christine de Pizan and the Moral Defence of Women: Reading beyond Gender* (Cambridge University Press, 1999) and *French Romance of the Later Middle Ages: Gender, Morality, and Desire* (Oxford University Press, 2008); and the translator of *Christine de Pizan's Book of the City of Ladies* (Penguin Classics, 1999). She is also co-editor, (with Anne D. Hedeman and Bernard Ribémont), of *Textual and Visual Representations of Power and Justice in Medieval France: Manuscripts and Early Printed Books* (Ashgate, 2015); and (with Rebecca Dixon), of *Text/Image Relations in Late Medieval French and Burgundian Culture (Fourteenth-Sixteenth Centuries)* (Brepols, 2015). Her research has been funded by awards from the Arts and Humanities Research Council, the Leverhulme Trust, and the British Academy, and she was a LE STUDIUM Research Fellow in Orléans in 2011-12.

been accepted by Medieval Institute Publications based in Kalamazoo, MI. Contributors to the conference will submit their revised papers to the consortium team in mid-December 2016, copy-editing and peer-reviewing will take place in the first few months of 2017, and at its final meeting in Orléans in June 2017, the team will discuss editorial issues arising and will draft an introduction to the volume, prior to final submission of the complete typescript to the publisher in early 2018. A subvention towards the costs of producing the volume has been gratefully received from two sources: Pr Ventura's own research funds and the Juslittera/Scientia research projects led by Pr Bernard Ribémont at the University of Orléans.

PARTNERS



Pr Iolanda Ventura
IRHT (UPR 841) - CNRS
Université d'Orléans FR



Pr Anne D. Hedeman
University of Kansas USA



Pr Gisela Drossbach
University of Augsburg
Ludwig-Maximilians-
Universität München DE



Dr Patrizia Carmassi
Georg-August-Universität
Göttingen DE



LE STUDIUM CONFERENCES

**Inscribing Knowledge on the Page
Sciences, Tradition, Transmission
and Subversion in the Medieval Book**

LE STUDIUM LECTURES

**La pharmacie au Moyen Âge la
pratique et les livres**

By Pr Iolanda Ventura, History of Sciences,
University of Orleans, IRHT (CNRS) member

POWER AND THE PARATEXT IN THE MEDIEVAL MANUSCRIPT CULTURE

AROUND THE PROJECT

CONFERENCES (PATRIZIA CARMASSI)

"Bücherleben zwischen Produktion und Kollektion. Beispiele aus der Sammlung Marquard Gude", paper given at the conference "Biographien des Buches" of the Forschungsverbund Marbach Weimar Wolfenbüttel (MWW), organized by Ulrike Gleixner, and held at the Herzog August Bibliothek, Wolfenbüttel, 5-8 April 2016

"Il taccuino di Wolfenbüttel e nuovi disegni nella collezione di Marquard Gude. Problemi metodologici e percorsi di ricerca", paper given at the conference "Taccuini e libri di modelli tra Medioevo ed Età moderna", organized by Federica Toniolo and held at the Università degli Studi di Padova, Dipartimento dei Beni Culturali, Padova, 3 May 2016

"Gottfried Wilhelm Leibniz und Marquard Gude: Zwei Gelehrte, ein Bibliothekar und eine Handschriftensammlung", Quedlinburg: paper in lectures series, organized by Kreisvolkshochschule Harz, Kulturamt der Stadt Quedlinburg, Verein Klopstock e.V., Lyonel-Feiningger-Galerie, Moses Mendelssohn Akademie, Gleimhaus in Halberstadt and Herzog August Bibliothek, 29 May 2016

"Messlektionar: Liturgische Bücher und mittelalterliche Wahrnehmung", paper given at the congress "Zur Typologie liturgischer Bücher des westlichen Mittelalters", organized by Harald Buchinger, at the University of Regensburg, Regensburg, 7-9 July 2016

"Texts and Contexts in the Medieval Manuscript Collection of Marquard Gude (Herzog August Bibliothek)", paper given at the "Texts and Contexts Conference" held at the Center for Epigraphical and Palaeographical Studies, Ohio State University, Columbus (OH), 21-22 October 2016

CONFERENCES (ANNE D. HEDEMAN)

"L'imagerie politique dans les manuscrits supervisés par Laurent de Premierfait", paper given at conference Hommage à Nicole Pons: Humanisme et politique en France à la fin du Moyen Âge held at Centre national de la recherche scientifique, Villejuif, 17-18 mars 2016

"The Role of Illustrations in the Grandes Chroniques de France," paper given at seminar at University of Stockholm, Sweden, May 30, 2016

"Imagining the Past", paper given at seminar at Uppsala University, Sweden, June 1, 2016

CONFERENCES (IOLANDA VENTURA)

"Jean of Saint-Amand and the tradition of commentaries to the Antidotarium Nicolai" (working title; paper given at the Third Workshop on deterrimi organised by the working group "TRALMAR", led by Pr Outi Merisalo; see <https://staff.jyu.fi/Members/merisalo/Tralmar2013-2017>)

AROUND THE PROJECT

CONFERENCE

Rosalind Brown-Grant, "Prefaces and frontispieces in chivalric romance manuscripts"

Patrizia Carmassi, "Book material, production and use from the point of view of the paratext. An investigation through the manuscript collection of Maquard Gude [HAB]"

Gisela Drossbach, "Prefaces in legal texts"

Anne D. Hedeman, "Prologues and prologue illustrations in translations of historical texts"

Iolanda Ventura, "Glosses and commentaries in Latin medical manuscripts"

PUBLICATIONS

Retter der Antike. Marquard Gude (1636-1689) auf der Suche nach den Klassikern, ed. Patrizia Carmassi = Wolfenbütteler Forschungen 147 (Wiesbaden 2016) [576 pp.]

Einleitung, in *ibid.*, pp. 7-22.

"A Gudianus latinus palimpsest: From the codex to the library (-ies)", in *ibid.*, pp. 263-307.

"Zeit und Reform in mittelalterlichen Handschriften aus Halberstadt. Zeit-Dimensionen in liturgischen Quellen", in *Zeitenwelten. Zur Verschränkung von Zeitwahrnehmung und Weltdeutung (750-1350)*, ed. Miriam Czock and Anja Rathmann-Lutz (Köln 2016), pp. 195-212. Abb. pp. 173-176.

"Kirchliche Institutionen und Verschriftlichungsprozess. Bemerkungen anhand eines bisher unbeachteten breve recordationis de ficto der mailändischen Lektoren", in *Träger der Verschriftlichung und Strukturen der Überlieferung in Oberitalienischen Kommunen des 12. und 13. Jahrhunderts*, ed. Hagen Keller and Marita Blattmann = *Wissenschaftliche Schriften der WWU Münster, Reihe X, Bd. 25* (Münster 2016), pp. 17-74.

"Libri al tempo di Matilde: l'evangelario New York, Pierpont Morgan Library, MS M 492", in *Lucca e Matilde di Canossa tra storia e mito. Catalogo della mostra. Lucca, Biblioteca Statale, 8 novembre - 6 dicembre 2016*, ed. Raffaele Savigni, (Lucca 2016), pp. 28-40.

SEPTEMBER 2016

AUGUST 2017



DR MARIA CLOTILDE CAMBONI

LE STUDIUM/Marie Skłodowska-Curie Research Fellow

From: Université de Fribourg, Switzerland

In residence at: CESR, Tours

Dr Camboni obtained her PhD in Italian studies from the University of Pisa. Her research focuses on the problem of the tradition of vernacular medieval literature and of medieval culture in general, with strong interdisciplinary aspects, and she has a special expertise about poetic form. Her academic career spans over three different countries: Italy, Switzerland and France. She was the recipient of the "Marco Praloran" Fellowship 2013-2015 (Ezio Franceschini Foundation, Florence, Italy - University of Lausanne, Switzerland). Her second monograph, reconstructing how the conception of poetic form evolved, in Italy, during the XIII and XIV century, is forthcoming in 2017.

MIDDLE AGES IN RENAISSANCE

The project "Middle Ages in Renaissance" aims at investigating how Middle Ages Italian vernacular tradition was considered during the Renaissance. One of the main historical turning points between the two periods is the affirmation of the idea that art must consist in an imitation of the Classics, but with the rise of vernacular literature, since the second half of the XV century, and definitely since the beginning of the XVI, a new pool of models must be defined. They obviously could not be real "Classics" and had to be "medieval": however they were nevertheless chosen as models, and derogating from already established lexical uses, in few significant cases also referred to as "Ancients". Moreover, sometimes these texts were not circulating anymore: therefore they had to be recovered from "ancient" sources, just as the literature of ancient Greece and Rome had to be, finally being perceived in a parallel situation as the classics.

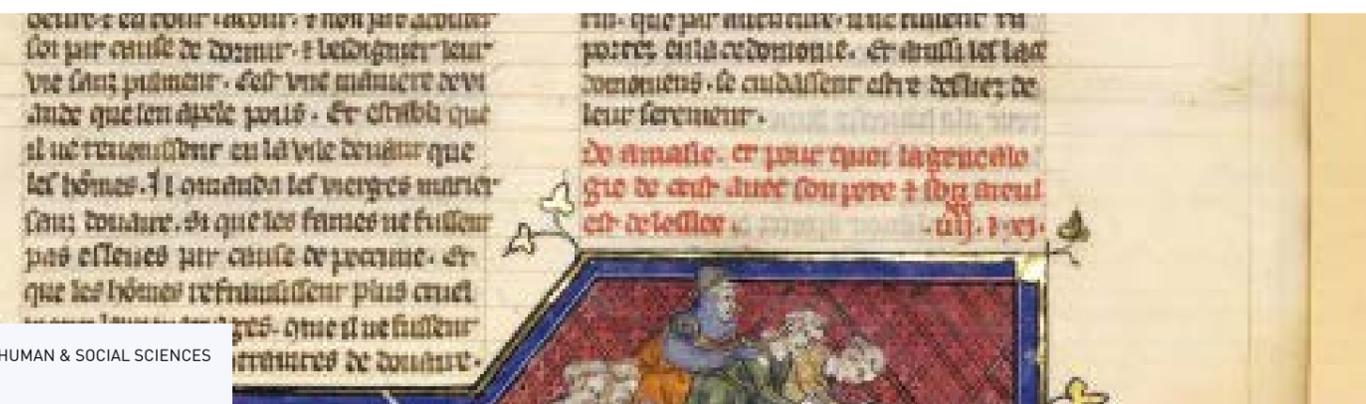
The project's aim is to set in context the process that lead to the final choice of vernacular authors, studying how medieval vernacular authors were considered, what was their appraisal, in some distinct Renaissance environments, focusing on vernacular poetry but taking into account non-lyric and also non-poetic works by which the medieval culture has been mediated to the Renaissance. The planned outcome of the research is a reconstruction of Renaissance attitudes towards a relevant part of Middle Ages literary tradition, and therefore towards their models, both possible and of choice.

To date, studying the role played by the Raccolta Aragonesa (a collection of early and contemporary Tuscan poems, assembled by Lorenzo de' Medici in 1476-7 to send to Federico of Aragon, the younger son of the King of Naples, whose localization is now unknown but whose content and appearance can be reconstructed by means of the study of its copies and of similar manuscript) regarding the access to the poems transmitted by it, it has been possible to reconstruct the logic that rules the choice and arrangement of its poems. Its apparent incoherencies can in fact be attributed to the fact that the collection is the result of a team work with the interference of different logics, that intervened in successive moments, resulting in at least one integration and rearrangement of the anthology. A scientific work demonstrating this hypothesis is currently being written.



Pr Chiara Lastraioli
Laboratory Host Scientist

Chiara Lastraioli is the director of the Maison des Sciences de l'Homme Val de Loire. Professor of Italian Studies at the Centre d'Etudes Supérieures de la Renaissance and at the Faculty of Languages and Literatures of the University of Tours, her teaching and research explore the relation of Italian and French Renaissance Literatures to theology, propaganda, book trade and the history of scholarship. She is in charge of the Bibliothèques Virtuelles Humanistes program (CESR) and she has published numerous essays on Renaissance authors and printers. Recently she has published a monographic volume on Pasquinate, grillete, pelate e altro Cinquecento librario minore. She's also the coordinator of the EDITEF project on Italian Books and Book Collections in Early Modern French Speaking Countries, financed by the Agence Nationale pour la Recherche, and the project ECRISA (L'Ecrit/ure, ses supports, ses archives) financed by Region Centre Val de Loire.



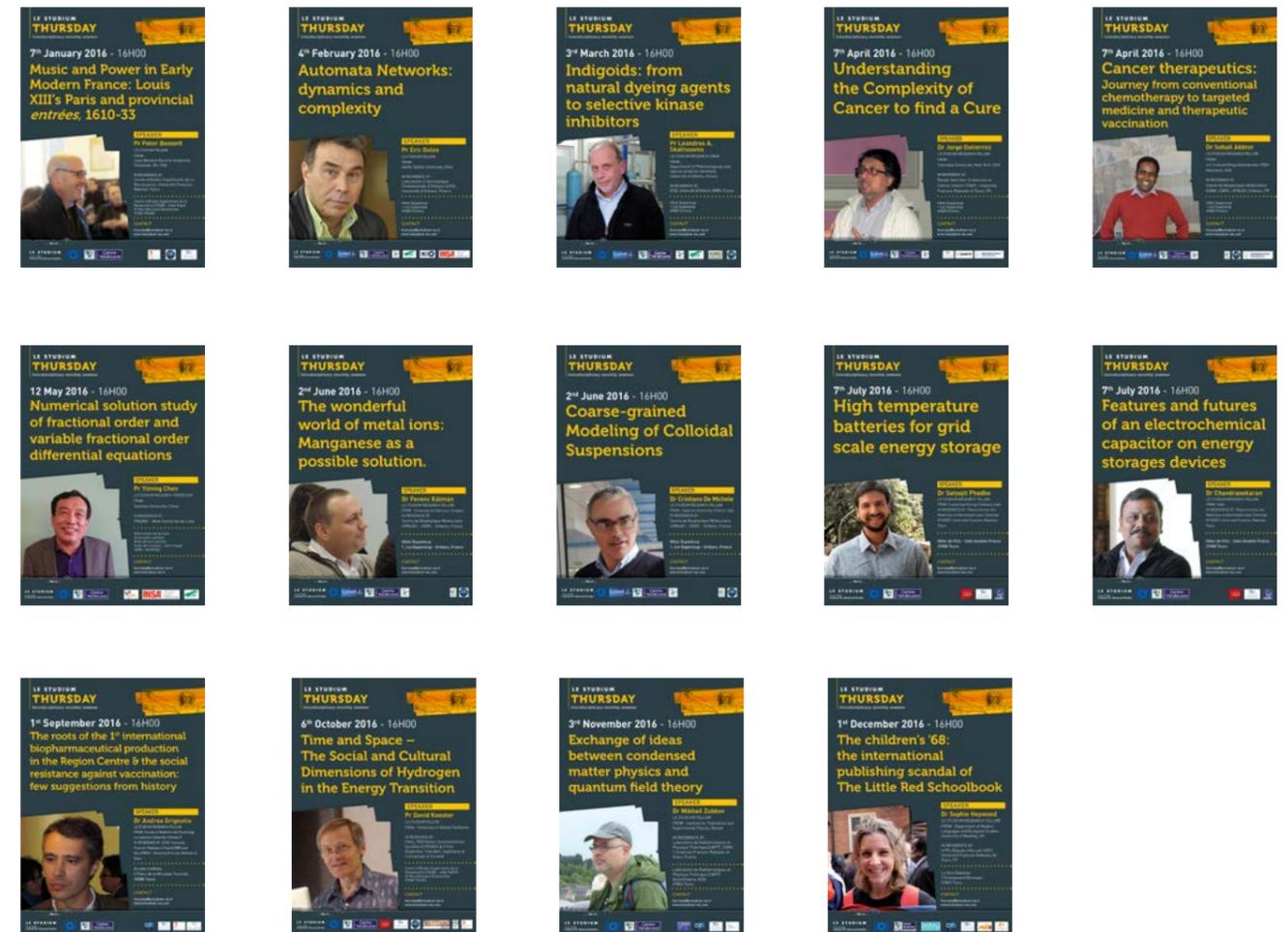


TRANSDISCIPLINARY APPROACH

Emblematic of the transdisciplinary approach put in place by LE STUDIUM Loire Valley Institute for Advanced Studies since 2010 to energize the regional scientific community exchanges are LE STUDIUM THURSDAYS monthly seminars.

These cross-disciplinary meetings take place every first Thursday of the month, gathering LE STUDIUM Research Fellows in residence, their laboratory hosts and guests from the scientific, industrial and institutional sectors. All international researchers visiting the region Centre-Val de Loire are welcome to attend these international meetings.

Since September 2016, PhD students of region Centre-Val de Loire's doctoral schools have the possibility to register and attend these seminars to enlarge their scientific field and discover new disciplines. A regular attendance enable them to validate credits.





LIFE OF INTERNATIONAL RESEARCHERS IN THE REGION CENTRE-VAL DE LOIRE

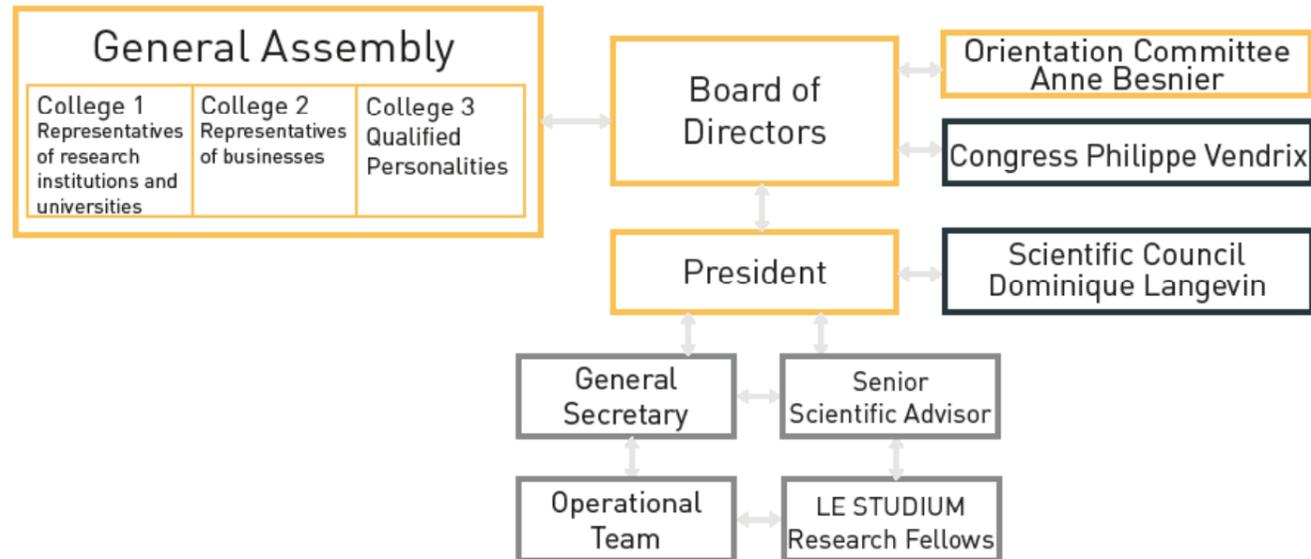
In all regional cities (Blois, Bourges, Chartres, Orléans and Tours) LE STUDIUM Research Fellows benefit from exceptional living and working conditions. Well established research institutions and laboratories offer their facilities in region Centre-Val de Loire and LE STUDIUM offers high-quality residences for its faculty.

In Orléans where LE STUDIUM headquarters are located, Research Fellows are regularly welcomed in the heart of the city in the prestigious Hôtel Dupanloup, the International University Centre for Research. This 16th century former bishop's residence has been brightly renovated using patrimony's architects and designers' talents and offers a prestigious modern and ancient decor to all scientific events.

Walking distance from the Hôtel Dupanloup in Orléans, LE STUDIUM houses Research Fellows in a newly renovated castle of the 18th century, Le Château de la Motte Sanguin. This impressive building offers seven apartments with a view over the Loire river, a terrace and a garden in which to relax.



GOVERNANCE



LE STUDIUM Loire Valley Institute for Advanced Studies is a non-profit organisation of Law 1901 registered in 1996 in Orléans, France. It is administered by a General Assembly of Members, a Board of Directors, an Orientation Committee and a Management team.

The General Assembly of members is composed of 3 collegia:

- representatives of research institutions and universities,
- representatives of businesses ,
- qualified personalities.

and meets annually to review the year's activities. Every four years, this General Assembly reviews the composition and elects a Board of Directors. Local and regional institutions are represented at LE STUDIUM Orientation Committee. The Board of Directors and the Orientation Committee meet 2 to 3 times a year to review the activities and prepare reports and orientation decisions for the General Assembly.

The President of LE STUDIUM is appointed for 4 years and reports to the Board of Directors. LE STUDIUM President oversees the activities performed by a small dynamic team based in Orléans.



Scientific Council meeting - June 2016

SCIENTIFIC COUNCIL

LE STUDIUM Scientific Council establishes the initial ranking of applications and recommends fellowship awards and consortium. It is composed of independent external researchers who gather once a year in June to analyze the scientific reviews provided by a pool of more than 600 experts and to finalize the selection of the Smart Loire Valley General Programme for Research Fellows who will next come in residence and other awards such as Professorship or Consortium. The Scientific Council members are also regularly consulted for their expertise to perform independent evaluations in the course of required recruitments occurring across the Ambition Research Development 2020 programmes.

For the campaign and call for applications 2016-2017, LE STUDIUM Scientific Council members were:

PRESIDENT

- Dominique LANGEVIN, Research Director in physical chemistry, Centre National de Recherche Scientifique, Laboratory of Solid State Physics at the University of Paris-Sud, FR

MEMBERS

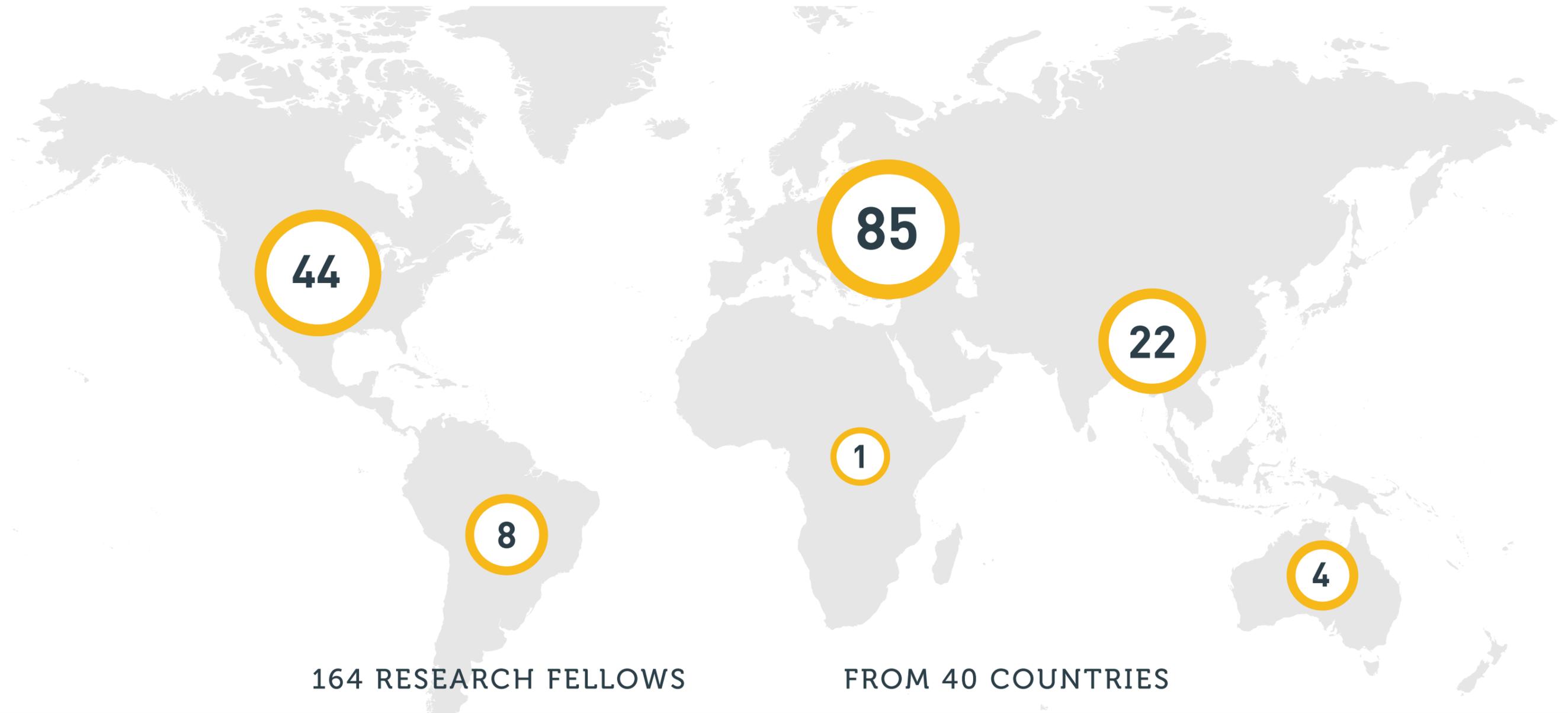
- Jean-Claude BERNIER, Professor, Chemistry and Interfaces in Physics and Biology, Strasbourg, FR
- Gordon CAMPBELL, Professor in Renaissance and seventeenth century studies, University of Leicester, UK
- Marie-Françoise COUREL, Geographer, Director of Research, Ecole Pratique des Hautes Etudes, Paris, FR
- James A. DIAS, Professor, Biomedical Sciences, University of the State of New York, USA
- Laurent FRANCIS, Professor of Information and Communication Technology, Electronics and Applied Mathematics, University of Louvain, BE
- Yves-Michel GINOT, Director of Innovation Division, Servier Group, Orléans, FR
- Pierre KHURI-YAKUB, Professor, Electrical Engineering, Stanford University, CA, USA
- David OGDEN, Director of Research, Laboratory of Brain Physiology and Biophysics, University Paris-Descartes, Paris, FR
- Alain PAVE, Professor, Biometrics and Evolutionary Biology, Lyon. Member of the Academy of Technologies, FR
- Christian PESKINE, Professor, Institute of Mathematics, Paris, FR
- Yveline PONCET, Geographer, Sustainability and Territories, FR
- Léandre POURCELOT, Professor Emeritis, Medicine, Tours, FR
- Michel VAN DER REST, Professor, Biochemistry and Biophysics, Lyon, FR
- Rüdiger WEHNER, Professor, Biology, University of Zürich, CH
- Friedrich-W WELLMER, Former President of the Federal Institute for Geosciences and Natural Resources, DE

PERMANENT GUESTS: REPRESENTATIVES OF UNIVERSITIES, RESEARCH ORGANIZATIONS AND REGIONAL INSTITUTIONS

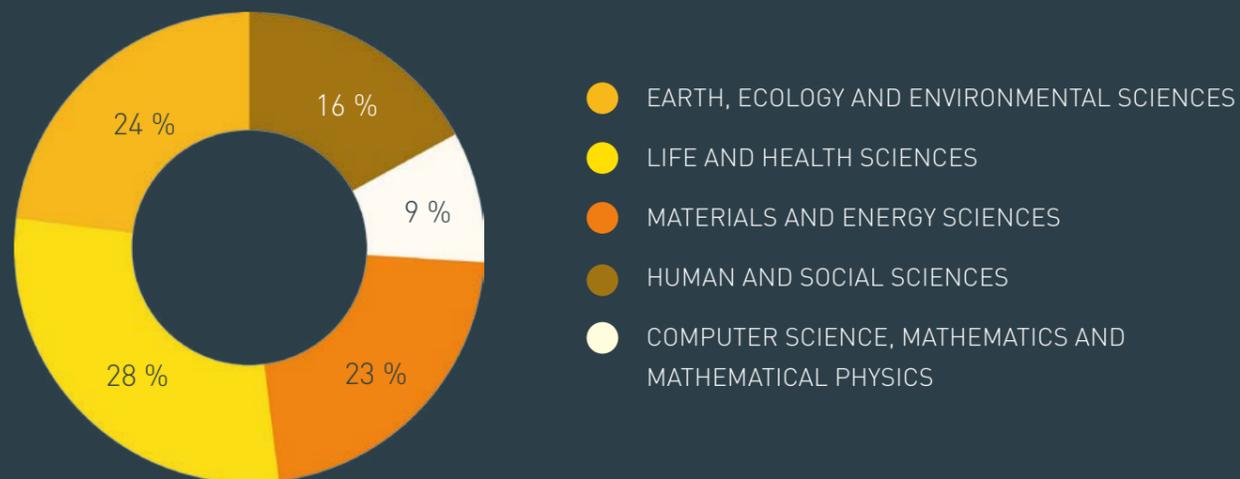
- Christian ANDRES, Inserm Scientific Correspondent.
- Catherine BEAUMONT, President Centre Inra Val-de-Loire
- Eric BUFFENOIR, CNRS Regional Delegate Centre Limousin-Poitou-Charentes
- Jean-Marie CASTELAIN, Director INSA Centre-Val de Loire, represented by Guy FEUILLARD
- Patrice PIANTONE, Research Branch, BRGM, Orléans
- Philippe SIMONNETTI, CEA Le Ripault, Tours
- Philippe VENDRIX, President of University François-Rabelais Tours, represented by Emmanuel LESIGNE, Vice-President Research
- University of Orléans, Vice-President Research
- Anne BESNIER, Vice-President Higher Education and Research, Region Centre-Val de Loire (2016-2019).
- Nicolas DUBOULOZ, Director of Higher Education, Research and Technology Transfer, Region Centre-Val de Loire.

ORIGIN OF LE STUDIUM RESEARCH FELLOWS

IN REGION CENTRE-VAL DE LOIRE SINCE 1996

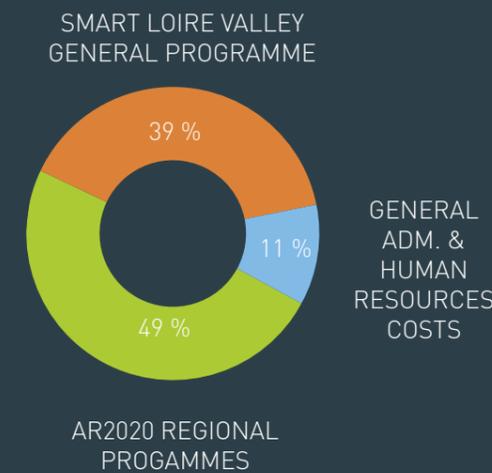


THEMATICS REPARTITION



2016 FINANCIAL DATA

2016 EXPENDITURES REPARTITION



2016 RESOURCES

Resource	Percentage	Total (€)
REGION CENTRE VAL DE LOIRE	65,27%	2 740 970 €
EUROPEAN FUNDS	26,31%	
UNIVERSITY FRANCOIS RABELAIS TOURS	2,28%	
AGGLO ORLEANS	2,01%	
LOIRET COUNCIL	1,34%	
PRIVATE CONTRIBUTIONS	1,06%	
VARIOUS	1,74%	

LE STUDIUM EVENTS IN 2016

CONFERENCE THURSDAY PUBLIC LECTURE WORKSHOP
CONSORTIUM SUMMER SCHOOL RENCONTRES LEONARDO



- 7 Music and Power in Early Modern France: Louis XIII's Paris and provincial entrées, 1610-33
Pr Peter Bennet (CESR)
- 11-15 Ecological Adaptation to Desert Environment (EADE)
Pr Raphaël Boulay (IRBI)
- 25-29 Dynamics of wood formation and adaptation of forest trees to climate variation
Dr Philippe Rozenberg (UAGPF)



- 3 Indigoids: from natural dyeing agents to selective kinase inhibitors
Pr Leandros Skaltsounis (ICOA)
- 7 Accidents Vasculaires Cérébraux : Recherche et thérapies
Dr Canan Ozsancak, Neurologue, CHR Orléans & Dr Myriam Bernardin, CERVOxy, Caen

- 2 Coarse-grained Modeling of Colloidal Suspensions
The wonderful world of metal ions: Manganese as a possible solution.
Dr De Michele (CBM) & Dr Kalman (CBM)
- 6-9 Inscribing Knowledge on the Page: Sciences, Tradition, Transmission and Subversion in the Medieval Book
Pr Rosalind Brown-Grant (POLEN)
- 6-10 Power and the paratext in the medieval manuscript culture
Pr Rosalind Brown-Grant (POLEN)
- 8 La pharmacie au Moyen Âge: la pratique et les livres
Pr Iolanda Ventura (IRHT)
- 13 Des théories d'Einstein aux matériaux les plus innovants
Pr Mark Olivier GOERBIG (Université Paris-Sud)

- 4 Les atouts santé de l'huile d'olive
Dr Veronique Coxam, UMR 1019 INRA/Université Clermont, France
- 4-6 Olive Bioactives: Applications and Prospects
Pr Skaltsounis Leandros & Pr Claire Elfakir (ICOA)
- 7 High temperature batteries for grid scale energy storage
Dr Satyajit Phadke (PCM2E)
- 7 Features and futures of an electrochemical capacitor on energy storages devices
Dr Chandrasekaran (PCM2E)
- 11-13 Sacred/secular intersections in early-modern European ceremonial: text, music, image and power
Pr Peter Bennett & Pr Philippe Vendrix (CESR)
- 11 La violence et le sacré dans l'entrée royale sous Louis XIII
Dr Marie-Claude Canova-Green (Goldsmiths College)

- 1 The roots of the 1st international biopharmaceutical production in the Region Centre & the social resistance against vaccination
few suggestions from history
Dr Andrea Grignolio (CESR / VALLOREM)
- 5-6 7th French-Czech «Vltava» Chemistry Meeting
Advancing Chemistry through Bilateral Collaborations
Dr Josef Hamacek (CBM)
- 7-9 Future strategies in electrochemical technologies for efficient energy utilisation
Dr Satyajit Phadke, Dr Chandrasekaran & Pr Mériem Anouti (PCM2E)
- 8 L'énergie disponible à tout moment : produire, économiser, stocker
Dr Anne De Guibert (SAFT)
- 26-28 Being Smart In Coordination Chemistry: Medical Applications
Dr Ferenc Kálmán & Dr Éva Jakab Tóth (CBM)
- 26 Chimie & Métaux du diagnostic médical aux thérapies
Pr Franck Denat (University of Burgundy)

- 3 Exchange of ideas between condensed matter physics and quantum field theory
Dr Mikhail Zubkov (LMPT)
- 7-9 Practical Engagements and the Social-Spatial Dimensions of the Post-Petroleum Future
Pr David Koester, Dr Bernard Buron & Dr Jean-Philippe Fouquet (CITERES)
- 8 Paléo-énergétique : les oubliés de la transition énergétique
Côme Bastin
- 24-25 Antibodies Targeting GPCRs, Recent Advances and Therapeutic Challenges
Dr Mohammed Ayoub & Dr Eric Reiter (PRC)
- 24 Peut-on breveter le vivant ?
Angélique Dacheux (IPforS)
- 28 Polish-French Scientific Workshop on Life Sciences

JANUARY

MARCH

MAY

JULY

SEPTEMBER

NOVEMBER

FEBRUARY

APRIL

JUNE

AUGUST

OCTOBER

DECEMBER

- 4 Automata Networks: dynamics and complexity
Pr Eric Goles (LIFO)
- 22-26 COSMetics in Orleans
Pr Salvatore Magazu (CBM)
- 25 Complexités et calcul : dessin et mathématiques
Pr Eric Goles (LIFO)

- 7 Cancer therapeutics: Journey from conventional chemotherapy to targeted medicine and therapeutic vaccination
Dr Sohail Akhter (Biopharmaceuticals ARD 2020)
- 7 Understanding the Complexity of Cancer to find a Cure
Dr Jorge Gutierrez (Biopharmaceuticals ARD 2020)



- 13-15 Condensed matter physics meets relativistic quantum field theory
Dr Mikhail Zubkov & Dr Maxim Chernodub (LMPT)
- 13-17 Ecohydraulics and dam removal
Pr Karl Wantzen (CITERES)
- 20-22 Cosmetopea and Sustainable Cosmetics
Pr Léandros Skaltsounis (ICOA)
- 20-24 Monitoring of monoclonal Antibodies Group in Europe (MAGE) for inflammatory diseases
Pr Denis Mulleman (GICC)
- 27-1st Sonoporation for therapy: from *in-vitro*, to *in-vivo* to patients
Dr Ayache Bouakaz (IC)



- 6 Time and Space – The Social and Cultural Dimensions of Hydrogen in the Energy Transition
Pr David Koester (CITERES)
- 10-14 DYNAWOOD
Dynamics of wood formation and adaptation of forest trees to climate variation
Dr Philippe Rozenberg (UAGPF)
- 10-12 Lipids, Nanotechnology and Cancer
Dr Jorge Gutierrez & Dr Philippe Frank (NCC)
- 10 Les lipides et le risque de cancer du sein
Pr Stephan Chevalier (NCC)

- 1 The Children's '68: the international publishing scandal of The Little Red Schoolbook
Dr Sophie Heywood (InTRu)
- 12-16 Anomalous Diffusion Processes In Biological And Physico-Chemical Systems
Pr Gerald Kneller (CBM)



LIST OF RESEARCHERS IN RESIDENCE IN 2016

SMART LOIRE VALLEY GENERAL PROGRAMME

PR PETER BENNETT

Music, liturgy and power: Louis XIII's Paris and provincial entrées, 1610-43

- August 2015 – August 2016
- In residence at: Centre d'Études Supérieures de la Renaissance (CESR) - UMR 7323 - Université François-Rabelais de Tours, CNRS
- Host scientist: Pr Philippe Vendrix

DR MARIA-CLOTILDE CAMBONI

Middle Ages in Renaissance

- September 2016 – August 2017
- In residence at: Centre d'Études Supérieures de la Renaissance (CESR) - UMR 7323 - Université François-Rabelais de Tours, CNRS
- Host scientist: Pr Chiara Lastraioli

PR YIMING CHEN

Observer Design for Distributed-Parameter Systems and Fractional Order Systems

- April 2016 – July 2016
- In residence at: Pluridisciplinaire de recherche en ingénierie des systèmes, mécanique et énergétique (PRISME), Université d'Orléans, Insa Centre Val De Loire
- Host scientist: Pr Driss Boutat

DR CRISTIANO DE MICHELE

Cell biology from the colloid physics perspective: a computational study of biomolecular interactions mid-way between the test-tube and the cell

- December 2015 – December 2016
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301-CNRS
- Host scientist: Pr Francesco Piazza

PR GARY GIBBONS

Classical and Quantum Space-Time and Its Symmetrics

- March 2016 – May 2016
- In residence at: Laboratoire de Mathématiques et Physique Théorique (LMPT) - UMR 7350 - CNRS, Université François-Rabelais de Tours
- Host scientist: Pr Sergey Solodukhin

PR ERIC GOLES

Discrete models of complex systems: computational complexity and (un)predictability, theory and applications

- January 2016 - March 2016
- In residence at: Laboratoire D'informatique Fondamentale D'Orléans (Lifo) – EA4022 – Université D'Orléans, Insa Centre Val De Loire
- Host scientist: Pr Nicolas Ollinger

DR SOPHIE HEYWOOD

The children's '68

- September 2016 – August 2017
- In residence at: Interaction, Transfert, Rupture Artistiques et Culturels (InTRu) - EA 6401 - Université François-Rabelais de Tours
- Host scientist: Dr Cécile Boulaire

DR FERENC KALMAN

Mn(II)-based smart contrast agents: synthesis and physico-chemical characterization

- January 2016 - December 2016
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301-CNRS
- Host scientist: Dr Eva Jakab Toth

DR MAURO MANNO

The role of glycosylation in the functional activity and pathological consequences of serpin proteins

- October 2016 - October 2017
- In residence at: Institut de Chimie Organique et Analytique (ICOA) – UMR 7311 – Université d'Orléans, CNRS
- Host scientist: Pr Richard Daniellou

PR MIHAI MUTASCU

A wavelet analysis of globalization and growth in euro zone

- November 2016 – November 2017
- In residence at: Laboratoire d'Économie d'Orléans (LEO) - UMR 7322 - Université d'Orléans, CNRS
- Host scientist: Pr Camelia Turcu

DR MAURO SIMONATO

Tracking the colonization patterns of an expanding forest pest and its natural enemies using molecular markers

- November 2016 – October 2017
- In residence at: Unité de Recherche Zoologie Forestière (URZF) - UR 0633 – Centre Inra Val de Loire
- Host scientist: Dr Jérôme Rousselet

PR LEANDROS SKALTSOUNIS

Application of state-of-the-art green technology for the development of high added value cosmeceuticals based on plant natural products

- December 2015 – July 2016
- In residence at: Institut de Chimie Organique et Analytique (ICOA) – UMR 7311 – Université d'Orléans, CNRS
- Host scientist: Pr Claire Elfakir

DR GYULA TIRCSÓ

Rational design, synthesis and study of new macrocyclic ligands for biomedical and radiopharmaceutical application

- January 2015 – January 2016
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301-CNRS
- Host scientist: Dr Eva Jakab Toth

DR MIKHAIL ZUBKOV

Establishing links between gravity, field theory and condensed matter: Dirac and Weyl semimetals, superfluids, composite Higgs bosons

- January 2016 – Décembre 2016
- In residence at: Laboratoire de Mathématiques et Physique Théorique (LMPT) - UMR 7350 - CNRS 2964 - Université François-Rabelais de Tours, CNRS
- Host scientist: Dr Maxim Chernodub

PROGRAMME ARD 2020 BIOPHARMACEUTICALS

DR SOHAIL AKHTER

Synthesis and Biosynthesis of molecules – Development of mRNA cellular factories

- June 2015 - June 2017
- In residence at: Centre de Biophysique Moléculaire (CBM), UPR 4301, CNRS
- Host scientist: Pr Chantal Pichon

DR MOHAMMED AKLI AYOUB

Targeting of G protein-coupled receptors by modulator antibodies

- July 2014 - December 2016
- In residence at: Physiologie de la Reproduction et des Comportements (PRC) - UMR 085 - Centre Inra Val de Loire, Université François-Rabelais de Tours, CNRS, Institut Français du Cheval et de l'Équitation
- Host scientist: Dr Eric Reiter

DR ANDREA GRIGNOLIO

The acceptability of biomedical innovation: historical approach

- November 2015 – February 2017
- In residence at: Laboratoire Val de Loire Recherche en Management (VALLOREM) – EA 6296 – Université d'Orléans, Université François-Rabelais de Tours & UMR 7323, CNRS, Centre d'études Supérieures de la Renaissance (CESR) - UMR 7323 - Université François-Rabelais de Tours, CNRS
- Host scientists: Pr Véronique Des Garets (VALLOREM) & Dr Concetta Pennuto (CESR)

DR JORGE GUTIERREZ

Lipids as modulators of the response to biodrugs

- December 2014 - June 2017
- In residence at: Nutrition, Croissance et Cancer (N2C) – UMR 1069 - Inserm, Université François-Rabelais de Tours
- Host scientist: Pr Philippe G. Frank

PROGRAMME ARD 2020 LAVOISIER

DR ARAYIK HAMBARDZUMYAN

MOINDEPAI Project

- September 2015 – December 2016
- In residence at: Interfaces, Confinement, Matériaux et Nanostructures (ICMN) - UMR 7374 - CNRS, Université d'Orléans
- Host scientist: Dr Marylène Vayer

DR JOHNSON IRUDAYARAJ

Engineering and Systems for Renewable Energy

- November 2016 – June 2017
- In residence at: Groupe de Recherche en Matériaux, Microélectronique, Acoustique et Nanotechnologies (GREMAN) UMR 7347 - Université François-Rabelais de Tours, CNRS, INSA-CVL
- Host scientist: Pr Marc Lethiecq

PR DAVID KOESTER

Social Values in the Vision of a Hydrogen-Based Society in France: A comparative, Social Study of Discourses and Institutions

- January 2016 - January 2017
- In residence at: CItés, TERritoires, Environnement et Sociétés (CITERES) - UMR 7324 - Université François-Rabelais de Tours, CNRS
- Host scientist: Dr Bernard Buron

DR SATYAJIT PHADKE

Energy storage systems – Storage 1

- January 2016 - June 2017
- In residence at: Physico-Chimie des Matériaux et des Electrolytes pour l'Énergie (PCM2E) - EA 6299 - Université François-Rabelais de Tours
- Host scientist: Pr Mérièm Anouti

DR CHANDRASEKARAN RAMASAMY

Redox flow and hybrid energy storage systems

- September 2015 - September 2016
- In residence at: Physico-Chimie des Matériaux et des Electrolytes pour l'Energie (PCM2E) - EA 6299 - Université François-Rabelais de Tours
- Host scientist: Pr Mérièm Anouti

PROGRAMME ARD 2020 COSMETOSCIENCES

PR SALVATORE MAGAZU

From sugars and polyols to innovative cosmetic formulations and technologies: Molecular mechanisms and nanoscopic characterization

- July 2016 - July 2017
- In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301-CNRS
- Host scientist: Pr Francesco Piazza

DR SIVAKUMAR PONNURENGAM MALLIAPPAN

Innovative nanocarrier delivery system for Active Cosmetic Ingredients (ACI) and In vitro model development of Stratum Corneum

- October 2016 - October 2017
- In residence at: Nanomédicaments et Nanosondes (NMNS) - EA6295 - Université François Rabelais de Tours
- Host scientist: Dr Emilie Munnier

CONSORTIUM MEETINGS

ECOLOGICAL ADAPTATION TO DESERT ENVIRONMENT

- 11-15 January 2016
- CESR, Tours
- Pr Raphaël Boulay (IRBI)

DYNAMICS OF WOOD FORMATION AND ADAPTATION OF FOREST TREES TO CLIMATE VARIATION

- 25-29 January 2016 and 10-14 October 2016
- Hôtel Dupanloup, Orléans
- Dr Philippe Rozenberg (UAGPF)

COSMETICS IN ORLÉANS

- 22-26 February 2016
- Hôtel Dupanloup, Orléans
- Pr Salvatore Magazu & Pr Chantal Pichon (CBM)

POWER AND THE PARATEXT IN THE MEDIEVAL MANUSCRIPT CULTURE

- 6-10 June 2016
- Hôtel Dupanloup, Orléans
- Pr Rosalind Brown-Grant (POLEN) & Pr Iolanda Ventura (IRHT)

ECOHYDRAULICS AND DAM REMOVAL

- 13-17 June 2016
- Chinon
- Pr Karl Matthias Wantzen (CITERES)

MONITORING OF MONOCLONAL ANTIBODIES GROUP IN EUROPE (IMAGE) FOR INFLAMMATORY DISEASES

- 20-24 June 2016
- CESR, Tours
- Pr Denis Mulleman (GICC)

SONOPORATION FOR THERAPY: FROM *IN-VITRO*, TO *IN-VIVO* TO PATIENTS

- 27 June-1 July 2016
- CESR, Tours
- Dr Ayache Bouakaz (IC)

ANOMALOUS DIFFUSION PROCESSES IN BIOLOGICAL AND PHYSICO-CHEMICAL SYSTEMS

- 12-16 December 2016
- Hôtel Dupanloup, Orléans
- Pr Gerald Kneller (CBM)

DEVELOPING HIGH ENERGY DENSITY STORAGE TECHNOLOGIES FOR PORTABLE AND TRANSPORTATION APPLICATIONS

- 12-16 December 2016
- CESR, Tours
- Pr Mérièm Anouti (PCM2E)

CONFERENCES & WORKSHOPS IN 2016

CLASSICAL AND QUANTUM BLACK HOLES

- 30-31 May 2016
- LMPT, Tours
- Pr Gary Gibbons and Pr Sergey Solodukhin (LMPT)

INSCRIBING KNOWLEDGE ON THE PAGE: SCIENCES, TRADITION, TRANSMISSION AND SUBVERSION IN THE MEDIEVAL BOOK

- 6-9 June 2016
- Hôtel Dupanloup, Orléans
- Pr Rosalind Brown-Grant and Pr Bernard Ribémont (POLEN)

CONDENSED MATTER PHYSICS MEETS RELATIVISTIC QUANTUM FIELD THEORY

- 13-15 June 2016
- CESR, Tours
- Dr Mikhail Zubkov and Dr Maxim Chernodub (LMPT)

OLIVE BIOACTIVES: APPLICATIONS AND PROSPECTS

- 4-6 July 2016
- Hôtel Dupanloup, Orléans
- Pr Leandros Skaltsounis and Pr Claire Elfakir (ICOA)

SACRED/SECULAR INTERSECTIONS IN EARLY-MODERN EUROPEAN CEREMONIAL: TEXT, MUSIC, IMAGE AND POWER

- 11-13 July 2016
- CESR, Tours
- Pr Peter Bennett and Pr Philippe Vendrix (CESR)

FUTURE STRATEGIES IN ELECTROCHEMICAL TECHNOLOGIES FOR EFFICIENT ENERGY UTILISATION

- 7-9 September 2016
- La Tortinière, 37-Veigné
- Dr Satyajit Phadke/Dr Chandrasekaran Ramasamy and Pr Meriem Anouti (PCM2E)

BEING SMART IN COORDINATION CHEMISTRY: MEDICAL APPLICATIONS

- 26-28 September 2016
- Hôtel Dupanloup, Orléans
- Dr Ferenc Kálmán and Dr Eva Jakab Toth (CBM)

LIPIDS, NANOTECHNOLOGY AND CANCER

- 10 - 12 October 2016
- Hôtel de Ville, Tours
- Dr Jorge Gutierrez/ Pr Philippe G. Frank and Pr Stephan Chevalier (NCC)

PRACTICAL ENGAGEMENTS AND THE SOCIAL-SPATIAL DIMENSIONS OF THE POST-PETROLEUM FUTURE

- 7-9 November 2016
- CCI Touraine, Tours
- Pr David Koester and Dr Bernard Buron (Citeres)

ANTIBODIES TARGETING GPRCS, RECENT ADVANCES AND THERAPEUTIC CHALLENGES

- 24-25 November 2016
- Hôtel Univeris, Tours
- Dr Mohammed Ayoub and Dr Eric Reiter (PRC)

THURSDAY MEETINGS IN 2016

MUSIC AND POWER IN EARLY MODERN FRANCE: LOUIS XIII'S PARIS AND PROVINCIAL ENTRÉES, 1610-33

- 7 January 2016
- CESR, Tours
- Pr Peter Bennet (CESR)

AUTOMATA NETWORKS: DYNAMICS AND COMPLEXITY

- 4 February 2016
- Hôtel Dupanloup, Orléans
- Pr Eric Goles (LIFO)

INDIGOIDS: FROM NATURAL DYEING AGENTS TO SELECTIVE KINASE INHIBITORS

- 3 March 2016
- Hôtel Dupanloup, Orléans
- Pr Leandros Skaltsounis (ICOA)

CANCER THERAPEUTICS: JOURNEY FROM CONVENTIONAL CHEMOTHERAPY TO TARGETED MEDICINE AND THERAPEUTIC VACCINATION - UNDERSTANDING THE COMPLEXITY OF CANCER TO FIND A CURE

- 7 April 2016
- Hôtel Dupanloup, Orléans
- Dr Sohail Akhter (CBM) & Dr Jorge Gutierrez (NCC)

NUMERICAL SOLUTION STUDY OF FRACTIONAL ORDER AND VARIABLE FRACTIONAL ORDER DIFFERENTIAL EQUATIONS

- 12 May 2016
- INSA Bourges
- Pr Yiming Chen (Prisme)

COARSE-GRAINED MODELING OF COLLOIDAL SUSPENSIONS - THE WONDERFUL WORLD OF METAL IONS: MANGANESE AS A POSSIBLE SOLUTION

- 2 June 2016
- Hôtel Dupanloup, Orléans
- Dr Cristiano De Michele (CBM)

HIGH TEMPERATURE BATTERIES FOR GRID SCALE ENERGY STORAGE FEATURES AND FUTURES OF AN ELECTROCHEMICAL CAPACITOR ON ENERGY STORAGE DEVICES

- 7 July 2016
- Hôtel de Ville, Tours
- Dr Satyajit Phadke and Dr Chandrasekaran Ramasamy (PCM2E)

THE ROOTS OF THE 1ST INTERNATIONAL BIOPHARMACEUTICAL PRODUCTION IN THE REGION CENTRE & THE SOCIAL RESISTANCE AGAINST VACCINATION: FEW SUGGESTIONS FROM HISTORY

- 1 September 2016
- Arcades Institute, Tours
- Dr Andrea Grignolio (CESR-VALLOREM)

THE SOCIAL DIMENSIONS OF HYDROGEN IN THE ENERGY TRANSITION

- 6 October 2016
- CESR, Tours
- Pr David Koester (CITERES)

EXCHANGE OF IDEAS BETWEEN CONDENSED MATTER PHYSICS AND QUANTUM FIELD THEORY

- 3 November 2016
- LMPT, Tours
- Dr Mikhail Zubkov (LMPT)

68' CHILDREN AND LITERATURE

- 1 December 2016
- CESR, Tours
- Dr Sophie Heywood (InTRu)

LECTURES IN 2016

LA PHARMACIE AU MOYEN ÂGE: LA PRATIQUE ET LES LIVRES

- 8 June 2016
- Hôtel Dupanloup, Orléans
- Pr Iolanda Ventura - IRHT - CNRS
- CNRS - IRHT, Université d'Orléans

DES THÉORIES D'EINSTEIN AUX MATÉRIAUX LES PLUS INNOVANTS

- 13 June 2016
- Hôtel de Ville, Tours
- Pr Mark Olivier Goerbig - Laboratoire de Physique des Solides - Université Paris-Sud

LES ATOUTS SANTÉ DE L'HUILE D'OLIVE

- 4 July 2016
- Hôtel Dupanloup, Orléans
- Dr Véronique Coxam, UMR 1019 INRA/Université Clermont

LA VIOLENCE ET LE SACRÉ DANS L'ENTRÉE ROYALE SOUS LOUIS XIII

- 11 July 2016
- Arcades Institute, Tours
- Dr Marie-Claude Canova-Green, Goldsmiths, University of London

L'ÉNERGIE DISPONIBLE À TOUT MOMENT : PRODUIRE, ÉCONOMISER, STOCKER

- 8 September 2016
- Hôtel de Ville, Tours
- Dr Anne de Guibert, SAFT

CHIMIE & MÉTAUX : DU DIAGNOSTIC MÉDICAL AUX THÉRAPIES

- 26 September 2016
- Hôtel Dupanloup, Orléans
- Pr Franck Denat, Institut de Chimie Moléculaire de l'Université de Bourgogne

LES LIPIDES ET LE RISQUE DE CANCER DU SEIN

- 26 October 2016
- Hôtel de Ville, Tours
- Pr Stephan Chevalier (NCC)

PALÉO-ÉNERGÉTIQUE : LES OUBLIÉS DE LA TRANSITION ÉNERGÉTIQUE

- 8 November 2016
- CCI Tours
- Côme Bastin, journaliste économie nouvelle génération

PEUT-ON BREVETER LE VIVANT?

- 24 November 2016
- Lycée Descartes, Tours
- Angélique Dacheux, IPforS (propriété industrielle au service des scientifiques)

AFFILIATED EVENTS

STACS 2016 - THE 33RD INTERNATIONAL SYMPOSIUM ON THEORETICAL ASPECTS OF COMPUTER SCIENCE

- 17-20 February 2016
- Hôtel Dupanloup, Orléans
- Pr Jarkko Kari, Turku University, Finland and Pr Eric Goles (LIFO)

ADVANCING CHEMISTRY THROUGH BILATERAL COLLABORATIONS (CONFERENCE VLTAVA - FRANCE/CZECH REPUBLIC - CHEMISTRY)

- 5-6 September 2016
- Hôtel Dupanloup, Orléans
- Dr Jozef Hamacek (CBM)

RENCONTRES LEONARDO

COMPLEXITÉS ET CALCUL: DESSIN ET MATHÉMATIQUES

- 25 February 2016
- Les Turbulences, FRAC Centre, Orléans
- Pr Eric Goles (LIFO)

ACCIDENTS VASCULAIRES CÉRÉBRAUX : RECHERCHE ET THÉRAPIES

- 7 March 2016
- Hôtel Dupanloup, Orléans
- Dr Canan Ozsancak, Neurologue, CHR Orléans and Dr Myriam Bernaudin, CERVOxy, Caen

SMART LOIRE VALLEY GENERAL PROGRAMME AWARDS – SELECTION OF CAMPAIGN 2016 / 2017

LE STUDIUM RESEARCH FELLOWSHIP*

**The SMART LOIRE VALLEY Fellowships receives H2020 co-funding from the European Union for research and innovation as part of the Maria Skłodowska-Curie Actions, Contract No. 665790.*

PR GRAEME BOONE

Emotion in Dufay

- From: Ohio State University, USA
- Host Scientist: Pr Philippe Vendrix, CESR, CNRS, Université François-Rabelais de Tours

DR MARIA CLOTILDE CAMBONI

Middle Ages in Renaissance

- From: University of Fribourg, Switzerland
- Host Scientist: Pr Chiara Lastraioli, CESR, CNRS, Université François-Rabelais de Tours

DR KRISTINA DJANASHVILI

Responsive Nanozeolites: Smart Porosity and Surface Tailoring for Multimodal Imaging and Therapy of Cancer

- From: Delft University of Technology, The Netherlands
- Host Scientist: Dr Eva Jakab-Toth, CBM, CNRS

DR SOPHIE HEYWOOD

The children's '68

- From: University of Reading, UK
- Host Scientist: Dr Cécile Boulaire, InTRu, Université François-Rabelais de Tours

DR WILLIAM HORSNELL

Targeting acetylcholine receptors to enhance immunity to acute viral infection

- From: University of Cape Town, South Africa
- Host Scientist: Pr Valérie Quesniaux, INEM, CNRS, Université d'Orléans

DR MAURO MANNO

- **The role of glycosylation in the functional activity and pathological consequences of serpin proteins**
- From: Consiglio Nazionale delle Ricerche, Italy
- Host Scientist: Pr Richard Daniellou, ICOA, CNRS, Université d'Orléans

DR ERIK BOUDEWIJN MULLER

- **Feeding and reproductive strategies: a dynamic energy budget approach applied to insects**
- From: University of California Santa Barbara, USA
- Host Scientist: Pr Jérôme Casas, IRBI, CNRS, Université François-Rabelais de Tours

PR MIHAI MUTASCU

- **A wavelet analysis of globalization and growth in euro zone**
- From: West University of Timisoara, Romania
- Host Scientist: Pr Camelia Turcu, LEO, CNRS, Université d'Orléans

PR MICHIEL POSTEMA

- **Sonic antibubbles in harmonic medical imaging and therapy**
- From: University of Bergen, Norway
- Host Scientist: Dr Ayache Bouakaz, Imagerie et Cerveau, Inserm, Université François-Rabelais de Tours

DR EMMANUEL SARIDAKIS

- **New crystallization strategies for structure-guided pharmacological development – Large biological assemblies for RNA metabolism**
- From: Institute of Nanoscience and Nanotechnology, Greece
- Host Scientist: Dr Marc Boudvillain, CBM, CNRS

PR VLADIMIR SHISHOV

- **Global Tree-Ring Growth Evolution Neural Network (VS-GENN)**
- From: Siberian Federal University, Russia
- Host Scientist: Dr Philippe Rozenberg, UAGPF, Inra

DR MAURO SIMONATO

- **Tracking the colonization patterns of an expanding forest pest and its natural enemies using molecular markers**
- From: University of Padova, Italy
- Host Scientist: Dr Jérôme Rousselet, Inra Ardon, URZF, INRA

LE STUDIUM RESEARCH PROFESSORSHIP

PR AKKIHEBBAL RAVISHANKARA

- **Interlinkages in the chemistries of the troposphere and stratosphere: impacts of nitrous oxide on Earth system**
- From: Colorado State University, USA
- Host Scientist: Dr Abdelwahid Mellouki, ICARE, CNRS Orléans

LE STUDIUM RESEARCH CONSORTIUM

PR GERALD KNELLER

- **Anomalous diffusion processes in biological and physico-chemical systems**
- Host Laboratory: CBM, CNRS

DR WOLFRAM KLOPPMANN

- **Multi-isotope and chemical tracing for understanding the sources and fate of macronutrients at the basin scale (MUTUAL)**
- Host Laboratory: Unité Isotopes, BRGM

CONTACTS

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LE STUDIUM

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