LE STUDIUM

Loire Valley
Institute for Advanced Studies

SCIENTIFIC REPORT 2019

ANNUAL REPORT 2019

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L'ÉDITORIAL DU PRÉSIDENT

En 2019, Le Studium a tenu sa place d'irrigateur de recherche fondamentale, de catalyseur de talents en Région Centre-Val de Loire, et de contributeur de liens à l'international soutenu par ses partenaires territoriaux, la Région Centre- Val de Loire, la Métropole d'Orléans, tout comme ses partenaires académiques, l'Université d'Orléans, l'Université de Tours, l'INSA, le BRGM, l'INRAE, l'IRSTEA, le CEA, l'INSERM, le CNRS. Il a accompagné des projets collaboratifs d'envergure internationale qui ont permis de faire venir une quarantaine de chercheurs internationaux dans les laboratoires académiques de la région. C'est le résultat des appels d'offre initiés au travers des programmes Ambition Recherche et Développement 2020 (ARD 2020) ou dans le cadre du Smart Loire Valley Programme intégré dans les actions Marie-Sklodowska-Curie de l'Union Européenne.

Pris en charge par Le Studium, les chercheurs sélectionnés ont pu se consacrer, dès leur arrivée, à leur activité de recherche au sein de leur laboratoire hôte. Lors des «Le Studium Thursdays», ils ont pu partager la raison et les perspectives de leurs travaux et élargir leur horizon aux côtés d'une communauté internationale réunie au sein de ces séminaires mensuels. Au-delà de l'approfondissement d'un domaine d'intérêt, Le Studium offre cette opportunité rare et réelle d'un partage interdisciplinaire. Ouvert au monde entier et à toutes les disciplines, Le Studium occupe une place singulière en tant qu'Institut d'Etudes Avancées.

Utile un réseau ? Certainement, déjà comme point de départ de deux initiatives à l'international. Dans le cadre des programmes ARD 2020 Biomédicaments et CosmétoSciences, des liens se sont noués avec l'Université de Lublin en Pologne qui ouvrent sur un partenariat entre les Universités de Tours et de Lublin en vue d'un projet d'Université Européenne. De même, la venue au Studium de représentants du ministère de la Recherche d'Indonésie accompagnés du conseiller scientifique de l'Ambassade de France à Djakarta. Ces échanges ont ouvert la possibilité d'accueillir pour quelques mois à l'INSA des chercheurs financés par leur pays d'origine.
2019, c'est aussi l'année d'une conférence internationale Le Studium «Climat, Qualité de l'Air et Santé», présidée par le Prof. M.J. Molina, Prix Nobel de Chimie. Un évènement qui est entré naturellement et logiquement en résonance avec le lancement de la 1ère COP Régionale - Urgences climatique et sociale.

Ces actions et réalisations sont le fruit d'un travail centré sur la qualité : en premier lieu celle des projets de recherche soumis au filtre exigeant d'un conseil scientifique international et indépendant, celle des chercheurs invités et celle de l'accueil en région qui vise à épargner à tout chercheur invité un parcours administratif chronophage. Cette qualité est construite jour après jour par une petite équipe qui ne ménage ni ses efforts ni son temps, au service des chercheurs, des laboratoires, du conseil scientifique, pour gagner et tenir ce label. Son moteur? Certainement la chance d'accueillir et côtoyer des femmes et des hommes de passion qui auscultent notre monde, à la pointe de savoirs étonnants, toujours porteurs d'une soif de comprendre et d'une grande diversité de culture. Une prouesse renouvelée encore cette année, avec le soutien de nos partenaires, et qu'il me faut chaleureusement remercier au travers de ce rapport scientifique 2019. Comme Carlos Moedas, ex-commissaire Européen à la Recherche, la Science et l'Innovation, en avait fait la ligne de son action à la Commission Européenne, Le Studium inscrit sa pratique dans la même perspective: « Open Science, Open to the World, Open to Innovation ».

Bonne lecture à chacun.

M. Yves-Michel Ginot,
Président

THE PRESIDENT EDITORIAL

In 2019, Le Studium has held its place as an irrigator of fundamental research, a catalyst for talents in the Centre-Val de Loire region, and a contributor to the development of international links in collaboration with its territorial partners, the Région Centre-Val de Loire, the Metropolis of Orléans, as well as its academic partners, the University of Orléans, the University of Tours, INSA, BRGM, INRAE, IRSTEA, CEA, INSERM and CNRS. It has supported international collaborative projects leading to the residency of forty international researchers in the region's academic laboratories. This is the result of calls for applications initiated through the Ambition Research and Development 2020 (ARD 2020) programmes or within the framework of the Smart Loire Valley Programme integrated into the Marie Skłodowska-Curie actions of the European Union.

The well-prepared arrivals of selected fellows enabled them to shortly switch to their research activity in their host laboratory. The monthly Le Studium Thursday seminars offered them a space to share the rationale and perspectives of their work and broaden their horizons alongside an international community gathered in these monthly seminars. Beyond the deepening of an area of interest, Le Studium offers this rare and real opportunity for interdisciplinary sharing. Open to the whole world and to all scientific disciplines, Le Studium occupies a singular place as an Institute for Advanced Studies.
Useful a network? Certainly, already as a starting point for two international initiatives. Within the framework of the ARD 2020 Biopharmaceuticals and Cosmetosciences programmes, links were established with the University of Lublin in Poland, which opening up a partnership between the Universities of Tours and Lublin with a view to an European University project. Similarly, the visit to Le Studium of the Indonesian Ministry of Research's representatives accompanied by the scientific advisor of the French Embassy in Jakarta. These exchanges translated into concrete funding of post-doctoral researchers for several months of residence at INSA Centre-Val de Loire.

2019, is also the year of an international Le Studium conference on Climate, Air Quality and Health, chaired by Prof. M.J. Molina, Nobel Prize in Chemistry. An event that naturally and logically resonated with the launch of the 1st Regional COP - Climate and Social Emergencies to which Le Studium brought its support.

These actions and achievements are the result of work focused on quality: first of all, the quality of research projects submitted to the demanding filter of an international and independent scientific council, the quality of selected researchers and the quality of regional hosting, which aims to spare any invited researcher a time-consuming administrative process. This quality is built day after day by a small team that saves neither effort nor time, at the service of researchers, laboratories and the scientific council, in order to earn and maintain this label. Its driving forces? Certainly, the chance to welcome and rub shoulders with men and women of passion who are at the cutting edge of our world, at the cutting edge of astonishing knowledge, always carrying a thirst for understanding and a great diversity of culture. A feat renewed again this year, with the support of our partners, for which I must warmly thank them through this 2019 Scientific Report.
As Carlos Moedas, former European Commissioner for Research, Science and Innovation, made it the line of his action at the European Commission, Le Studium places its practice in the same perspective: «Open Science, Open to the World, Open to Innovation».

Wishing you a pleasant reading.

Mr Yves-Michel Ginot,
President

IDENTITY & MISSION

LE STUDIUM Loire Valley Institute for Advanced Studies (IAS): a unique support to research and innovation in the Centre-Val de Loire region and intellectual space for interdisciplinary exchanges.

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 Centre-Val de Loire region an outward looking dynamic for the scientific community that includes public and private research stakeholders. It aims to strengthen the human capital for research, development and innovation and to participate in the valorisation of research and regional scientific and economic influence.

To achieve these objectives LE STUDIUM Loire Valley IAS supports international collaborative research projects and the mobility of experienced international researchers across all scientific disciplines, selects, recruits and hosts experienced international scientists through calls for applications and develops a rich scientific animation programme with international conferences, workshops, transdisciplinary seminars, and events for the promotion of the scientific culture and knowledge. Each selected researcher benefits from a dedicated assistance to facilitate his/her smooth and prompt integration in the region.

LE STUDIUM Loire Valley IAS is largely supported by the Region Centre-Val de Loire and other local authorities and regional partners. The SMART LOIRE VALLEY general 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. In parallel LE STUDIUM is the official partner for the international dynamic, recruitments and scientific events of the ARD 2020 smart specialization programmes initiated by the Region Centre-Val de Loire to structure the regional scientific landscape.

At the interconnection between fundamental research and innovation, LE STUDIUM benefits from a strong regional network of scientific partners and works in close collaboration with regional research stakeholders:

- **Higher education and research institutions**: University of Orléans, University of Tours, INSA Centre-Val de Loire, ESAD Orléans
- **National research institutes**: BRGM, CNRS Centre Limousin Poitou-Charente, CEA Le Ripault, Centre INRAE Val de Loire, Inserm
- **Poles of Competitiveness**: Cosmetic Valley, Elastopole, Dream, S2E2
- **Other clusters and organisations** : Euclide, Dev'Up, Végépolys, POLEPHARMA, Centre-Sciences, Chambers of Commerce, etc...

LE STUDIUM Loire Valley Institute for Advanced Studies various awards are attributed thanks to the support and expertise of LE STUDIUM Scientific Council made up of twenty-five renowned international scientists who regularly dedicate some of their precious time to assess research projects and applications.

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 a creative activity, namely Curiosity, Imagination and Intuition.

SCIENTIFIC VISION & SURROUNDINGS

From fundamental research to innovation and socio-economic development

LE STUDIUM Loire Valley Institute for Advanced Studies is strongly embedded in the Centre-Val de Loire region's research landscape. With 23 years of experience and holding a prestigious portfolio of regional and international research programmes, LE STUDIUM activities continue to grow and spread light on its actors and partners. The focus of its mission remains to build the human capacity for research and scientific knowledge and to foster socioeconomic development and innovation. As a matter of fact, LE STUDIUM's expertise lies in attracting, managing a growing flow of global research exchanges, creating new scientific value chains, and contributing to the emergence of innovative, collaborative research and enterprise activities. The impact of new knowledge on the economy is incremental, but the cumulative effect is substantial.

In November 2015, LE STUDIUM was awarded by the European Union Horizon 2020 COFUND scheme in the category of the Marie Skłodowska-Curie Actions. The Smart Loire Valley Fellowship Programme (SLV) enables LE STUDIUM to select and attract a large number of experienced scientists who come to spend a one-year full time residency in the Centre-Val de Loire region. This award brought 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 2019, LE STUDIUM Scientific Council reviewed eighty applications and recommended a total of eighteen awards, including one Research Professorship, fourteen Research Fellowships, one Visiting Researcher and two Research Consortia. Other recruitments and awards were conducted in the framework of the ARD 2020 smart specialization programmes initiated by the Regional Council Centre-Val de Loire and in which LE STUDIUM is the key partner for the international dynamics and scientific events.

This past year, LE STUDIUM attracted and welcomed a total of forty international researchers from nineteen countries. These awards came across diverse disciplines from the social sciences, natural sciences and engineering to laboratories located in Orléans, Tours, Bourges, Blois and Chartres.

The monthly transdisciplinary seminars, LE STUDIUM THURDAYS, are praised by all

participants, as they enable LE STUDIUM international Research Fellows and Professors 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. PhD students are invited to attend, which is an opportunity to validate transversal credits, to meet international professional experts and to increase their scientific culture and knowledge. The eleven events organised in 2019 have demonstrated again the diversity of research projects represented in the faculty of fellows and in the creative interactions that emerged from all discussions.

Awards of selected candidates include the opportunity to see LE STUDIUM finance the organisation of Conferences and Workshops; these multidisciplinary events organized in partnership with regional host laboratories attract a large number of leading international researchers to the Centre-Val de Loire region each year. Their medium sized format and peculiar specificity offer the ideal scenery for the creation of close and fruitful discussions, which often result in new ideas for research and international collaborations. This past year LE STUDIUM was also honored to partner with the first Regional COP for Climate and Societal Urgencies and to organise an international Conference on Climate, Air Quality and Health with the presence of Nobel Prize Prof. M. J. Molina. Open to scientists and to the civil society, the event gathered a large interest in the early days of an extraordinary hot summer. Evening public conferences, LE STUDIUM LECTURES and RENCONTRES LEONARDO, contribute to the general public's awareness of research and stimulate the transfer of scientific knowledge to a wider audience; these events keep the local community informed about regional research activities and have become increasingly popular. Partnerships with universities and other local actors, have been essential to guaranty visibility and participation to these events.

LE STUDIUM is an international outward looking 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 Centre-Val de Loire region.

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, 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) for the period 2015 to 2021.

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 Centre-Val de Loire region. It is open to all scientific disciplines and is a precious tool to access funding to develop fundamental research projects and extend international collaborations.

Events and 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 assessed and selected by independent external peer reviewers and an international 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, comply with the European mobility rules and have at least a five-year experience after the PhD.

LE STUDIUM RESEARCH

FELLOWSHIP *

This award enables experienced international researchers to work in a host laboratory for 12 consecutive months. The award is designed to offer internationally competitive researchers the opportunity to discover and work in nationally accredited laboratories with international renown in the Centre-Val de Loire region. A salary, a fully furnished housing, logistic and administrative support, and possibility of funding to organise an international event 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 consists in four periods of three months in the Centre-Val de Loire region (12 months in total in 4 consecutive years). A salary, a fully furnished housing, logistic and administrative support and funding to organise an international event are associated to the award.

* The SMART LOIRE VALLEY Fellowships Programme receives H2020 co-funding from the European Union for research and innovation (Marie Sklodowska-Curie Actions, COFUND contract #665790)

LE STUDIUM RESEARCH

VISITING RESEARCHER

This award enables experienced international researchers already having an opportunity to work in a host laboratory of the Centre-Val de Loire region to enter Le Studium scientific community. The award offers a fully furnished housing, full logistic and administrative relocation support and integration in the region for 3 to 12 months of residency.

LE STUDIUM RESEARCH

CONSORTIUM

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

The Ambition Research & Developpement Programmes 2020 (ARD 2020)

The long-term Socio-economic development of the Centre-Val de Loire region, 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 Socio-economic impacts by providing support to create strong regional research and develop centres of international scale, stimulate innovation, job creation and socioeconomic dynamism in the territory.

Through these large research programmes, the Region Centre-Val de Loire supports the strengthening of quality research in five targeted 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 engineering)*,
- **ARD 2020 INTELLIGENCE DES PATRIMOINES** *(Cultural and Natural Heritage)*.

LE STUDIUM stands as the official partner of these five regional ARD 2020 smart specialisation programmes, leading on the internationalisation dynamic, bringing its expertise and services to recruit international experienced researchers and to organise international actions and events to boost international scientific exchanges and collaborations.

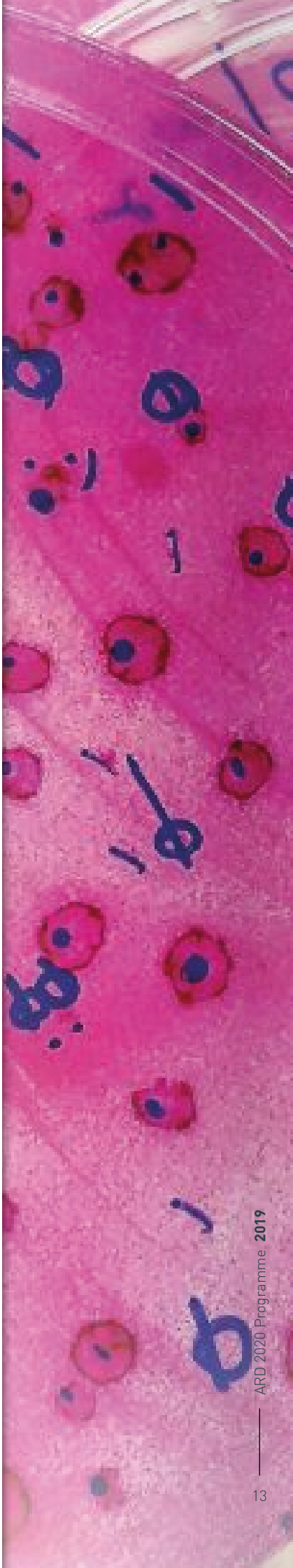
ARD 2020
BIOPHARMACEUTICALS

BIOPHARMACEUTICALS
Innovation Dynamics in Health
in REGION CENTRE-VAL DE LOIRE

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 is constantly increasing and represents about 30% of the market. The Centre-Val de Loire region is at the cutting edge of research in the pharmaceutical sector and has included the development of biopharmaceuticals into its smart specialisation strategy. The Regional Council supports research in this sector to facilitate innovative industrial development and partnerships for socioeconomic development beyond 2020. The ARD 2020 Biopharmaceuticals programme aims to further develop and strengthen the Centre- Val de Loire region biopharmaceuticals industry by capitalising on the recognised capabilities of the multidisciplinary research teams from the regional research institutions so as to:

- Develop a flagship research and development pole on biopharmaceuticals in the Centre-Val de Loire region.
- 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.
- Support the development of new competences for the sector.

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.



ARD 2020
COSMETOSCIENCES

In an international framework 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 the Centre-Val de Loire region, 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 enabling the creation of new startups. It fosters French leadership in the sector and the leadership of the Centre-Val de Loire region, particularly with regard to sustainable cosmetics.

Anchored in the Centre-Val de Loire region, this project revolves around the structuring of research at the national level on this cosmetic theme, including the research group (GDR) Cosmactifs, set up by CNRS in January 2015. It brings forty-eight 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 Centre-Val de Loire region.

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, its 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:

- Cosmétopée and Sustainable Cosmetic
- Glycochemistry and Glycobiology
- Innovation in Formulation, Cellular Tools and Technologies

The programme is funded by the Region Centre-Val de Loire for the period 2015-2020.

ARD 2020 INTELLIGENCE DES PATRIMOINES

An interdisciplinary research programme dedicated to innovation, training and scientific development, Intelligence des Patrimoines offers a new understanding of cultural and natural heritage.

INTELLIGENCE DES PATRIMOINES is an interdisciplinary scientific research and innovation programme serving the tourism heritage economy in the Centre-Val de Loire region and offering new education and employment perspectives. It consists in an unprecedented approach to the promotion of the territory combining the scientific research with the socio-economic world to design new innovative services and products. It reunites the efforts of thirty-three laboratories and three hundred and sixty researchers from Tours and Orléans, led by the Centre for Higher Studies of the Renaissance (CESR) in Tours.

The **INTELLIGENCE DES PATRIMOINES** programme is articulated around five major interdisciplinary topic projects of research for the development of interdisciplinary scientific activities:

- Chambord Chateaux
- Vine and Wine
- Gastronomy, Health and Wellbeing
- Loire and Rivers
- Monuments, Parks and Urban Gardens

It proposes a transversal heterogenous digital data platform that collects and presents all developed activities and products (HeritageS platform). It offers new multidisciplinary and professional training courses at Master and Research Doctoral levels (École supérieure en Intelligence des Patrimoines) and has created a thematic academic incubator – the Smart Tourism Lab - for the development of startups on the regional territory and to support entrepreneurial projects dedicated to promote and renew the tourist experience around heritage.

ARD 2020 PIVOTS

PIVOTS - Environmental Technology Innovation, Development and Optimisation Platforms project.

The **PIVOTS** project is a coordinated set of seven 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 (increased anthropogenic pressure and climate change).

The innovation through **PIVOTS** is founded on an integrated approach based on excellent research by academic and industrial experts together at all stages of the value chain, from fundamental research to validation of products and services.

The platforms are identified as:

- **DECAP**: Development of Environmental Sensors and Pollutants Removal Processes
- **PRIME**: Remediation and Innovation in the Service of Environmental Metrology
- **O-ZNS**: Observatory of transport in the Unsaturated Zone
- **PERMECA**: Testing and Research Platform in Collaborative and Applied Environmental Mechanics
- **PESAT**: Soil - Atmosphere exchanges in peat bogs
- **PESAA**: Soil - Atmosphere exchanges in Agricultural soils
- **PRAT**: Atmospheric Reactivity

The teams involved originate from BRGM (French Geological Survey), University of Orléans, CNRS (National Center for Scientific Research), INRAE (National Research Institute for Agriculture, Food and Environment), Antea Group (consulting and engineering), DREAM (cluster of enterprises) and LE STUDIUM (Loire Valley Institute for Advanced Studies).

ARD 2020 LAVOISIER

LAVOISIER 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 CEA (Centre for Alternative Energies) Le Ripault AlHyance platform is dedicated to joint research efforts (Universities, CNRS, industrials) in the field of non-emitting greenhouse gases energies, particularly in the hydrogen field (fuels and hydrogen storage cells). The research themes are the following: design and materials expertise, safety and effectiveness of the systems, synthesis and characterisation, and methods and implementations.

The **LAVOISIER** programme led by CEA Le Ripault covers activities through research to transfer of technologies and is supported by the Centre-Val de Loire Regional Council over 7 years till March 2021 in the view to:

- Gather the conditions to support the tomorrow energies 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 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. 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.

MATERIALS & ENERGY SCIENCES

HOST LABORATORIES IN MATERIALS & ENERGY SCIENCES

INSTITUT DENIS POISSON (IDP) - UMR 7013 - UNIVERSITÉ D'ORLEANS, UNIVERSITÉ DE TOURS, CNRS

The Institut Denis Poisson (UMR CNRS 7013) includes one hundred permanent professors, assistant professors and CNRS researchers, as well as thirty PhD students and postdoctoral researchers. As the result of a merger in 2018 of two laboratories, the MAPMO in Orléans and the LMPT in Tours, the Institute is bi-localized in the two cities. The activities of Orléans' branch of the Institute (former MAPMO – Mathematics Laboratory, for Mathematics, Analysis, Probability, Modeling,

Orléans, created in 1994), are devoted to mathematical analysis, probabilities and mathematical physics with the focus on interactions with other branches of science, both internal and external to mathematics. The Tours part of the Institute (former LMPT – Laboratory of Mathematics and Theoretical Physics, created in 1996) has a multi-disciplinary structure concentrated on studies of gravitation, integrable systems, classical and quantum dynamics of complex systems, and quantum field theory.

CONDITIONS EXTRÊMES ET MATÉRIAUX : HAUTE TEMPÉRATURE ET IRRADIATION (CEMHTI) - UPR 3079 - CNRS

The lab was originally formed in 1969 and renamed the «Centre de Recherche sur les Materiaux à Hautes Températures» in 1998. In 2008, it merged with the Centre d'Etudes et de Recherches par Irradiation laboratory. Its goals are to analyse and understand the physical and chemical properties of materials under extreme conditions based on a detailed description of the atomic-scale structures and defects in the solid state or the melt.

CEMHTI has an international level of expertise in chemistry and physics at high temperature and/or under irradiation. Its objectives are the analysis and the understanding of the physicochemical properties of solid and molten materials and their behaviour in extreme conditions of temperature (up to more than 2500°C) and irradiation, from a better description of the local atomic structure and defects in the solid and liquid states. The laboratory has expertise in the fields of high temperatures, fusion and solidification, phase transitions, local order and disorder, meta-stability, in optical, radiative, thermic and electrical properties which are studied in crystalline and amorphous oxides, ceramics, cements and molten salts.

GROUPE DE RECHERCHES SUR L'ENERGÉTIQUE DES MILIEUX IONISÉS (GREMI) - UMR 7344 - UNIVERSITÉ D'ORLÉANS, CNRS

Created in 1982, the GREMI is a joint University of Orléans/CNRS research unit focusing on plasma and laser processes and their applications in a wide range of fields: energetics, materials, micro-electronics, nanotechnologies, metrology, radiation sources, biomedicine, transport, and the environment. About 30 permanent position professors and researchers develop their research with the help of 10 engineers, technicians and administrative staff. The laboratory also welcomes around 20 PhD students and post-docs. The GREMI is one of the major plasma processing laboratories in France and its expertise is internationally recognized in many areas involving plasma properties. Its facilities comprise a substantial experimental infrastructure dedicated both to the production of plasma media and to state-of-the-art plasma diagnostics. Modeling, strongly linked to experimentation, is also an important aspect of the performed research.

LABORATOIRE DE PHYSICO-CHIMIE DES MATÉRIAUX ET DES ELECTROLYTES POUR L'ENERGIE (PCM2E)
EA 6299 - UNIVERSITÉ 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. 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 behavior, 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.

Prof. Igor Denysenko

LE STUDIUM Research Professor
Smart Loire Valley General Programme

From: V. N. Karazin Kharkiv National University - UA

In residence at: Research Group in the Energetics of Ionized Media (GREMI) - Orléans

Nationality: Ukrainian

Dates: **May 2019 to July 2019**

Prof. Igor Denysenko is working on low-temperature plasma physics and dusty plasma physics and chemistry since more than 25 years and is an expert of their theoretical and numerical modeling. His recent studies concern the growth of nanoparticles in low-pressure plasmas and its effect on the plasmas. He is particularly well-known for his works related to effects of nanoparticles on electron energy distribution in complex plasmas and for the studies of effects of plasma on growth of vertically-aligned carbon nanostructures. In 2003, Prof. Denysenko was awarded by a research fellowship of the Alexander von Humboldt Foundation (Germany). He was project leader of a few international projects (Humboldt Foundation projects and a NATO Collaborative Linkage Grant) and many Ukrainian projects. He is co-author of 63 papers, 2 chapters of books, 2 textbooks and many proceedings. He was co-chairman of two international workshops.

Dr Maxime Mikikian

Host scientist

Dr Maxime Mikikian is working on dusty plasma physics and chemistry since more than 20 years and is an expert of their experimental investigation. The background of his recent studies concerns the growth of nanoparticles in low-pressure plasmas and its effect on the plasma. He is particularly well-known for his work related to nanoparticle formation and dynamics and for his discovery of original dusty plasma instabilities. Co-responsible of the topic Functional Materials by Plasmas and Lasers in GREMI, he was also the coordinator of the national network on low-temperature plasmas in 2015-2016 («Réseau Plasmas Froids»). Co-author of 45 papers and about 60 proceedings, he gave 9 invited lectures and 14 talks at international conferences. He coordinated 6 national or international research projects, and also participated in the organization of 13 national and international conferences and workshops.

MODELING OF REACTIVE PLASMAS FOR NANOPARTICLE SYNTHESIS

The goals of the project are the development of theories and numerical programs to describe physical and chemical processes in reactive (mixtures of argon with acetylene, ethanol or aniline) steady-state and pulsed plasmas, and on walls, substrates and surfaces exposed to these plasmas. These theories and programs are required for analyses of the experimental data of partner-researches from GREMI and for determination of optimal conditions for the production of nanostructures with desired properties. The activity is carried out to get materials with new advanced properties for different applications and is also of fundamental interest for different fields.

During his first visit to France in May-July 2019, Igor Denysenko in collaboration with the project partners developed a theoretical model and a numerical program for description of properties (densities of ions, electrons, neutrals and atoms in different excited states, radical and ion fluxes to plasma walls, effective electron temperature and nanoparticle charge) of Ar/C_2H_2 complex nonstationary plasma. The pulsed regime and the plasma with growing nanoparticles were considered. The models for Ar/C_2H_2 complex plasma account for various processes of production and loss of main species in the plasma in different binary collisional processes, as well as for their loss due to diffusion to the walls and collisions with nanoparticles. Analyzing effects of external conditions on the densities of species taking part in the nanoparticle nucleation (negative and positive hydrocarbon ions and hydrocarbon radicals), it was found that Ar/C_2H_2 plasmas with low electron density, moderate input flux of acetylene and an electron energy distribution function (EEDF) close to the Druyvesteyn EEDF are the most suitable for the production of carbonaceous nanoparticles. The time-dependent properties of an Ar/C_2H_2 dusty plasma were studied for conditions corresponding to experiments on nanoparticle growth of partner-researches from GREMI. The calculated density evolution for C_2H_2, H_2 and C_4H_2 molecules were compared with time-resolved measurement of the mass peaks of the neutral species and the effects of the dust density on the plasma properties were analyzed. Time evolutions of the main positive and negative ions were also obtained thanks to the calculations.

As a consistency check the time-dependence of the dust radius was also obtained numerically, assuming that an increase of the dust radius was due to deposition of hydrocarbon ions and C_2H radicals on the surface of dust particles. It was shown that for conditions corresponding to the experiment, the ions are the main contributor to the particle growth. The calculated dust growth rate was compared to the time-dependence of the dust particle size obtained in the experimental measurements. The results of the numerical calculations were found to be in a good qualitative agreement with the experimental data. The work on development of a spatially-averaged model for argon-ethanol plasma was also started this year.

Dr Arunabh Ghosh

LE STUDIUM Research Fellow
ARD 2020 LAVOISIER Programme

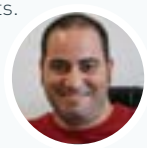
From: Tata Steel Advanced Materials Research Centre - IN

In residence at: Laboratory of Physico-Chemistry of Materials and Electrolytes for Energy (PCM2E) - Tours

Nationality: Indian

Dates: **February 2019 to December 2020**

Dr Arunabh Ghosh obtained his PhD from the SKKU Advanced Institute of Nanotechnology, Sungkyunkwan University, South Korea in July 2013. He is an M.Sc. in physics from IIT Kanpur, India (2008). After PhD, he worked as Senior Research Fellow in the National University of Singapore (Since Aug 2013). In February 2018, he joined Tata Steel Advanced Materials Research Centre, India, and worked as Application Engineer (senior manager), before starting his current position in LE STUDIUM Loire Valley Institute for Advanced Studies (since Feb 2019). Here he is working in collaboration with PCM2E laboratory of University of Tours. His research interest is focused on the development of nanomaterials and electrolytes for supercapacitors and batteries. He worked extensively on translational research, and industry-academia collaborations. He was involved in several industrial projects with companies like Nippon, Murata, Hoshen Corp., Tata Motors and others. He has a strong interest in performance-cost modeling of the battery packs for electric vehicle applications, and he is actively involved in real-life projects.



Prof. Fouad Ghamouss

Host scientist

Prof. Fouad Ghamouss is an associate professor in PCM2E Lab in the University of Tours. He is involved in several activities within the general area of electrochemical storage. He currently has a sub-grouping of ca 12 Master's thesis, PhD students and postdocs and takes parts in several national and international projects, especially for Li-ion batteries and supercapacitors. He is co-author of more than 80 peer-reviewed articles, patents, conference proceedings, and reports in the field of electrochemical storage. Fouad Ghamouss has supervised 14 PhD thesis and more than 30 master's students in electrochemistry, material sciences, and electrochemical storage. His main interest is the development and the study of advanced electrolytes and electrodes materials for Li-ion batteries and beyond Li-ion as well as supercapacitors.

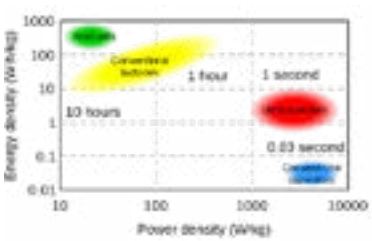
DESIGN, FORMULATION AND CHARACTERISATION OF NEW SAFER ELECTROLYTES FOR ELECTROCHEMICAL STORAGE OF ENERGY

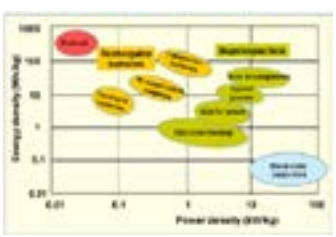
The goal is to develop another new electrolyte composition, which is much safer compared to the commercially available benchmark for supercapacitive energy storage applications. This new electrolyte would be capable of working in ultra-low temperatures.

Developing a novel electrolyte for supercapacitor application is not a straightforward process. Beyond having a large potential window and high ionic conductivity, there are many other requirements, such as electrochemical stability, high ionic conductivity, suitable viscosity, that an electrolyte needs to meet in order to be promising for the performance of the device. Besides these, the electrolyte must have a large liquid range temperature, which is the main deciding factor of the device's operating temperature range. Furthermore, the volatility and flammability of the electrolyte are the keys to deciding the safety grades of supercapacitor devices. Controlling all these parameters at the same time is what makes the development of electrolytes a very fascinating but a tricky process. Therefore, we can see that commercially available organic solvents still fail to provide an ideal solution, and they suffer from one or more following issues, like flammability, low potential window, and low operating temperature range.

In this context, we have formulated and designed new set of electrolytes, one is based on a new organic solvent, and the other one is based on mixture of two ionic liquids; with a strong focus on the optimization of all the required characteristics, which can potentially fulfill well-round application needs. The target is to fulfill application needs in sub-ambient temperatures, presenting good mobility, low flammability and wide working potential window.

The new organic solvent-based electrolytes exhibited higher potential window stability up to 3 V; also, it is noteworthy that this 3 V potential window was obtained using symmetric supercapacitor configuration only. Besides, each optimized electrolyte has shown significantly improved fire safety compared to commercially available ACN-based electrolytes, which is reflected by significantly higher flash points compared to those based ACN. In addition, we have demonstrated that each selected new electrolyte is capable of low-temperature supercapacitor operations. On the other hand, the second type of developed electrolyte (ionic liquid mixtures) was used in conjugation with vertically aligned carbon nanotube based electrodes for supercapacitor applications, and we have demonstrated ultra-low temperature operations, along with higher safety compared to any commercially available electrolytes.
In both cases, we have finished all detailed characterizations, like determination of conductivities, viscosities, flash points, and obtained detailed electrochemical performances. One of the work is already completed and the corresponding manuscript has been drafted for submission. The other work is at the final stage, and we will start drafting soon.





Prof. Dmitri Kharzeev

LE STUDIUM Research Professor
Smart Loire Valley General Programme

From: Stony Brook University - US

In residence at: Institute Denis Poisson (IDP) - Tours

Nationality: American

Dates: **June 2018 to September 2018**
June 2019 to August 2019

Dmitri Kharzeev was educated at Moscow State University; he received his PhD in particle and nuclear physics there in 1990. He then spent two postdoctoral years in the Italian National Institute of Nuclear Physics, three years in the Theory Division at CERN in Geneva, Switzerland, and a year at Bielefeld University in Germany. In 1997 he joined the newly created RIKEN-BNL Research Center at Brookhaven National Laboratory under direction of Prof. T.D. Lee, a Nobel laureate. In 2000 he became a Scientist with tenure at BNL; he had been the head of the Nuclear Theory group there from 2004 till 2010. In 2010, Kharzeev has become a Professor (since 2018 – a Distinguished Professor) at the Department of Physics and Astronomy at Stony Brook University where he directs the Center for Quantum Materials; he also continues to hold the Senior scientist appointment at BNL, where he is the Head of the RIKEN-BNL Theory group.

Dr Maxim Chernodub

Host scientist

Maxim Chernodub has received his PhD in 1999 at the Moscow Institute of Physics and Technology. In 1999-2001 and 2003-2008 he was a researcher in the Institute for Theoretical and Experimental Physics (ITEP), Moscow; in 2001-2003 he was a JSPS postdoctoral fellow in Kanazawa, Japan. He received his habilitation (Doctor of Science) degree in 2008 at ITEP. Since 2008 he is a researcher (and since 2016 – a senior researcher) of CNRS at the University of Tours, France. He received an Award of scientific excellence of CNRS (2010), outstanding Referee of the American Physical Society (2018) and Elsevier (2018). Recently his research has been focused on properties of theory of strong interactions in exotic environments of heavy-ion collisions at high temperature, strong magnetic field, and fast rotation. He also works on transport phenomena associated with anomalies in quantum field theories with applications in solid-state physics.

CHIRAL MATTER: THEORY AND APPLICATIONS

The main goal of the project is to form a new interdisciplinary Chiral Matter collaboration in Loire Valley to focus on key open problems in study of quantum strongly coupled matter, quantum coherence and topological order. The project will create a network of theoretical and experimental groups in the partner laboratories of Région Centre Val de Loire focused on joint efforts on basic and applied research of chiral matter.

The experimental branch of the project aims to provide a solid ground for future commercialization of these ideas in the domains of transmission and storage of energy and information.

The project will foster communication across disciplinary boundaries and among theorists, experimentalists and engineers. It will offer a unique opportunity for training postdocs and students by integrating them in these collaborations.

The achievements to date include:

1. The development of the idea of topological stabilization of a superconducting qubit by using a novel knot geometry. This should result in a longer quantum coherence time and this in a higher fidelity of the quantum computer based on the proposed "knot qubit". The analytical and numerical calculations of the stabilizing properties of the knot qubit are underway.
2. Basing on this theoretical idea (developed by M. Chernodub, J. Garaud and D. Kharzeev in Tours), we started working on the establishment of the "QuantiLoire" research consortium including experimentalists from the Loire valley region based at CEA and GREMAN laboratories. A particular aim of the consortium is to produce a prototype of the knot qubit for further experimental studies.
3. We have also considered an alternative direction based on usual, unknotted qubit made of a so-called noncentrosymmetric superconductor material. We expect that this material should have an intrinsic stabilization of the logical states. On the theoretical side, we are advancing the investigation of the ground state of these qubits using numerical Monte-Carlo simulations of thermodynamic states.
4. Proposed a new effect in the behavior of chiral solitons on vortices in chiral media: the "chiral propulsion". Namely, the soliton is transported along the vortex in the direction determined by its chirality (in collaboration with Y. Hirono, A. Sadofyev).
5. Proposed a new kind of a chiral magnetic effect induced by light in symmetric and asymmetric Weyl semimetals (with students E. Philip and S. Kaushik).
6. Argued that a conformal anomaly in Weyl/Dirac semimetals generates a bulk electric current perpendicular to a temperature gradient and the direction of a background magnetic field. An experimental realization of this new type of «giant» Nernst effect is proposed. The effect may be used for an efficient electric-power generation from thermal sources.
7. Demonstrated that a rotating warm phonon gas generates a new «zilch» current along the axis of rotation. The effect is related to a gravitational anomaly. The zilch quantum number, which literally means «nothing», may have important applications in transmission of information.

Dr Satyajit Phadke

LE STUDIUM Research Fellow
ARD 2020 LAVOISIER Programme

From: Customized Energy Solutions - IN

In residence at: Laboratory of Physico-Chemistry of Materials and Electrolytes for Energy (PCM2E) - Tours

Nationality: Indian

Dates: **January 2016 to June 2019**

Dr Satyajit Phadke completed 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 Advanced Research Projects Agency for Energy funded project as a postdoctoral associate at 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 Ambri, Inc. During his position as a materials scientist at Alveo Energy, Inc., 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 is the author of several publications in the field of energy storage and conversion technologies. Recently, he was selected into the list of '50 Most Influential Indians in the Field of Energy Storage and Microgrids' awarded by India Energy Storage Association (IESA).

Prof. Mérièm Anouti

Host scientist

Prof. Mérièm Anouti is a Professor in the PCM2E laboratory at the University of Tours. Her research focuses of electrolytes for electrochemical energy storage with a particular emphasis on room temperature molten salts 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. 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.

ENERGY STORAGE SYSTEMS

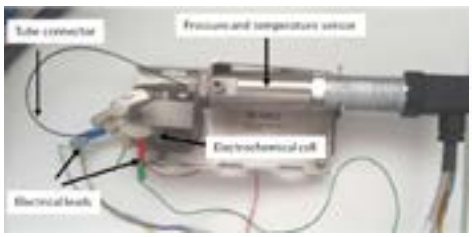
The research project focuses on Energy Storage and Conversion Technologies and is supported by the ARD 2020 LAVOISIER Programme. The objective of the project is to develop novel materials for advanced energy storage devices. The research work performed on Lithium-Sulphur batteries has led to the expansion of the project in the form of industry funding (Arkema) for two years.Details about the topics of research and the progress made are listed below:

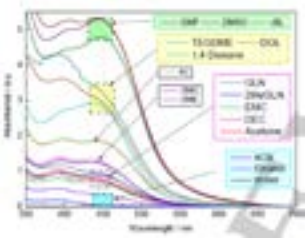
1. High energy NMC cathodes (HE-NMC): The high energy NMC cathodes have considerably higher energy density when compared to conventional lithium ion battery materials such as LCO, LMO, NMC, etc. Specific electrolyte modification strategies have been demonstrated to significantly reduce the capacity fade 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.

2. Lithium-Sulfur (Li/S): Li/S batteries have an extremely high theoretical capacity density of about 1600 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. Although significant progress has been made, most of the processes used are either difficult to scale up industrially or require the use of very expensive additives. 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.

3. 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. In this research we are focusing on the characterization of PAQS (poly anthraquinone sulphide) as a negative electrode material. It shows excellent cycling stability with a high discharge capacity 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 and with conventional lithium ion cathode materials where PAQS can serve as a highly reversible and stable anode. Recent tests conducted 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/ desinsertion kinetics of larger cations (potassium and sodium).

4. Gas solubility measurement in electrolytes: The work is focused on the measurements of the solubility of gases in various electrolytes and solvents of interest. Complimentary to these measurements are the pouch cell volume expansion studies and pressure cell measurements. These studies together allow precise in-situ determination of the evolution of gases during the cell cycling. Such studies are essential for prolonging the cycle life of batteries.





Dr Edurne Serrano-Larrea

LE STUDIUM Research Fellow
ARD 2020 LAVOISIER Programme

From: University of the Basque Country - ES

In residence at: Extreme Conditions and Materials: High Temperature and Irradiation (CEMHTI) - Orléans

Nationality: Spanish

Dates: **September 2019 to September 2020**

Edurne Serrano-Larrea received her PhD in Chemistry by the University of the Basque Country in 2009. Her thesis focused on the search of open inorganic–organic compounds based on the vanadate oxoanion, involving crystal structure resolution and analysis, and the study of their thermal, spectroscopic and magnetic properties. She has specialized on the study of the catalytic properties of inorganic–organic materials. During her postdoctoral trajectory, she has focused on the obtention and study of porous crystal frameworks with open metal sites for enhanced catalytic activity. She has participated in the International Network on Ionic Liquid Deep Eutectic Solvent Based Metal Organic Frameworks Mixed Matrix Membranes MSCA-RISE (N° 778412) whose aim is to develop new advanced water remediation filters for heavy metals removal. She is coauthor of 29 scientific articles and has a H-index of 9.

Dr Conchi Ania

Host scientist

Conchi Ania received her PhD in Chemistry by the University of Oviedo (Spain) in 2003, and performed postdoctoral stays in USA and France. In 2009 she became researcher at Instituto Nacional del Carbón (Spain) belonging to Agencia Estatal CSIC, and in 2017 she joined CEMHTI laboratory (CNRS) as Research Director. She is a grantee of the European Research Council since 2016 and editor of Carbon journal (Elsevier) since 2020.

Dr Encarnacion Raymundo-Piñero

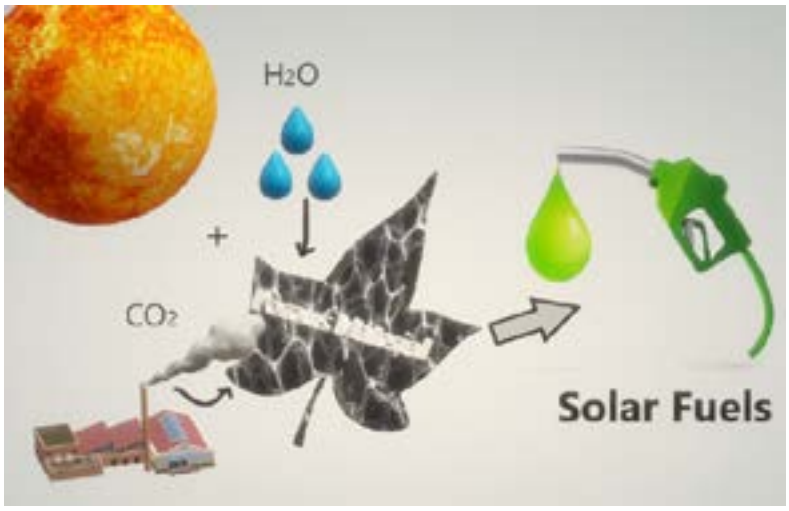
Host scientist

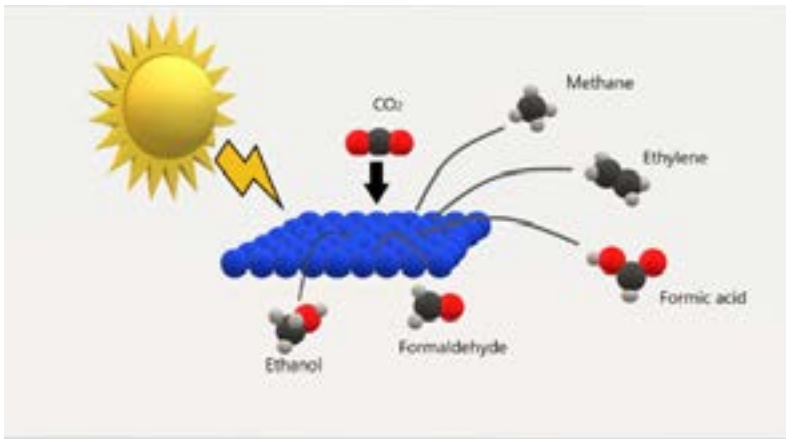
She got her PhD in 2002 at University of Alicante (Spain). Born in 1970 in Spain, she is Research Director at CEMHTI-CNRS since 2006 and holds over 18 years' experience in the field of R&D management. She has been involved in several research and technology development programmes (national ANR, Region).

ELECTROCHEMICAL ENERGY CONVERSION BASED ON METAL-FREE NANOPOROUS ELECTROCATALYSTS

The production of fuels from renewable energy sources plays a key role in all future energy scenarios, and the rapid inter-conversion of electricity into chemical energy offers an important avenue in the use of renewable energy. In this regard, the generation of electricity in fuel cells from the electrochemical reaction of H_2 and O_2, coupled with the photoelectrochemical water splitting to produce oxygen and hydrogen gases, offers a viable approach to efficiently produce electricity using water and sunlight. Additionally, CO_2 has the potential to be used in the manufacture of fuels and high added value chemical feedstocks (e.g., formic acid, methanol, methane), prompting a new economy approach based on lower fossil fuel consumption. However, being a thermodynamically stable molecule, the electrochemical reduction of CO_2 needs to overcome kinetic barriers to lower overpotentials, increase faradaic efficiency and promote products selectivity. The development of new processes and efficient materials to obtain fuels from carbon dioxide using (photo)catalytic and (photo) electrocatalytic routes has become an important research field topic.

The project aims to design, formulate and characterize new metal-free electrocatalysts based on nanoporous carbons for a sustainable CO_2 conversion into fuels or feedstock. The goals are to explore the transformation of CO_2 and H_2O into sustainable fuels at a multiscale level, going from (i) the understanding of the nano-microscale phenomena that govern the (photo)electrocatalytic process; (ii) to the macroscopic level by designing photo(electro)catalytic reactors (e.g., bench scale) with electrodes operating in a continuous regime.





Dr Wolfgang Wisniewski

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Friedrich Schiller University Jena - DE

In residence at: Extreme Conditions and Materials: High Temperature and Irradiation (CEMHTI) - Orléans

Nationality: German

Dates: **September 2019 to August 2020**

Wolfgang Wisniewski worked in Jena, Germany from 2010-2018 where he focused on applying the method of electron backscatter diffraction (EBSD) to glass-ceramics for which he received his Ph.D. in 2011. In early 2019 he became a Visiting Scientist in Trencin, Slovakia and is currently a Le Studium Research Fellow at the CEMHTI in Orléans, France. While his primary work has remained the EBSD-analysis of crystallized glasses, he has contributed to more than 65 articles published in peer reviewed journals concerning glass-ceramics, the information depth of EBSD, ceramics, dewetted metal nano particles, super conductors and solar cell materials.

In 2015 he received a Best Presentation Award at the 11th International Symposium on Crystallization in Glasses and Liquids in Nagaoka 2015). He also contributed to work concerning solar cell materials which became an ESRF Scientific Highlight in 2018 (Nano Energy, 2017, Vol. 42, 307–313).

Dr Mathieu Allix

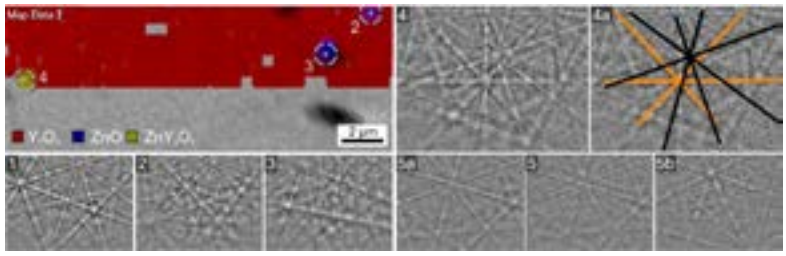
Host scientist

Mathieu Allix, completed his PhD at the University of Caen in 2004. After three years at the University of Liverpool (U.K.), he joined the CNRS in Orléans at the CEMHTI laboratory. His research covers synthesis and characterization of inorganic materials with a special interest on new transparent ceramics. He has patented and published (i) the first transparent polycrystalline ceramics obtained by full crystallization from glass (http://www.cnrs.fr/inc/communication/direct_labos/allix.htm) and (ii) new highly transparent glasses and glass-ceramics exhibiting controlled nanostructuration. He is author or co-author of more than 120 scientific publications (H-index = 29), he is also co-inventor of 5 recent international patents on transparent alkaline earth aluminate glass and nanostructured glass and glass-ceramics. He was awarded the CNRS bronze medal in 2013.

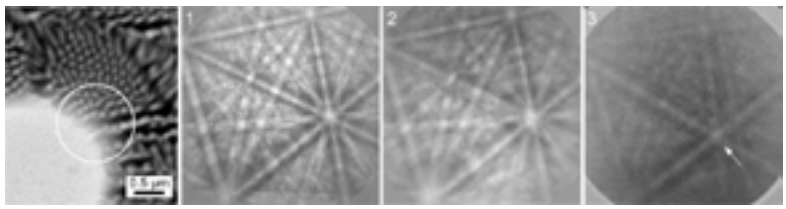
MECHANISMS OF GLASS CRYSTALLIZATION ANALYSED BY ELECTRON BACKSCATTER DIFFRACTION (EBSD)

This project is aimed towards studying crystallization during or after the process of levitation melting. This includes the crystallization of melts during cooling but also the more controlled crystallization of glasses in a subsequent thermal treatment. In order to determine the occurring crystallization mechanism, it is necessary to analyze the crystallographic orientation relationships amongst the various components of a microstructure. While phase identification and characterization can be achieved using X-ray diffraction (XRD), determining local orientation relationships in the microstructure necessitates the use of electron backscatter diffraction (EBSD) which is performed in a scanning electron microscope (SEM). EBSD can also be used to locate and identify phases which occur in a quantity below the detection threshold of XRD.

It is essential to know and understand the possibilities and limits of the applied methods when performing high-level analysis. With this aspect in mind, critically viewing the results obtained during the search for a phase of the composition ZnY_2O_4 in solid state ceramics led to an observation affecting the application of EBSD: misindexing due to EBSD-pattern superposition. The Figure below illustrates this artifact: during the performed EBSD-scan, most data points are correctly attributed to Y_2O_3, an example is featured as EBSD-pattern 1. The patterns 2 and 3 originate from ZnO and were acquired at the locations 2 and 3. EBSD-pattern 4, however, is indexed as ZnY_2O_4, although it is in fact a superposition of two Y_2O_3 patterns, individual components are highlighted in pattern 4a. EBSD-pattern 5 is also indexed as ZnY_2O_4 although it is a superposition of the Y_2O_3 patterns 5a and 5b acquired from neighboring grains. This observation illustrates, that is essential to confirm certain indexing results of the software by a detailed analysis of the obtained EBSD-patterns.



Keeping such possible artifacts in mind is essential when performing measurements. In the context of performing EBSD-analysis of a phase with the composition $Ga_3La_2O_{7.5}$ synthesized using levitation melting, this critical view enabled the results presented below. The SEM-micrograph (left) illustrates components of the $Ga_3La_2O_{7.5}$ microstructure after dendritic growth: the primary compact crystals (bright) with a secondary crystallization (fine lamellae) of $Ga_3La_2O_{7.5}$ in the interdendritic spaces and residual glass (dark). The EBSD-pattern 1 represents the high pattern quality obtainable from the primary dendritic crystals. Pattern 2 was obtained from the interdendritic crystallization and is of lower quality due to residual glass within the information volume of this pattern. The identical positions of the bands show that the interdendritic crystals do not originated from independent nucleation, but are a continuation of the primary crystal lattice in a second crystallization step. Pattern 3 was acquired from the circled area: the somewhat broader bands and deviating dominant zone axis (white arrow) imply that it may originate from a different, perhaps unknown crystal phase. Further research is needed to confirm this result.



2 LIFE AND HEALTH SCIENCES

HOST LABORATORIES IN LIFE & HEALTH SCIENCES

BIOMOLÉCULES ET BIOTECHNOLOGIES VÉGÉTALES (BBV)
EA 2106 - UNIVERSITÉ DE TOURS

the Lab of Plant Biomolecules and Biotechnology (BBV-EA2106, Tours University), founded in 1987 and located at the Faculty of Pharmacy. This Lab is mainly dedicated to the characterization of plant specialized metabolisms and their use as pharmaceuticals, cosmeceuticals and biopesticides with the use of combinatory approaches in plant physiology, molecular biology, biochemistry, bioinformatic (identification of genes), genetic and metabolomics. The lab is also involved in the development of plant biotechnologies (in vitro technologies and GMOs) and in bio engineering (production of plant metabolites in yeast).These two laboratories also work on applied research programs to identify new natural preservatives or Biologically active ingredients (BAIs) for cosmetics.

BIOLOGIE DES OISEAUX ET AVICULTURE (BOA)
UMR 0083 - CENTRE INRAE VAL DE LOIRE, UNIVERSITÉ DE TOURS

In 2018, the INRA URA unit became the UMR BOA, Avian Biology & Poultry Research, in collaboration with the University of Tours. In the context of its mandate, UMR BOA conducts integrated research on the biology of birds, from the molecular level to that of the entire animal in its environment. The overall objective is to produce knowledge in the fields of physiology and genetics and to contribute to the development of sustainable livestock systems. Their research is based on three axes shared by the four teams of the unit: To characterise the physiological, molecular, and genetic mechanisms underlying the biological functions of birds (metabolism, growth and development, digestion, plasticity, egg formation and function); To propose evaluation tools, by developing indicators or biomarkers that can be used in selection programs and during rearing to improve bird adaptability and the quality of products (eggs and meat); To integrate knowledge and tools so as to contribute to the transition from animal husbandry systems to multi-performance and to the food and non-food valuation of poultry products.

CENTRE DE BIOPHYSIQUE MOLÉCULAIRE (CBM)
UPR 4301 - CNRS

CBM 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. 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. 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. Moreover, some research projects are dedicated to the identification of new therapeutic targets and the development of innovative delivery systems for therapeutic and imaging agents in various pathologies. 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.

HOST LABORATORIES IN LIFE & HEALTH SCIENCES

CENTRE D'ÉTUDE DES PATHOLOGIES RESPIRATOIRES (CEPR) UMR 1100 - INSERM, UNIVERSITÉ DE TOURS

Respiratory diseases have a major impact in medical and socio-economic terms. It is against this backdrop that the CEPR is aimed to develop innovative research that gives a better understanding of the pathophysiology of these diseases and improves inhalation therapy devices. These activities therefore fall in line with Inserm's scientific priorities which are: - To identify the mechanisms at work in respiratory mucosal cell alterations and characterise their regulation during inflammatory and infectious processes; - To identify the cellular and molecular mechanisms that regulate tissue remodelling in the various structures of the respiratory system; - To develop better targeted treatment strategies. This translational research has yielded an abundance of results that are complementary. Also, knowledge transfer from CEPR's scientific programmes was achieved both at the academic level (e.g. publications, oral presentations, student training, conferences organisation, etc), at the socio-economic level (e.g. acquisition of licences, patents deposits, development of public-private partnerships, etc) and at the clinical level (e.g. coordination of three national "PHRC" programs by clinicians affiliated with the CEPR's three teams, etc).

GROUPE DE RECHERCHES SUR L'ENERGÉTIQUE DES MILIEUX IONISÉS (GREMI) - UMR 7344 - UNIVERSITE D'ORLEANS, CNRS

The host laboratory is the GREMI (Groupe de Recherches sur l'Energétique des Milieux Ionisés), mainly located on the university campus in Orléans and with a branch in Bourges 120 km south or Orléans. Created in 1982, the GREMI is a joint University of Orléans / CNRS research unit focusing on plasma and laser processes and their applications in a wide range of fields: energetics, materials, micro-electronics, nanotechnologies, metrology, radiation sources, biomedicine, transport, and the environment. About 30 permanent position professors and researchers develop their research with the help of 10 engineers, technicians and administrative staff. The laboratory also welcomes around 20 PhD students and post-docs. The GREMI is one of the major plasma processing laboratories in France and its expertise is internationally recognized in many areas involving plasma properties. Its facilities comprise a substantial experimental infrastructure dedicated both to the production of plasma media and to state-of-the-art plasma diagnostics. Modeling, strongly linked to experimentation, is also an important aspect of the performed research.

IMAGERIE MULTIMODALE MULTIÉCHELLE ET MODÉLISATION DU TISSU OSSEUX ET ARTICULAIRE (I3MTO) - EA 4708 - UNIVERSITÉ D'ORLÉANS

The I3MTO laboratory is recognised for the development of new microarchitectural indicators risk factors of osteoporosis and osteoarthritis in vivo on radiographs. Our first aim is to predict early bone erosion in link with rheumatoid arthritis at the metacarpal joints. Herein, we focus on the characterisation of macro-architecture, microarchitecture and bone strength in both human and animal models. We have a particular interest in studying the changes of bone quality induced by the osteoporosis, ageing, menopause, physical activity, nutrition, and medications. Our second area of research aims to elucidate the causes of the initiation and progression of osteoarthritis and other degenerative joint diseases and to create and improve treatment and prevention strategies.

IMAGERIE ET CERVEAU (IC)
UMR 1253 - UNIVERSITÉ DE TOURS, INSERM

The starting point for our research unit was a local network of psychiatrists and biophysicists. A first unit was created in 1988 to promote cross-fertilization among specialists from different domains. Almost all members were then assembled in the same campus (School of medicine – Tours University Hospital). The Unit research in Psychiatry, studies in cellular/molecular neurosciences and investigations aiming to develop new technologies for diagnosis and treatment of psychiatric and neurological diseases. Our team have worked on the development of new technologies and methodologies which are non-pathology-specific and which include US brain imaging, DW-MRI (validation of tractography using a comparative anatomical approach), metabolomics, and radiopharmaceuticals development for PET imaging. In addition, we develop vector-valued image processing methods to increase the combined potentiality of these imaging tools. It helps to validate existing or emerging imaging methods. A neuroanatomy and neuroimaging group, led by Prof. C Destrieux, works inside this team and gathers anatomists, engineers and radiologists.

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

The Institute of Organic and Analytical Chemistry of CNRS and University of Orléans: ICOA UMR 7311 is directed by Prof. Pascal Bonnet. The main objective of the laboratory's research activities is the discovery, the synthesis and the analysis of novel bioactive molecules having potential applications in drug discovery or in cosmetics. ICOA has numerous collaborations and partnerships in the Centre-Val de Loire region, with many research laboratories such as CBM (CNRS UPR 4301), forming with this laboratory a Research Federation (FR 2708), with CEA (ICOA is Laboratoire de Recherche Correspondant LRC M09), with the Hospital of Orléans (CHRO), with many biotechs and large companies and through Clusters of Competitiveness such as LabEx SYNORG and IRON. In order to maximise human and financial ressources, the ICOA has recently created three focused strategic research axes: Therapeutic Innovation and Diagnostics, Molecular Diversity, and Bioactives and Cosmetics. Through these three axes, the research teams of the ICOA are working and publishing in many scientific areas such as molecular modeling, bioinformatics, glycochemistry, heterocyclic, nucleoside and green chemistry, molecular imaging, analytical strategies, metabolite identification, biomolecular interactions, etc.

IMMUNOLOGIE ET NEUROGENETIQUE EXPERIMENTALES ET MOLECULAIRES (INEM) - UMR 7355 - UNIVERSITÉ D'ORLÉANS, CNRS

The research unit "Experimental and Molecular Immunology and Neurogenetics" (INEM), UMR 7355 affiliated to CNRS and University of Orleans, is located on Orleans CNRS campus. Created in 2001, INEM is presently composed of 2 Teams, "Immune responses to infection and injury" led by V. Quesniaux/ I. Couillin, and "Neurogenetics" led by S. Briault / S. Mortaud, focusing on « Autism, mental deficiency and genetics » and « Developmental Neurotoxicity». A spin-off company Artimmune SAS was created in 2010 based on our immunology team expertise and research. A joined laboratory is being created with INEM (Site: http://www.artimmune.com/). Upcoming public health challenges will have to integrate the constant increase of 1) asthma and lung pathologies, 2) neuropathologies such as autism due notably to pesticides neurotoxic effects, and 3) the emergence of drug resistant bacteria and parasites. Inflammatory responses, either exacerbated and pathogenic, or protecting and controlling infection, are central. Our strategy to contribute to these clinical challenges is multifold and transversal, by addressing novel regulatory mechanisms that are being unraveled and may concern these different pathologies. We aim at fostering the progress of the main research themes through common transversal approaches and research on mechanistic pathways, either in silico or in vitro when it is possible, but mainly through integrated in vivo approaches based on functional analysis of murine models.

HOST LABORATORIES IN LIFE & HEALTH SCIENCES

INFECTIOLOGIE ANIMALE ET SANTÉ PUBLIQUE (ISP) - UMR 1282 - CENTRE INRAE VAL DE LOIRE, UNIVERSITÉ DE TOURS

The Multi-resistance and Pathogenicity of Nematodes team (MPN) belonging to Infectiology and Public Health Unit (ISP, UMR 1282). The main aim of the MPN team is the sustainable control of gastro-intestinal parasitic nematodes (GIN) in livestock. During the past ten years, they have investigated several different aspects of anthelmintic resistance, from field studies to molecular characterisation of parasite anthelmintic targets. The team identified the first molecular markers for levamisole resistance, and was the first to perform the functional expression of strongylid AChR in Xenopus oocytes. The range of expertise includes: molecular ecology, mathematical modelling, biochemistry and cellular and molecular biology. They have participated in numerous international projects dealing with anthelmintic resistance.

LABORATOIRE DE BIOLOGIE DES LIGNEUX ET DES GRANDES CULTURES (LBLGC) - EA 1207 - UNIVERSITÉ D'ORLÉANS, CENTRE INRAE VAL DE LOIRE

The Laboratory of Woody Plants and Crops Biology UPRES EA1207 was created under this label in January, 2000. This day, it is constituted of 4 research teams called respectively: Trees and Responses to Hydric and Environmental Constraints, Entomology and Integrated Biology, Cell Signaling and Plants Lignans, this last team being located in the Scientific Campus of Chartres. Founded in 1996, the team Plant Lignans works in the fields of plant physiology, molecular biology (gene function), biochemistry (biosynthesis of molecules through the plant), analytical chemistry and in vitro culture applied to the study of phenylpropanoids derived products. This team is also working on applied research programmes to find new natural preservatives or active ingredients for cosmetics. More recently the team started to work on allelopathic activities of plant specialised metabolites.

NANOMÉDICAMENTS ET NANOSONDES (NMNS) EA 6295 - UNIVERSITÉ DE TOURS

The NMNS group is part of the Philippe Maupas Faculty of Pharmacy of the Université de Tours. It is lead by Professor Igor Chourpa. It started in 2008 and became an independent "Equipe d'Accueil" in 2012. Its scientific research centers around the development of nanotechnologies for anticancer drugs and/or contrast agents for imaging with applications in cancer theranostics as well as dermatological and cosmetic science. The group's activities combine expertise in biology, chemistry (synthetic and analytical) and physics. This confluence of expertises is reflected in the pluridisciplinarity of its staff, consisting of pharmaceutical scientists, chemists and physicists. The group enjoys research collaborations within an extensive national and international network consisting of academic and industrial partners. Funding sources include the Région Centre, La Ligue contre le Cancer, the Institut National du Cancer, ERA.NET Plus and ARD 2020 CosmétoSciences / LE STUDIUM.

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

The Reproductive Physiology and Behaviours Laboratory is affiliated to INRAE, CNRS, University 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 The Centre-Val de Loire region in the framework of the MabImprove LabEx and the ARD 2020 "Biopharmaceuticals", the BIOS group is currently developing GPCR-specific antibody fragments displaying pharmacological efficacy *in vivo*.

TRANSPLANTATION, IMMUNOLOGIE ET INFLAMMATION (T2I) EA 4245 - UNIVERSITÉ DE TOURS

The Transplantation, Immunology and Inflammation T2I - EA 4245 research team is directed by Prof. Christophe Baron and is based at the Faculty of medicine of the University of Tours. The team is imbedded in the Labex MabImprove. Research axis focuses on the study of the immuno-inflammatory response in organ transplantation and during ischemia reperfusion, the identification of biomarkers of organ dysfunction (tissue injury, rejection, relapse) and the development of new therapeutic strategies (antibodies and pharmacological agents) to prevent tissue damage. The unit is interested in understanding the interactions between stressed tissue cells (cardiac cells, normal or cancerous epithelial cells) and immune cells for the modulation of immuno-inflammatory responses in hypoxia/ischemia and in developing novel strategies using pharmacological agents and antibodies with immuno-modulatory properties targeting ion channels and purinergic receptors.

Dr Bilal Haider Abbasi

LE STUDIUM Research Fellow
ARD 2020 - COSMETOSCIENCES Programme / PRESTIGE

From: Quaid-i-Azam University - PK

In residence at: Biomolecule and Plant Biotechnology (BBV) - Tours & Laboratory of Woody Plants and Crops Biology (LBLGC) - Chartres

Nationality: Pakistani

Dates: **January 2018 to September 2019**

After completing PhD from University of Chinese Academy of Sciences, Beijing, China, Dr Bilal Haider Abbasi joined Quaid-i-Azam University, Islamabad, Pakistan in June 2008 as Assistant Professor of Biotechnology. Since his inception, he has supervised 66 Masters and 11 PhD theses. After establishing feasible platform for production of Caffeic acid derivatives from Echinacea purpurea submerged culture, he focused on medicinal plant biotechnology. Till to date, he has published 110+ research papers in internationally renowned impact factor journals. He has won several research grants from different institutions of Pakistan. In 2014, he was awarded the Quaid-i-Azam University Best Young Researcher Award in recognition of his outstanding achievements in Faculty of Biological Sciences. He got promoted to Tenured Associate Professor of Biotechnology in August 201. In 2016, he obtained the Pakistan Academy of Sciences Gold medal for Biotechnology in recognition of his contributions to the development of medicinal plant biotechnology at National level. In 2017 he was declared as Most productive scientist in Department of Biotechnology, Quaid-i-Azam University by Pakistan Council for Science & Technology.

Prof. Nathalie Guivarc'h

Host scientist

She is a full professor and the director of the Plant biomolecules and biotechnologies laboratory (EA2106) at the University of Tours. After a PhD in plant physiology and metabolism from Orsay-Paris XI University and a Post-doc in the Institute of Plant Sciences (ISV) in Gif-sur-Yvette, she obtained a position in the University of Tours. Her research themes are articulated around the identification, characterization and valorization of specialized plant metabolisms for biotechnological applications including metabolic engineering processes for the production of bioactive compounds of interest for pharmaceutical, cosmetic or agronomic applications. She has been involved in more than 20 collaborative projects (regional, national and europeen) in plant biology and biotechnological fields and is co-authors of 82 peer-reviewed papers.

Dr Christophe Hano

Host scientist

He is an associate professor at the University of Orléans and conducts his research activity at the LBLGC Lab, focusing mostly on plant physiology, molecular biology, and biochemistry. He mostly work on the regulation aspects controlling polyphenol biosynthesis in planta as well as on the development of methods of their extraction. The main objectives of his work are to elucidate the mechanisms of the regulation of the biosynthesis of these compounds with high potential for cosmetic and pharmaceutical applications, to provide informations dealing with their biological activities and to develop green sustainable extraction methods. He is a member of the Polyphenols Group and the Phytochemical Society of Europe. He is co-authors of 70 peer-reviewed papers.

STRATEGIES TO ENHANCE COSMECEUTICALS IN *IN VITRO* CULTURES OF HERBAL PLANTS

The overall goals of the current proposal were to elucidate the phytochemical basis of the common traditional knowledge of the species by comparing the chemical composition of herbal plants grown as axenic cultures under identical nutritional, growth regulators and environmental regimes. Enhancing biologically active ingredients (BAIs) content in cell cultures of herbal plants by application of elicitors (biotic & abiotic) copes with the increasing demand of phenolic compounds.
The specific goals were to identify feasible production of BAIs in cell lines of various selected species from preliminary experiments, to apply biotic and abiotic elicitors and evaluate their influence on growth kinetics, biochemical parameters, antioxidative stress enzymes and phytochemicals, etc. To identify BAIs in cells grown under different elicitors and conditions. To establish correlation between different elicitors and biologically active ingredients (BAIs) biosynthesis.
Several regional herbal plant species were selected and evaluated for their biosynthetic potential. Linum usitatissimum, Linum grandiflorum, Arctium lappa, Silybum marianum, Trifolium pratense, Echinacea purpurea were selected for further experiments. Seeds were collected and inoculated on Murashige & Skoog medium for germination. The average time to obtain feasible plantlets for explant ranges from 6-8 weeks. Leaf and stem explants were exploited to establish *in vitro* callus cultures. Several plant growth regulators (PGRs) were tested to optimise callus induction response. Synergestic combination of cytokinins with auxin induced optimum response in these explants. Phytochemical profile was evaluated by HPLC to determine the pattern of BAIs accumulation. Dark and photoperiod conditions were are also exploited to evaluate growth behaviour and phytochemical accumulation in these calli cultures. Some new findings are made from this research which is opening new dimensions for future research. We have evaluated antioxidant potential with different protocols/ reagents and found that extract from similar cell lines have shown different levels of antioxidant potential. Antiageing activities were also evaluated and some extracts with considerable activities. Heat map data showed relationship between different metabolites and their antioxidant and antiageing potential. Correlation was established among different data and developped a new platform to select optimum cell line. Principal component analysis (PCA) technique was exploited to establish insight into biological methods and other parameters. This is the very first time that PCA have been utilized to evaluate feasible cell lines for biosynthesis of commercially attractive BAIs. It has been observed that the cells grown in LBLGC and BBV had diverse biosynthetic potential. It is observed that these variations in biosynthetic potential were induced due to different culture conditions. This phenomenon is known as epigenetics and paves new path for further exploration of biosynthetic pathways of BAIs and their link with different environmental conditions.
To make biosynthesis of these metabolites feasible, elicitation strategy was adopted. Several abiotic and biotic elicitors were applied on these cell lines. In preliminary experiments, the optimum concentration of these elicitors was selected. The phytochemical analysis has shown considerable enhancement in accumulation of these BAIs. The timing of elicitation was evaluated and log phase of culture time was found optimum. Different species have shown different trend and accumulation of BAIs. All selected species have shown considerable potential in biosynthesis of these BAIs.

Dr Guillaume Collet

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University of Geneva - CH

In residence at: Center for Molecular Biophysics (CBM) - Orléans

Nationality: French

Dates: **September 2019 to August 2020**

Guillaume Collet obtained his PhD in molecular and cell biology in 2009 on the development of cell-gene based therapy applied to cancer. He then did a first postdoctoral internship at the GREMI in 2013 on the effects of cold plasma on vascular parameters. A second postdoctoral fellowship at the University of California, San Diego in United States between 2014 and 2016 allowed him to design and study «intelligent» nanoparticles for the controlled delivery of therapeutic agents. In 2016, he completed his third post-doctorate at the University of Geneva in Switzerland on the design of "on-demand" degradable MOFs. He continued this project at the CBM in Orleans where he moved in 2018, joining Stéphane Petoud's group with the goal of designing new metal-organic frameworks (MOFs) based on lanthanides for bio-applications in optical imaging and therapy.

Prof. Stéphane Petoud

Host scientist

Prof. S. Petoud is an INSERM Research Director. A LE STUDIUM Fellowship in 2009 enabled him to move from the University Pittsburgh in the United States to the CBM in Orléans. He has an extensive experience in the creation of lanthanide-based molecules designed for applications in optical biological imaging. He is especially interested in near-infrared emitting lanthanide. He received three scientific research awards for his stay at the University of California, Berkeley, USA (Swiss National Science Foundation - Novartis Stiftung and Leenaards Foundation). His current research has been recognised by several "Prime d'Excellence Scientifique" from INSERM from 2010 to 2019. Since 2018, he holds the title of Fellow of the Royal Society of Chemistry (FRSC) upon nomination. Prof. Petoud has been the coordinator of one NSF grant (USA), three NIH (USA), nine grants from "La Ligue Nationale contre le Cancer" and six projects of the Centre-Val de Loire region.

EARLIER TUMOR DIAGNOSTIC COMBINED WITH RADIO-PRECONDITIONING IN CANCER THERAPY: A NOVEL NEAR-INFRARED EMITTING NANOMOFS FOR OXYGEN DELIVERY

Diagnostic and therapy are closely related to each other since an early detection of a pathology offers a better chance to set a treatment at a time it is the most efficient. The concept of theranostic agents introduced to address this need by combining both diagnostic and therapy on the same entity suffers from limitations that are mainly due to the off-targeting induced toxicity.
To revisit this concept, we propose to create a tumor-targeted metal-organic frameworks (MOF) as a new generation of theranostic agents.
A remarkable property of MOFs is their crystalline rigid organisation including pores that can be loaded with biologically relevant gases such as O_2. Relatively harmless by itself, this original payload once delivered to a hypoxic tumor will reinforce radiotherapies that require O_2 to generate the reactive species that will promote the eradication of tumor cells. Alternatively to commonly described theranostic agents carrying an active drug, this innovative nanomaterial will be able to specifically precondition the tumor microenvironment to reinforce radiotherapies.
Moreover, as intrinsic properties the proposed nanoMOFs will operate as near-infrared (NIR) emitting imaging agent, providing a detection together with a tracking modality of the targeted compounds. These luminescent nanoMOFs will be created from the tridimensional assembly of NIR luminescent lanthanides (light emitting elements) coordinated and sensitized with antennae building block (light absorbing elements). NanoMOFs structures will provide a high density of absorbing and emitting moieties per unit volume resulting in a strong signal enhancement.
The successful completion of this project will result in the creation of a novel NIR emitting lanthanide-based nanoMOF offering unprecedented sensitivity for tumor detection combined with tumor radiotherapy.

Inspired by the MOF recently published in JACS (Collet et. al., J Am Chem Soc, 2018), I created a new MOF system that has the ability to emit NIR light at 980nm (ytterbium emission) under biologically compatible excitation wavelength. To obtain the Yb^{3+} ions sensitization, I used an innovative approach in which I entrap a chromophoric lanthanide sensitizer inside of the pores during the synthesis, allowing the homogeneous and complete loading of MOFs pores. Such type of MOF, able to operate in water is unprecedented to date. We have submitted this works for publication as a communication (manuscript available upon request).
A second complementary aspect of this work consists in the design of new MOF formed by the reaction of the Di-9AC ligand lanthanide cations of different natures in order to obtain new optical properties. Interestingly, I obtained different type of MOFs through this work, some of them possessing different structures. In this respect, I designed and successfully synthesized a promising down-converter system possessing both excitation and emission in the NIR domain (ex 980 nm, em 1530 nm). I obtained these optical properties by introducing both Yb^{3+} and Er^{3+} lanthanide ions in an appropriate ratio in the framework of the MOF. I anticipate two publications from these new materials that are in preparation. This new down-converting MOF is an excellent candidate to move the project to the next step with gas loading since its NIR optical properties are associated to the MOF framework keeping consequently pores empty and available for gas.

I am also driving the biological applications of MOFs created in collaboration with the worldwide MOF expert, Prof. Nathaniel Rosi at the University of Pittsburgh. A new approach consisting to grow a polymer inside of MOF pores has shown, in addition to enhanced water stability, unprecedented NIR emission. A manuscript has been submitted for publication (manuscript available upon request).

Dr Yuri Dancik

LE STUDIUM Research Fellow
ARD 2020 COSMETOSCIENCES

From: Agency for Science, Technology and Research - SG

In residence at: Nanomedicines and Nanoprobes (NMNS) - Tours

Nationality: American

Dates: **October 2018 to June 2020**

Yuri Dancik obtained his PhD in Chemical and Biological Engineering from the State University of New York at Buffalo in 2007. His main research interests are understanding the physico-chemical basis of chemical transport through skin and applications in cosmetic, pharmaceutical and toxicological science. In Buffalo, he developed mathematical models of drug transport through skin appendages. He worked at Procter & Gamble (Brussels), developing in silico pharmacokinetic methods for the prediction of skin sensitization and systemic toxicity following cutaneous exposure. From 2014 to 2018 Yuri was Senior Research Fellow at the Institute of Medical Biology and the Singapore Skin Research Institute. His colleagues' and his efforts into the development and validation of a novel microfluidic skin-on-chip platform were recognized with a Global 3Rs Award.

Dr Franck Bonnier

Host scientist

Franck Bonnier obtained his PhD from the Department of bio-spectroscopy for life sciences as a member of the Médian CNRS group, Université de Reims, France. Following his PhD, he joined the FOCAS Research Institute, DIT in 2008 as a postdoctoral research engineer under the National BioPhotonics and Imaging Platform, Ireland, and as a member of the Biophotonics and Imaging group specialised in the application of biophotonics, especially Raman and Infrared spectroscopy, in the biomedical field. In September 2014, Franck Bonnier joined the NMNS research group at University of Tours (France) as associate professor. The main field of expertise remains the development of methodologies towards implementation of spectroscopic techniques as clinical screening tools for diagnostic or with a particular focus on pharmaceutical and cosmetic applications.

MOLECULAR IMAGING USING RAMAN SPECTROSCOPY: FROM FUNDAMENTAL RESEARCH TO INDUSTRIAL APPLICATIONS

We are using Raman spectroscopy to demonstrate the impact of storage conditions on the biophysical quality of lab-grown human skin equivalent tissues. These skin equivalents are known as reconstructed human epidermis or RHE, as they mimic the uppermost epidermal layer of human skin.

The development, characterization and use of RHE is an active area of cosmetic and pharmaceutical R&D. Designed to replace animal tissues, RHE are particularly useful for testing or screening new cosmetic formulations and pharmaceutical topicals. To date, little is known on the effects of common tissue storage conditions on the quality and in particular, the barrier function, of RHE. Commercial RHEs are frequently cultured and shipped in batches of 6 or 12 replicates. With testing and screening applications often requiring large numbers of replicates, practical knowledge on the effects of storage conditions is of significant value to academic and industrial users.

The specific scientific goals are thus:

1. To investigate the impact of different storage conditions on the barrier function of RHE. To this end, the penetration of resorcinol, a well-known cosmetic ingredient, in RHEs stored under different conditions is tracked via confocal Raman spectroscopy.
2. To compare the spectroscopic results to resorcinol penetration data obtained from a conventional, but more labor-intensive, diffusion protocol performed in the RHE culture plates.
3. To assess how the information obtained by confocal Raman spectroscopy complements that attained from the conventional diffusion experiment.

In addition to answering a practical scientific question, the project is novel in that it highlights confocal Raman spectroscopy as a method to assess the barrier integrity of RHE.

The achievements to date are:

1. Optimisation of the conventional diffusion and Raman spectroscopy experimental protocols of the spectroscopic data analysis (data pre- and post-processing).
2. Acquisition of conventional diffusion and spectroscopic data for 6 different RHE storage methods and 3 different resorcinol formulations.
3. Analysis and interpretation of all conventional diffusion data. Raman data analysis and drafting of a manuscript are ongoing.

SKIN MODELS IN COSMETIC SCIENCE: BRIDGING ESTABLISHED METHODS AND NOVEL TECHNOLOGIES

LE STUDIUM CONFERENCES

The LE STUDIUM Conference aimed at bringing together an international group of experts to discuss the state-of-the-art in the research and development of skin models (*in vitro*, *ex vivo* and *in vivo*) and novel non-invasive analytical techniques for efficacy and safety testing of cosmetic products. The event gathered about 60 attendees, including 27 international speakers from academia and the private sector. Inclucing a few internationally recognised leaders in their respective R&D fields, the conference received highly positive feedbacks with an emphasis given on the quality of the presentations and discussions. Following the talk of Dr Maxim Darvin (Charité, Germany), he and Dr Claudio Nico (RiverD, Netherlands) had a spirited discussion about methodology. Dr Jonas Ogien from DAMAE Medical (Paris, France) presented impressive optical coherence tomography images of the structure of human skin.

PRODUITS COSMÉTIQUES: PARLONS PÉNÉTRATION CUTANÉE!

LE STUDIUM LECTURES

Skin care and health are of significant interest and importance to society at large, including from an economic standpoint. The efficacy and safety of topical products is of paramount importance, with much R&D going into testing for these endpoints. The public may not, however, be aware of the variety of laboratory techniques and methodologies that exist to optimize topical products. The aim of this public lecture was to introduce the common techniques in this field and to juxtapose these with novel and emerging biophotonics-based methods.

AROUND THE PROJECT

Oral communications

- **Yuri Dancik**, Christophe Eklouh-Molinier, Martin Soucé, Emilie Munnier, Igor Chourpa, Franck Bonnier; *Study of the effects of storage conditions on the barrier function of reconstructed human epidermis by confocal Raman spectroscopy*; Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies; Tours, France; November 2019
- **Yuri Dancik**, Franck Bonnier; *Produits Cosmétiques: Parlons Pénétration Cutanée!*; Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies; Tours, France; November 2019
- **Yuri Dancik**, Christophe Eklouh-Molinier, Martin Soucé, Emilie Munnier, Igor Chourpa, Franck Bonnier; *Study of the effects of storage conditions on the barrier function of reconstructed human epidermis by confocal Raman spectroscopy*, International Meeting on Plasma Cosmetic Science; Orléans, France; November 2019
- **Yuri Dancik**; *Caractérisation non invasive de la composition et la fonction barrière de modèles de peau humaine par la spectroscopie confocale Raman*; Technologie Servier, Orléans, France; November 2019
- **Yuri Dancik**; *Etude des effets de conditions de stockage sur la fonction barrière de peaux reconstruites par spectroscopie Raman*; Groupe De Recherche (GDR) 3711 Cosm'actif; Vannes, France; May 2019
- **Yuri Dancik**, *Putting some skin in the spectroscopy game: probing the integrity of laboratory-grown models of human skin for testing cosmetics using Raman spectroscopy*; LE STUDIUM Loire Valley Institute of Advanced Studies; Tours, France; April 2019.

Posters

- **Yuri Dancik**, G. Sriram, B. Rout, M. Alberti, Y. Zou, B. Wu, R. Wu, Z. Feng, S. Ramasamy, M. Bigliardi-Qi, Z. Wang, P. L. Bigliardi; *Confocal Raman Spectroscopy for Characterization of Differently Cultured 3D Full-Thickness Human Skin Equivalents*; Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies; Tours, France; November 2019
- **Yuri Dancik**, Christophe Eklouh-Molinier, Martin Soucé, Emilie Munnier, Igor Chourpa, Franck Bonnier; *Study of the effects of storage conditions on the barrier function of reconstructed human epidermis by confocal Raman spectroscopy*, International Meeting on Plasma Cosmetic Science; Orléans, France; November 2019
- **Yuri Dancik**, Christophe Eklouh-Molinier, Martin Soucé, Emilie Munnier, Igor Chourpa, Franck Bonnier, *Study of the effects of storage conditions on the barrier function of reconstructed human epidermis by confocal Raman spectroscopy*; Skin & Formulation; Reims, France; September 2019

Dr Grégory Guirimand

LE STUDIUM Research Fellow
ARD 2020 BIOPHARMACEUTICALS Programme

From: Kobe University - JP

In residence at: Biomolecule and Plant Biotechnology (BBV) - Tours

Nationality: French

Dates: **June 2019 to July 2020**

Living in Japan since 2011, I became an Assistant Professor at Kobe University in 2016, intensively working on metabolic and cell surface engineering of baker's yeast.
My research interests are widely broad from plant and yeast biotechnologies, to synthetic biology, for the bio-production of high value-added therapeutic bio-molecules in microbial cell factories.
My main achievements include but are not limited to:

- 21 research articles (11 h-index), 9 oral presentations (4 as invited speaker) at intl. conferences.
- co-inventorship (10%) of a biotechnological process for xylitol bio-production from Kraft Pulp.
- Grant-in-Aid from the Japanese Ministry of Research and Higher Education (KAKENHI) [2.000.000 JPY]; (2011-2013).
- Fellowship from the French Ministry of Research and Higher Education (MNERT) (2007-2010).
- Special Grant from the doctoral school "Health, Science and Technology" of Tours University [1.000 EUR] (2009).

Dr Vincent Courdavault

Host scientist

Vincent Courdavault is Associate Professor at the University of Tours in the EA2106 BBV laboratory. He is working at the elucidation of the biosynthetic pathways of plant natural products with a particular on the anticancer alkaloids and to the production of these compounds through metabolic engineering strategies in microbiological cells. He recently contributed to the elucidation of the last steps of the biosynthesis of Vinca alkaloids in the Madagascar periwinkle and to elaboration of the first yeast strain producing monoterpene indole alkaloids. He published 93 research articles/10 book chapters and has 30 h-index. He is reviewing editor for Frontiers in Plant Science and editor for the "MDPI plants" journal. He is currently leading research programmes aiming at securing the supply of anticancer compounds and is the scientific coordinator of the European H2020 project MIAMi in Tours.

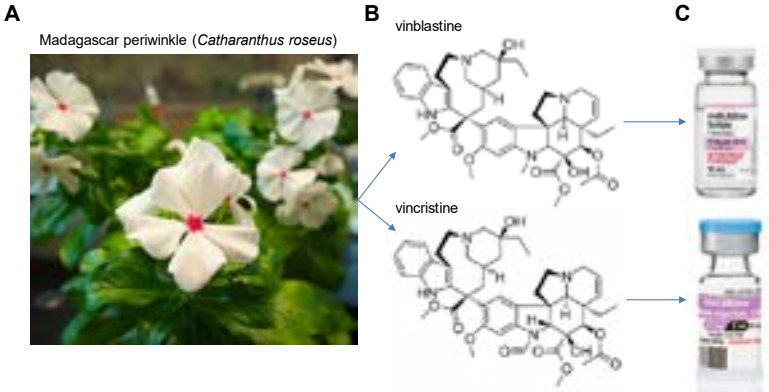
BIO-PRODUCTION OF VINDOLINE AND CATHARANTHINE BY RECOMBINANT YEAST CELL FACTORIES

The tropical plant Madagascar periwinkle (*Catharanthus roseus*) is a natural source of anticancer monoterpene indole alkaloids (MIA), such as vinblastine and vincristine, two molecules of major interest and therapeutic values (Fig.1). *In planta*, the MIA biosynthetic pathway in *C. roseus*, described in the literature as the most complex pathway in all living organisms, shows an outstanding compartmentation at both cellular and subcellular levels. This drastic compartmentation is potentially responsible for the extremely low level of production of these MIA *in planta*.
One promising approach to overcome this issue consists thus in producing these molecules in a heterologous system such as yeast cell factories. The present research project supported by the ARD2020 Biopharmaceuticals Programme is a very ambitious project aiming to produce vindoline and catharanthine, (the monomeric precursors of vinblastine and vincristine) in yeast cell factories by using cutting-edge techniques of synthetic biology and metabolic engineering of *S. cerevisiae*.
In total, the biosynthetic pathway leading to vindoline from tabersonine encounters 7 enzymatic steps, while the catharanthine biosynthesis from tryptamine and secologanine encounters not less than 12 steps.

To build such kind of yeast cell factories, able to produce vindoline and catharanthine respectively, we need first to transfer each gene (cDNA) coding for each corresponding enzyme from the plant cells to the yeast cells. Once all the target genes correctly integrated into the genome of S. cerevisiae, another important challenge consists in the rational coordination of them altogether, in order to ensure a proper metabolic flux in the yeast cells, for an optimal bio-production ability of our system.

In order to generate the recombinant strains of S. cerevisiae able to produce vindoline and catharanthine respectively, an intensive preliminary work of molecular biology has been conducted. This work has allowed us to obtain a full set of 11 different vectors containing bidirectional strong promoters. Each vector allows to stably integrating into the genome of yeast cells two different enzyme genes simultaneously.
To achieve this goal, we used the cutting edge molecular tool CRISPR-Cas9 to ensure a strong stability and expression levels of the transgenes.
This powerful approach enabled us to generate the recombinant yeats cell factories *S. cerevisiae* CENPK "Vindoline I3.0" and *S. cerevisiae* CENPK "Catharanthine I3.0", which will be used for the industrial bio-production of vindoline and catharanthine, respectively.
At this point of the project, the strain *S. cerevisiae* CENPK "Vindoline I3.0" has been fully established, while the *S. cerevisiae* CENPK "Catharanthine I3.0" is still under construction.

Figure 1. *Natural origin of two different monoterpene indole alkaloids molecules with anticancer properties. Catharanthus roseus (A) is a tropical plant naturally able to synthesize the anticancer molecules vinblastine and vincristine (B), both used in chemiotherapy treatments in human medicine (C).*



Prof. Pieter Hiemstra

LE STUDIUM Research Professor
ARD 2020 BIOPHARMACEUTICALS Programme

From: Leiden University Medical Center - NL

In residence at: Centre for the Study of Respiratory Pathologies (CEPR) - Tours

Nationality: Dutch

Dates: **September 2018 to December 2018**
September 2019 to October 2019

Pieter S. Hiemstra is Professor of Respiratory Cell Biology and Immunology at the Department of Pulmonology of the Leiden University Medical Center (LUMC) in The Netherlands. He is currently head of the Laboratory for Respiratory Cell Biology and Immunology of the Department of Pulmonology. His research is focused on basic and translational research in chronic obstructive pulmonary disease (COPD), asthma and lung cancer. He has a specific interest in the role of the epithelium of the airways and alveoli in these diseases. His other activities include teaching and curriculum development for Biomedical Sciences and Medical students. Until October 2019, he was head of Assembly 3 (Basic and translational science) of the European Respiratory Society, and he is currently the Section Editor of the European Respiratory Journal. Pieter Hiemstra was elected to a fellowship of the European Respiratory Society in 2014.

Dr Mustapha Si-Tahar

Host scientist

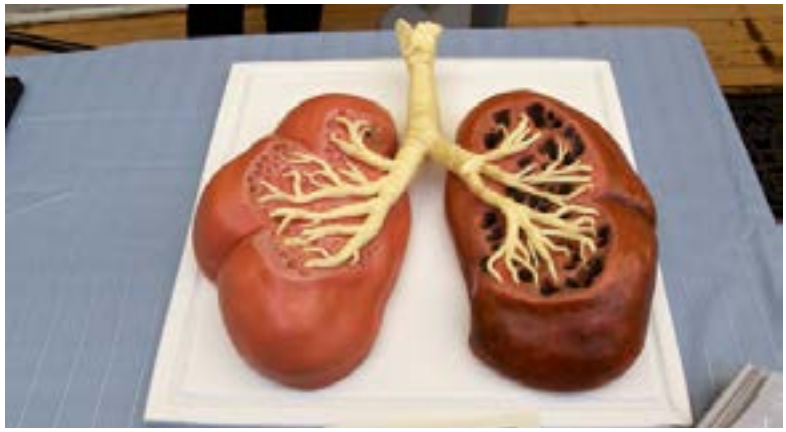
He is an INSERM research director who worked for 10 years at the Pasteur Institute in Paris before moving in 2012 to Tours to be the Head of Research Center for Respiratory Diseases (french acronym: "CEPR"). He also supervises one out of the three research teams of this laboratory. M. Si-Tahar has expertise in innate immunity and antimicrobial responses in the lung mucosa as well as strong competence with *in vitro* and *in vivo* models. Thus, he demonstrated the role for specific pattern-recognition receptors and cell signalling pathways in the immune response to major respiratory bacteria and viruses, in the context of cystic fibrosis or COPD. Besides, he contributes to several scientific expert committees (including ANR, VLM) and is the co-founder of Cynbiose Respiratory, a contract research organization providing a set preclinical services in the area of respiratory diseases.

DEVELOPMENT AND APPLICATION OF WELL-DIFFERENTIATED CULTURE MODELS OF PRIMARY AIRWAY EPITHELIUM FROM VARIOUS SOURCES

This project is directly in link with the ARD2020 research programme entitled «*PRIMine – « Modèle préclinique de PRIMates non humains (PNH) pour traiter les épisodes infectieux d'exacerbations de la Broncho-Pneumopathie chronique obstructive (BPCO)*». The specific aim of this part of the project is to develop a state-of-the-art airway epithelial cell (AEC) culture model from non-human primate tissue to study the effect of cigarette smoke exposure and respiratory tract infections. This project is supported by the ARD2020 Biopharmaceuticals Programme and this report covers the work carried out in the second visit of my Professorship in 2019:
The set objectives were to:

1. Introduce the methods for culture of **airway epithelial organoids** at CEPR with the aim to establish cultures of nasal epithelial cells from nasal scrapings of non-human primates.
2. Further establish **isolation and culture of primary airway human epithelial cells** at CEPR in collaboration with Thoracic Surgery (Dr Antoine Legras) and Pathology clinical departments.

During the 2019 stay in Tours, to address aim 1 a nasal organoid method was introduced in the laboratory that was developed in the laboratory of the researcher in residence at LUMC. Using this method, nasal epithelial cell cultures were established from nasal scrapings derived from healthy volunteers and from non-human primates. These 3D organoids cultures were next used to establish 2D air-liquid interface (ALI) cultures that are required to perform exposures to airborne substances, such as respiratory viruses and cigarette smoke. Organoid and ALI cultures were characterized using immunofluorescence analysis of markers of epithelial differentiation.
To address aim 2, before and during the 2019 stay in Tours, methods were provided and established at CEPR to begin setting up a biobank of cultures of primary airway epithelial cells derived from resected lung tissue. This proved to be successful, and a large number of vials from several donors have now been stored in liquid nitrogen for the establishment of the Tours biobank. Characterization for epithelial cell markers and functional assays using influenza virus infections were performed to confirm that such cultures established at the CEPR behaved in a similar manner as those established at the home institute of the researcher in residence (LUMC).
The established collaboration has resulted in a one-week training visit of one of the researchers from CEPR (Virginie Vasseur) to the LUMC in Leiden in June 2019. This visit was aimed at learning techniques required to set up the above-mentioned biobank in of cultured human airway epithelial cells in Tours. In addition, in April 2020 Dr Antoine Guillon and Dr Mustapha Si-Tahar will visit the LUMC in Leiden to further discuss ongoing and new collaborations, and to give two seminars.
Discussions were started for the organisation of a Le Studium conference entitled «Novel host- and microbiota-directed strategies for respiratory infectionsplanned.



Prof. Maxwell Hincke

LE STUDIUM Research Professor
Smart Loire Valley General Programme

From: University of Ottawa - CA

In residence at: Avian Biology & Poultry Research (BOA) - Tours

Nationality: Canadian

Dates: **March 2018 to May 2018**
March 2019 to May 2019

Maxwell HINCKE (PhD, Univ. Alberta, 1981) is a senior scientist and tenured Full Professor in the Faculty of Medicine at the University of Ottawa. He is former Head of the Division of Clinical and Functional Anatomy, and has been a member of the Senate of the University of Ottawa. He investigates integrated defense strategies that operate at biomineralized barriers to understand molecular control of calcific biomineralisation and antimicrobial strategies. His vision is that the insight gained can be reverse-engineered for application to human health and therapeutics. His CV includes: >108 refereed journal publications; mentorship: >115 undergraduate & graduate students, postdoctoral fellows and clinical trainees; awards: Excellence in Mentorship; international research collaborations with extended sojourns in France, Spain and China. (https://www.researchgate.net/profile/Maxwell_Hincke)

Dr Sophie Rehault-Godbert

Host scientist

Sophie Réhault-Godbert (PhD, Univ. of Tours, 2001) is currently the co-director of the unit Défenses de l'Oeuf, Valorisation, Evolution (DOVE). She has expertise in the physiology of chicken egg formation, egg defenses, functional and structural characterisation of egg proteins including proteases, antiproteases and antimicrobials, and has coordinated a project aiming at evaluating the therapeutic potential of egg derived molecules against microbial infections, inflammation and cancer. Her research addresses the role of egg proteins and the regulation of egg defenses during chicken embryonic development. She has authored >45 peer-reviewed articles, 8 book chapters, and holds 1 patent. She was a partner in various DOVE-coordinated projects. (https://www.researchgate.net/profile/Sophie_Rehault-Godbert)

EVOLUTION OF INNATE IMMUNITY AT BIOMINERALIZED BARRIERS

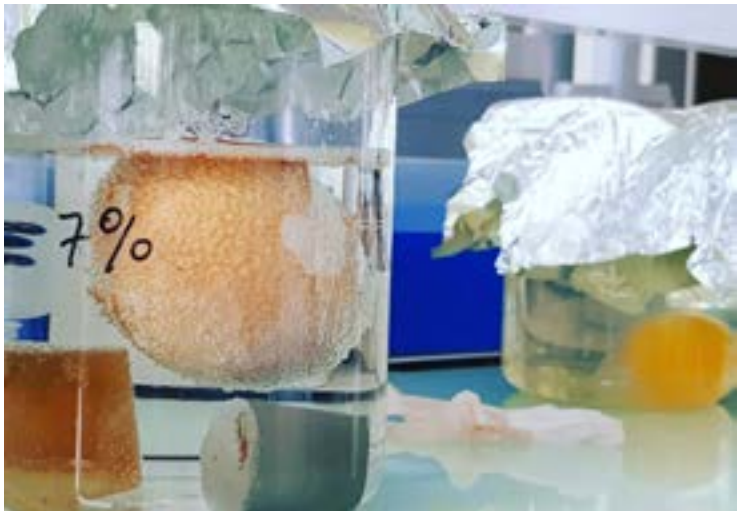
Hypotheses: The antimicrobial environment in the critical zone between the eggshell and CAM are upregulated during embryonic development and during pathogen challenge: i. Genes coding for defense molecules are expressed within the growing chorioallantoic membrane during embryonic development; ii. Secreted antimicrobial proteins enhance protection against pathogens in the chorioallantoic membranes and in the extra-embryonic fluids; iii. Weakening of the eggshell during CAM-mediated decalcification is compensated by upregulation of innate immune mechanisms.

To explore these hypotheses, the aims are:

1. To identify the full inventory of peptides / proteins that intervene between the eggshell and developing embryo and characterise their role in pathogen defense.
2. To determine the plasticity of protection against pathogens in embryonic placental – like structures during development.
3. To further characterise the role of the CAM in eggshell calcium solubilisation / decalcification during embryonic development, using functional bioassays, transcriptomics, proteomics and bioinformatics.

What are the achievements to date?

1. A review specifically focused on the Le Studium project was recently published in the Journal of Innate Immunity. Hincke MT, Da Silva M, Guyot N, Gautron J, McKee MD, Guabiraba-Brito R, Réhault-Godbert S. "Dynamics of Structural Barriers and Innate Immune Components during Incubation of the Avian Egg: Critical Interplay between Autonomous Embryonic Development and Maternal Anticipation".
2. S. Réhault-Godbert and M. Hincke were asked to write a chapter for the new edition of a book "Avian Immunology", edited by Thomas Göbel, Lonneke Vervelde, Ton Schat and Bernd Kaspers. The submission of the chapter is planned for February, 2020.
3. A PhD Project (director: S. Réhault-Godbert / co-director: M. Hincke) was developed and received a financial support from Région Centre Val de Loire and the scientific department Animal Physiology and Rearing Systems, INRA. A large number of candidates were interviewed, with the outcome of successful recruitment of Maeva Halgrain, who commenced in October 2019 (title of project: Role of the chorioallantoic membrane during chicken embryonic development and impact of genetic selection on its functionality, with a focus on innate immunity and mineral transport.
4. A special day devoted to the avian egg was organised for March 22, 2019 by the "Pôle Alimentation" at the Villa Rabelais, Tours, with the help of Michel Duclos (INRA). This public event included presentations by Porf. Hincke, other members of the BOA team and researchers from the university of Tours.



Prof. Igor Lima Maldonado

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Federal University of Bahia - BR

In residence at: Imaging and Brain laboratory (iBrain) - Tours

Nationality: Brazilian

Dates: **January 2018 to December 2019**

IL Maldonado (BMath, MD, PhD) is Neurosurgeon and Researcher. For the previous six years, he worked as a professor and neurosurgeon at the Federal University of Bahia, where he was head of the Laboratory of Anatomy, and oversaw the implantation of the Neuromusculoskeletal Unit, a novel department which assembled different specialties related to the nervous and locomotor systems. His works have targeted the functional anatomy of the white matter, intraoperative mapping in awake patients, and endovascular therapies for cerebrovascular diseases. He is the current secretary and former vice-president of the Anatomy Committee of the World Federation of Neurosurgical Societies, whose mission is to promote the neurosurgical anatomy among neurosurgeons and researchers worldwide. Following his fellowship, IL Maldonado was hired by the Tours University Hospital. Currently, he heads a Unit of Interventional Neuroradiology and continues to perform research activities as a permanent member of the iBrain Laboratory.

Prof. Christophe Destrieux

Host scientist

Prof. Christophe Destrieux serves as a staff Neurosurgeon in Tours University Hospital since 1998. He is mainly interested in low-grade gliomas, epilepsy and stereotactic surgery. He spent one year (1997) in University of Utah (Salt Lake City, USA), where he developed an atlas of the human cortex for the FreeSurfer package. He obtained his PhD in 2009 (Univ. Tours), where he served as an assistant professor until 2011, when he became Professor. After cortical and surgical anatomy, his research now mainly focuses on brain white matter anatomy. He runs the Fibratlas project, which aims to validate MRI tractography by dissection. He teaches general anatomy to medical students and is invited worldwide several times each year to teach surgical anatomy to neurosurgical residents.

CHARACTERIZATION OF LIMBIC SYSTEM CONNECTIVITY THROUGH FIBER DISSECTION AND DIFFUSION IMAGING TECHNIQUES

This research project aims to better describe white matter tracts of the limbic system using both fiber dissection, and in and ex vivo Diffusion Weighted Imaging (DWI) techniques at various spatial resolutions. This multiple approach will:

1. improve the current anatomical knowledge on limbic connectivity;
2. validate in and ex vivo tractography by comparison to fiber dissection considered as a ground truth;
3. describe functional roles of limbic white matter tracts by studying correlations between neuropsychological alterations and microstructural changes examined by DWI.

The main white matter fasciculi of the limbic system are the cingulum, the fornix, the mammillothalamic tract and the thalamic radiations. The cingulum, the largest one, is a long association tract inside the white matter of the cingulate gyrus, which is part of the middle aspect of the cerebral hemisphere, and classically associated with emotion processing. It has been suggested that the cingulum may also be a route for extra-limbic pathways, whose importance may be greater than previously estimated.

In our laboratory, the morphology of the such limbic and extralimbic connections has been detailed using Diffusion Tensor Imaging (DTI) tractography and fiber dissection techniques. The results put a spotlight on direct frontoparietal interlobar pathways. Direct transcingular tracks between the anterior medial frontal cortex and the precuneus has been found in the great majority of the examined cerebral hemispheres with both *in vivo* (DTI) and *ex vivo* techniques (fiber dissection).

Their terminations were detailed and corresponded mainly to the Brodmann areas (BA) 8, 9 and 32. With respect to these extensive connections, some processes that were not classically associated with the cingulum are discussed, such as the initiation of motor activity, executive functions, DMN, social cognition and consciousness. We consider that these observations plead for a pivotal rethinking of the main role of the cingulum in the human brain, as probably the primary interconnecting system of the medial aspect of the cerebral lobes.

We also examined the spatial disposition and anatomical relationships of the surrounding tracts, the cingulum subcomponents, and the diffusion characteristics of the white matter, to check for specific associations with age or neuropsychological alterations, the last part of this project. The subject has important implications in neuropsychology, for the modeling of cognitive functions, for the interpretation of manifestations of cerebral white matter diseases, and for the development of surgical approaches to the cerebral parenchyma.

Dr Frédéric Jean-Alphonse

LE STUDIUM Research Fellow
ARD 2020 BIOPHARMACEUTICALS Programme

From: University of Pittsburgh - US

In residence at: Physiology of Reproduction and Behaviour (PRC) - Tours

Nationality: French

Dates: **November 2018 to May 2020**

During my PhD obtained in 2008, and my two postdoctoral experiences, I've been studying GPCRs. I characterised small molecules Gs biased ligands for the Vasopressin Receptor type 2 (V2R) and also demonstrated that these molecules act as pharmacological chaperones to restore cell surface expression and function of several mutants of the V2R involved in the Nephrogenic Diabete Insipidus. For my first post doc at the Imperial College London 2009, I studied the endocytic trafficking of the Gonadotrophins receptors and, I identified and characterised a new endocytic compartment that we called Very Early Endosomes where LHR traffics to and signal from. To further study this new concept of endosomal signaling by GPCRs, in 2013, I joined the laboratory of Prof. Vilardaga in Pittsburgh, USA. In 2017, I was promoted Research Instructor in the Department of Pharmacology and Chemical Biology (University of Pittsburgh).

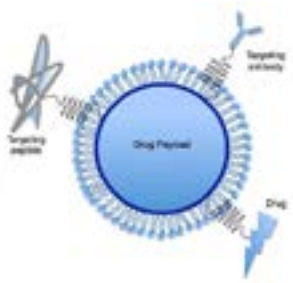
Dr Eric Reiter

Host scientist

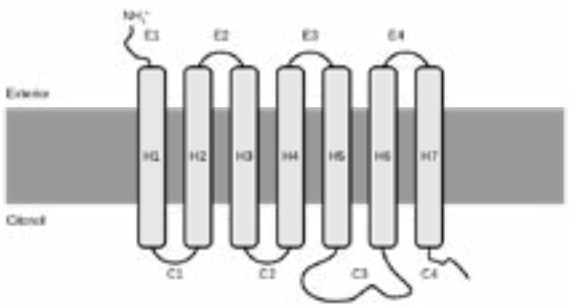
Eric Reiter is research director at INRAE Nouzilly. He has a long-standing experience of GPCR biology and pharmacology. He received his PhD in Molecular Biology from University of Liège, Belgium in 1996. The same year, he took a position of researcher at INRAE, Nouzilly, France. He visited Robert J. 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 cofounded ReproPharm, and in 2017, MAbSilico, two spin-offs from INRAE. He has published more than 100 peer-reviewed papers that have been cited more than 5825 times. He has acted as an expert for national and international agencies. He organised 1 international congress and 3 workshops and maintains sustained editorial responsibilities for a number of journals. He is a Key Question leader in MabImprove LabEx and coordinates the GPCRAb project in the framework of ARD 2020 Biopharmaceuticals Programme.

LUTEINIZING HORMONE RECEPTOR (LHR) SPECIFIC NANOBODIES DEVELOPMENT FOR THERAPEUTIC USE

LHR belongs to the GPCR family and is expressed by the gonads in both males and females. LHR is crucial to control gametogenesis and steroidogenesis. While GPCRs are the main target of most of pharmaceutical drugs on the market (>30%), with the exception of recombinant or extractive hormones, there is no available compound targeting and modulating specifically the LHR. One reason arises from the structural complexity of this receptor and its hormones and the lack of knowledge in its structure function. Moreover, classical approaches for drug discovery are traditionally tedious and costly. To tackle down these limitations, with the support of the BIOS team, my goal is to modulate LHR function using LHR specific antibody fragments, more specifically nanobodies or VHH. Nanobodies present several advantages including high affinity, selectivity for the antigen, reduced cost of development and production compare to other methods. The objective is to find and characterize VHH binding the LHR, possibly at various epitopes (extracellular or intracellular). For this purpose, an immune bank was generated from a llama immunized with cell membranes expressing the LHR. Additionally, we recently developed and acquired a synthetic bank of VHH that should help to further select anti-LHR VHH. Following isolation of these VHH, their pharmacological properties (antagonists, agonists, biased ligands, allosteric modulators, etc.) will be determined. Ultimately, the goal is to develop new and original therapeutic tools targeting LHR to positively or negatively regulate its functions *in vivo*. To date, I am developing tools for the selection of these VHH, including the production of several fragments of the receptor corresponding to the full extracellular LHR ectodomain, the hinge region, but also the intracellular domains. The *in vitro* production is currently being optimized for both a mammalian suspension cell system (ExpiCHO) and bacterial systems. This should allow to obtain material for the selection by phage- display. Meanwhile, I am also working in deciphering the molecular mechanisms of LHR function in signaling and trafficking. This work is crucial to develop and select tools that will fine-tuned LHR function. This work should be valorized by at least one scientific publication by the end of 2020.



Regarding the VHH/antibody project, I attended to the MabImprove retreat meeting (Mont Dore 2019) allowing me to meet the other scientists developing therapeutic antibodies and involved in the MabImprove Labex programme. I am also involved in the work package of the LabEx MAbImprove consisting in developing strategies to better modulate protein target activity using an antibody. With Prof. Manuela Simoni, another Le Studium Fellow, and the team BIOS, I am also involved in the FET- OPEN European programme, due this year 2020, and for which we aim at developing and using nanobodies targeting LHR and FSHR to improve and/or replace current strategies to manipulate reproduction in humans but also in farm animals.



Prof. Manuela Simoni

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University of Modena and Reggio Emilia - IT

In residence at: Physiology of Reproduction and Behaviour (PRC) - Tours

Nationality: Italian

Dates: **April 2019 to April 2020**

Manuela Simoni, MD, PhD, trained as clinical endocrinologist at the Unit of Endocrinology of the University of Modena, Italy between 1982 and 1990 and, thereafter, as molecular endocrinologist at the Institute of Reproductive Medicine of the University of Münster, Germany, where she was Professor for Endocrinology and Molecular Biology of Reproduction from 1998 to 2008. Since 2008 she is full professor of Endocrinology at the University of Modena & Reggio Emilia, Italy.
Her research interests are gonadotropin and androgen action, testicular function, male infertility, endocrinology and pathophysiology of reproduction.
She is Editor-in-Chief of ANDROLOGY, the official journal of the European Academy of Andrology and the American Society of Andrology.
Bibliometry (Scopus): 239 articles, 11519 citations, 55 H-index.

Dr Pascale Crépieux

Host scientist

Pascale Crepieux is a CNRS Research Director at the Laboratory of Physiology of Reproduction and Behaviors in Nouzilly. Her main research area is on the mechanisms whereby extracellular signals are integrated into an adapted cell response, from gonadotropin receptors membrane receptors to gene expression. She acquired a strong background in molecular biology during her PhD at the Pasteur Institute in Lille, then in cell signaling during a 3-year post-doctoral training at McGill University, Montreal. Since 2012, she has been co-heading the Biology and Bioinformatics of Signaling Systems (BIOS) group, a pluridisciplinary group that gathers 8 research scientists. Among other management activities, she has been participating to the Specialized Scientific Commission of Animal Physiology at INRA since 2011, and has been recently reviewer for the Biomedecine Agency, for the « SYSBios» of the Cancer ITMO, for the MRC and for the ESF. She also teaches in Masters of « Biology of Reproduction », « Biology, Health », « Antibodies », at the University of Tours.

PLEOTROPISM OF GONADOTROPIN ACTION

The goal is to investigate how the two human gonadotropins influence each other in granulosa cells expressing both receptors, or by co-culturing cells expressing either the LHCGR or the FSHR (as a model granulosa/theca interaction). To reach this goal the production of several cell lines is necessary. These cell lines will then be used to perform *in vitro* experiments with LH, FSH, hCG and combinations thereof and the data used for *in silico* modeling to gain insight onto the dynamics of the intertwined cell response to FSH and LH. Hypotheses about the underlying mechanisms will be proposed and tested through a systems biology approach combining computational modelling and experimental measurements.

The achievements to date are the construction of plasmids (one still ongoing) and the production of three cell lines. The last plasmid and two more cell lines are expected to be completed before the end of the stay. Further experiments will be continued both at the host site and the University of Modena at the end of the fellowship, though continued, intensive collaboration and exchanges.

To control both temporally and quantitatively the expression of the FSHR and the LHCGR in the KGN human granulosa cell line, cell lines stably expressing both receptors are needed. Three plasmids expressing FSHR, LHCGR, Luciferase (as positive control) and an empty plasmid (as negative control) with the TetOn system (induction of expression of the inserted gene in the presence of Tetracycline), were constructed.

The basic structure consists of Sleeping Beauty recombinase recognition site (SB) - response element activated by the Tet-sensitive transactivator - minimal promoter - gene of interest (RFSH/RLHCG/Luciferase) - GFP - tetracycline-sensitive transactivator - resistance to Puromycin - SB recognition site - Ampicillin resistance. Both receptors were tagged in the extracellular portion to be easily identified, c-myc-tagged-LHCGR and the FLAG-tagged FSHR. Transfection conditions and conditions of tetracyclin induction were optimised and several clones of KGN cells were obtained, which have stably integrated the plasmid both FSHR and LHCGR. We are currently proceeding with the characterisation of the clones and production of the cell lines still outstanding. The cell line stably expressing LHCGR is responsive in terms of cAMP production after stimulation by hCG. Some intriguing results have been obtained with the FSHR-KGN cell line, containing but apparently not expressing the FSHR, and this is currently under further investigation.

Finally, further experiments with the new induction system based on Coumarin are ongoing. The production of the double inducible system (coumarin, tetracyclin) will complete the cell lines expressing both FSHR and LHCGR.

AROUND THE PROJECT OF Dr FRÉDÉRIC JEAN-ALPHONSE

Publication review

- Biased Signaling and Allosteric Modulation at the FSHR., Landomiel F, De Pascali F, Raynaud P, **Jean-Alphonse F**, Yvinec R, Pellissier LP, Bozon V, Bruneau G, Crépieux P, Poupon A, Reiter E. Frontiers Endocrinology 2019, Mar 13;10:148

AROUND THE PROJECT OF Prof. MANUELA SIMONI

Scientific publications

- Riccetti L, Sperduti S, Lazzaretti C, Klett D, De Pascali F, Paradiso E, Limoncella S, Potì F, Tagliavini S, Trenti T, Galano E, Palmese A, Satwekar A, Daolio J, Nicoli A, Villani MT, Aguzzoli L, Reiter E, **Simoni M**, Casarini L (2019) Glycosylation Pattern and in vitro Bioactivity of Reference Follitropin alfa and Biosimilars. Front. Endocrinol., 24 July 2019 https://doi.org/10.3389/fendo.2019.00503

- **Simoni M**, Huhtaniemi I, Santi D, Casarini L (2019) Research Topic Follicle-stimulating hormone: fertility and beyond. Editorial. Front Endocrinol, 06 September 2019 https://doi.org/10.3389/fendo.2019.00610

- **Simoni M**, Santi D (2019) Opinion - FSH Treatment Of Male Idiopathic Infertility: Time For A Paradigm Change. Andrology. 2019 Dec 24. doi: 10.1111/andr.12746. [Epub ahead of print]

- Santi D, De Vincentis S, Alfano P, Balercia G, Calogero AE, Cargnelutti F, Coccia ME, Condorelli RA, Dal Lago A, De Angelis C, Gallo M, Iannantuoni N, Lombardo F, Marino A, Mazzella M, Pallotti F, Paoli D, Pivonello R, Rago R, Rampini M, Salvio G, **Simoni M**. Use of follicle-stimulating hormone (FSH) for the male partner of idiopathic infertile couples in Italy: Results from a multicentre, observational, clinical practice survey. Andrology. 2019 Dec 24. doi: 10.1111/andr.12748.

- Sperduti S, Limoncella S, Lazzaretti C, Paradiso E, Riccetti L, Turchi S, Ferrigno I, Bertacchini J, Palumbo C, Potì F, Longobardi S, Millar RP, **Simoni M**, Newton CL, Casarini L (2019) GnRH antagonists produce differential modulation of the signaling pathways mediated by GnRH receptors. Int J Mol Sci. 2019 Nov 7;20(22). Pii: E5548. Doi: 10.3390/ijms20225548.

TARGETING GPCR TO GENERATE LIFE, PRESERVE THE ENVIRONMENT AND IMPROVE ANIMAL BREEDING: TECHNOLOGICAL AND PHARMACOLOGICAL CHALLENGES

LE STUDIUM CONFERENCES

Co-organised by Prof. Manuela Simoni and Dr Frédéric Jean-Alphonse and their host scientists, the conference gathering European specialists of GPCRs involved in the biology of reproduction of both Human and Animals, enabling to build and/or strengthen collaborations, to analyse the current challenges around this theme and to envision novel pathways not only to optimise reproduction but also to reduce the environmental and societal burden of the current technologies.

The panel of invited scientists covered a broad range of specialties, from basic molecular biology to cellular and physiological biology as well as human biology with contributionsvfrom the area of life sciences (biology, pharmacology, chemistry, human and veterinary medicine), humanities (bioethics) and industry (a big gonadotropin producing company). The Conference served as a springboard for a Consortium, which convened again in a Workshop in December 18-19, 2019 in Tours and is currently writing an application to the H2020 FET-Open RIA project.

LES PERTURBATEURS ENDOCRINIENS ET LA NOUVELLE TOXICOLOGIE

LE STUDIUM LECTURES

Environmental pollutants have many presumed health effects: respiratory, metabolic, cardiovascular, neurodegenerative, neurodevelopmental, fertility, allergies, etc.

Their effects needs to be integrated into the broader study of the exposome, which corresponds to all exposures (physical, chemical, biological, psychosocial) throughout life. Research has focused on a category of toxic substances that act by modifying the effects or quantities of hormones: endocrine disruptors (EDs). These toxic compounds can mimic or alter very fine physiological regulations with harmful consequences for the organism. The unusual behaviour of EPs leads to a questioning of traditional dogmas of toxicology, in particular concerning the effects of different doses of toxicants, long-term effects and the role of epigenetics, particular vulnerability at certain stages of development, notably the foetal stage and early childhood, and the effects of mixtures. Prof. Robert Barouki, Université Paris Descartes - France explained how these new data have an impact on regulations and public health.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VENTE EXCLUSIVE
VET-ORGA

Dr Magdalena Malinowska

LE STUDIUM Guest Research Fellow
ARD 2020 COSMETOSCIENCE Programme

From: Cracow University of Technology - PL

In residence at: Biomolecule and Plant Biotechnology (BBV) - Tours

Nationality: Polish

Dates: **October 2019 to October 2020**

Doctor Magdalena Malinowska works as an Assistant Professor at Cracow University of Technology, the Faculty of Chemical Engineering and Technology. Her PhD thesis was based on the synthesis of novel triterpenes as potential active substances for skin regeneration. Her research was focused on natural and semisynthetic molecules which have potential as active ingredients for topical application. She has the experience in organic synthesis, various extraction techniques, compounds purification and the analytical methods (UPLC-MS, NMR, IR UV/VIS), determination of active substances biological activity, evaluation of skin permeability and the safety evaluation for chemical substances. She is focused of natural sources of active ingredients. Moreover, her professional experience covers also the technology of modern cosmetic formulations, allowing for encapsulation of natural active substances.

Dr Arnaud Lanoue

Host scientist

Doctor Arnaud Lanoue is Assistant Professor at University of Tours, BBV Laboratory (Laboratoire Biomolécules et Biotechnologies Végétales EA2106). He is the author of numerous publications concerning plant metabolomics analysis and screening of natural products with biological activities. His professional experience covers the development of bio-based active ingredients for various applications using methods derived from green chemistry. His research is currently focused on the molecular diversity in grapevine in relation to different genetic in environmental factors. Carring out a metabolic mapping of various grape varieties, including rare species, will allow to multiply rare or ancient grape varieties to their future exploitation. Doctor Arnaud Lanoue applies high-throughput biochemical analysis techniques such as metabolomics which allow to grasp remarkable complexity of natural vine products. His scientific studies have shown that European vines have a specific biomolecule composition which is linked to their genetic background.

GRAPE METABOLOMICS & CELL COSMETICS

The research project "Grape Metabolomics & Cell Cosmetics" focuses on the metabolomics screening of ancient, rare grape varieties from Loire Valley for the development of plant cell lines producing active cosmetics.

Various grape cultivars present a remarkable diversity of original natural substances capable of being valued by the cosmetic and dermatological sectors. Grape extracts enriched with natural antioxidant substances can be used as natural preservatives or also as cosmetic active ingredients.

Today, high-throughput biochemical analysis techniques such as metabolomics make it possible to understand this remarkable complexity of natural vine products. A first step in this project will be to carry out a metabolic mapping of ancient regional grape varieties in order to assess their potential in cosmetic active ingredients.

In a second phase, we will propose how to initiate *in vitro* culture processes applied to rare or extinct Loire Valley grape varieties. This exploratory work will provide access to rare or ancient plant material that has the potential to produce natural substances of original cosmetic interest compared to the grape varieties conventionally used.

Samples of 107 grape cultivars, including six rare cultivars from Loire Valley region, were collected in October 2019 from the grape collection maintained by URGC (Union pour les Ressources Génétiques du Centre). Berries and leaves are being prepared for a metabolomics screening targeted on polyphenols and stilbenoids.

First results of the composition of berries and leaves (rare cultivars compared to the selected common ones) have been obtained. In January, grape canes, representing the winter by-products of viticulture, have been also harvest from the very large grape genetic collection for a further metabolomics screening.

Dr Magdiel Pérez-Cruz

LE STUDIUM Research Fellow
ARD 2020 BIOPHARMACEUTICALS Programme

From: Stanford University - USA

In residence at: Experimental and Molecular Immunology and Neurogenetics (INEM) - Orléans

Nationality: Spanish

Dates: **October 2019 to September 2020**

Magdiel Pérez-Cruz was educated at University of Havana. He received his PhD degree in Biomedicine from the University of Barcelona in 2012. He spent two postdoctoral years in French Pasteur Institute from Lille, 3 years in blood and marrow transplantation division from Stanford University in the United States. He has been interested in biomedical research to study infections and immunity. He is the author of several publications in the field of immunology and immunotherapy, and currently, three papers are under revision. He has been awarded different international grants from Carolina and IDIBELL Foundations, among others. In addition, he has worked on the development of novel immunology-based therapies using antibodies and T cells therapy to prevent or treat exacerbation of inflammatory diseases and cancer, as well as to induce immune tolerance in transplantation. Several international patents protect these innovations; some of them have been licensed to RemAb Therapeutics and Triursus Therapeutics.

Dr Bernhard Ryffel

Host scientist

Bernhard Ryffel's research interests primarily relies in understanding the mechanisms of pulmonary inflammation and repair of resulting from lung injury. He has published over 480 papers and has H factor of 85. In addition to his position at CNRS, he has honorary positions in Guanzhou and Cape Town. He currently holds a number of major international grants supporting this work. In addition to his academic achievements. Bernhard has excellent links with the pharmaceutical industry and founded IBR Inc. and ArtImmune SAS, and is editor of and serves a reviewer for several journals and consultant of several private and academic institutions.

THERAPEUTIC USE OF BLOCKING ANTI-PERIOSTIN ANTIBODY IN INFLAMMATORY LUNG DISEASES

According with the World Health Organization, asthma prevalence has significantly increased in the last 30 years, resulting in a severe human health and economic burden for the society affecting around 235 million people worldwide. In 2016, it was estimated that 383,000 people in the world died from asthma in 2015, more than 1000 per day. Risk factors associated with asthma are exposure to allergens as an infant and exposure to environmental factors, such as pollutants.

Several mechanisms are invoked in driving the allergic lung inflammation. Recently, an increase of the matricellular protein periostin (PO) was reported in serum of patients with asthma and chronic obstructive pulmonary disease (COPD) which is considered also as a biomarker of severity. Several studies suggest also that periostin may be part of a negative-feedback loop regulating allergic inflammation that could serve as a therapeutic target in the treatment of lung diseases.

This research project aims to develop novel immunology-based therapy using blocking monoclonal antibodies against periostin to prevent or treat exacerbation of asthma severe and others inflammatory lung diseases. It is supported by the ARD2020 Biopharmaceuticals Programme.

In the last 4 months, preclinical models to evaluate the anti-inflammatory capacity of therapy, as well as fibrosis and exacerbation has been successfully established. Details about the tree principal topics of research are listed below:

1. **Inflammation**: PO is expressed upon lung inflammation and upregulated in the lung epithelium in mouse models. The development of the therapy is based on the use blocking monoclonal antibodies against periostin to reduce respiratory barrier injury and lung inflammation in preclinical asthma severe models using papain and house dust mite (HDM) allergens.
2. **Fibrosis**: PO plays a unique role as an inducer of chemokines to recruit neutrophils and macrophages important for the process of pulmonary fibrosis. We demonstrate that blocking anti-periostin antibody to prevent or treat attenuates respiratory barrier injury, disruption of tight junction and fibrosis in a preclinical model. Bleomycin (BLM)-administered in mice is widely used as a model of idiopathic pulmonary fibrosis (IPF).
3. **Exacerbation of inflammation**: Another important aspect in inflammatory lung diseases is the frequent acute exacerbation due to infections. We are evaluating the efficiency of blocking anti-periostin antibody to promote bacteria or virus clearance.

The collaboration with the public and industrial partners (still under negotiation) will provide more resources and support to continue the biological evaluation of monoclonal antibodies in preclinical animal models. Furthermore, we will test protective effects the anti-periostin antibodies in vitro human and mouse fibroblasts and co-culture models to explore the mechanisms of action and the affected pathway.

Novel data obtained from this project will be considered first for intellectual property protection to facilitate the generate spin-off company since the preliminary results are very encouraging. In particular, the aim of the spin-off is to develop to prepare a solid preclinical dossier to license for clinical trials in severe asthma and other lung diseases. The results will be presented in congress relevant in the field, as well as, published in peer-reviewed journals.

Dr Denis Reis de Assis

LE STUDIUM Research Fellow
ARD 2020 BIOPHARMACEUTICALS Programme
PRESTIGE

From: Pontifical Catholic University of Rio Grande do Sul - BR

In residence at: Imaging and Brain laboratory (iBrain) - Tours

Nationality: Brazilian

Dates: **March 2018 to March 2019**

Dr Reis de Assis did his masters and PhD studying brain energy metabolism. He showed that metabolites accumulating in a fatty acid oxidation disorder called MCAD deficiency decrease the activity of the enzyme Na^+, K^+-ATPase, Krebs cycle, the activities of the mitochondrial respiratory chain complexes, creatine kinase and cause lipid peroxidation. He did his first post-doc in the neural stem cells field. During his second post-doc, he clarified mechanisms by which cell therapy is neuroprotective in a rat model of epilepsy, methylprednisolone improves aversive memory, neurotoxicity of venoms, and by which a neuropeptide involved in appetites and neuropsychiatric disorders acts in hippocampal cells. He received hands-on training in iPS cells and human neural progenitors. Currently, D Reis de Assis studies the effects of a hallmark protein in amyotrophic lateral sclerosis, TDP-43, on calcium signalling and mitochondrial bioenergetics.

Prof. Hélène Blasco

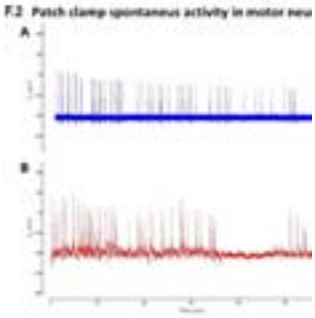
Host scientist

H. Blasco is professor and practitioner in the Laboratory of Biochemistry and Molecular Biology and in the team «Neurogenomics and Neuronal physiopathology» of INSERM U1253 (CHU and University of Tours). She is specifically working on Amyotrophic Lateral Sclerosis (ALS), a neurodegenerative disease characterized by degeneration of motor neurons that leads to a progressive muscular paralysis. ALS diagnosis is mostly based on clinical criteria that lack the precision to establish a rapid diagnosis. Thus, her research activity is focused on the development of biomarkers, the understanding the aetiology of the disease and the identification of new neuroprotective agents. More recently, the team is developing a therapeutic approach based on intrabodies to target protein aggregates. Thus, her current project is mainly to develop biopharmaceuticals in ALS and to use pharmaco-metabolomics to assist this development.

RECOMBINANT INTRABODIES AS MOLECULAR TOOLS AND POTENTIAL THERAPEUTICS FOR AMYOTROPHIC LATERAL SCLEROSIS (INTRABALS)

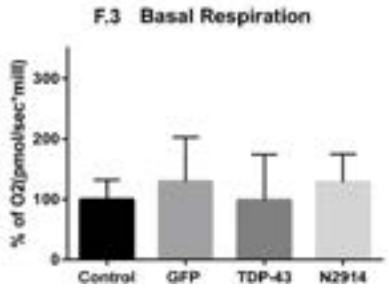
Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease that has no diagnostic marker, prognosis, nor an effective treatment. Numerous physio-pathological mechanisms have been described for this disease, in particular the aggregation of cytoplasmic TDP-43. Additionally, a "prion-like" mechanism of the propagation of the pathology including TDP-43 has been described. Much effort has been directed to therapeutic treatments for ALS, but these efforts explore sparsely the potential of biomolecules.
The objective of this project is to target the protein aggregates containing TDP-43 by a novel approach. We planned to characterise the therapeutic sites of TDP-43 through fragments of antibodies synthesised by the cell, termed intrabodies. The results of this project will have applications not only for ALS but also potentially for other neurological diseases, such as dementias.

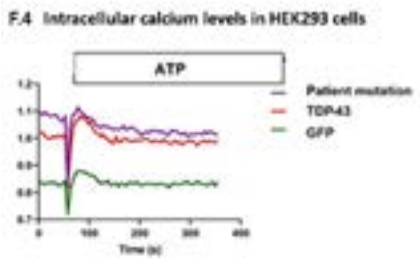
We have just obtained our first intrabodies (about 6 clones). We are currently evaluating several markers, including cellular respiration, glycolysis, the endometabolome, as well as calcium signaling and neurotransmission. We have obtained interesting results and we have determined few robust and reproducible parameters to test for intrabodies screening. We are currently testing the effects of TDP-43 on synaptic neurotransmission by a technique called patch clamp, which measures several electrophysiological parameters using primary cultures of motor neurons from mice (*Fig1 and Fig2*). These experiments have the potential of showing if TDP-43 overexpression could disturb neurotransmission in motor neurons, which is a property exclusive of excitable cells, such as neurons.



In addition, our preliminary results suggest that overexpression of TDP-43 in HEK293 cells do not affect directly mitochondrial respiration (*Fig3*), however it provokes an increase in the basal levels of intracellular calcium (*Fig 4)*. Thus, we are currently testing whether TDP-43 overexpression also affects intramitochondrial calcium levels, which are critical to stimulate mitochondrial respiration. Our results are important, since there is currently a disagreement among data from different research groups regarding the effects of TDP-43 on the mitochondrial energy metabolism.

The collaboration with the industrial partner (still under negotiation) will provide a library of small molecules that could mimic the activity of the intrabodies with the advantage of an easier access to the brain and into target cells. Therefore, we will test the competitive binding of these small molecules against the intrabodies then will test their protective effects in vitro in the models described previously.





INDUCED PLURIPOTENT STEM CELLS (IPSCS): FROM DISEASE MODELS TO MINI-ORGANS

LE STUDIUM CONFERENCES

Induced pluripotent stem cells (iPSCs) are pluripotent cells obtained by the development of a technique of reprogrammation of somatic cells using 4 defined factors. With this technique, scientists started to being able to access neurons derived from somatic cells of patients with neurological illnesses such as Alzheimer's and Parkinson's and use it as models for research laboratory studies. iPSCs opened new avenues for a better understanding about human cell differentiation, and for the ex vivo development of human organs. Besides, iPSCs brought new hopes for the development of cell therapies for conditions such as blindness and liver and kidney diseases. More recently, scientists could obtain «mini-organs» from iPSCs. These three-dimensional structures mimic human organs, allowing a unique opportunity to access whole organs affected in different pathologies. Moreover, iPSCs derived from patients with the most diverse diseases are a highly attractive tool for screenings selecting new medicines from libraries with thousands of compounds. The conference organised in the framework of the ARD 2020 Biopharmaceuticals Programme. gathered a small group of most prominent experts from the iPSCs field who discussed the different applications, advantages, and caveats of the use of iPSCs in Biological Sciences and Medicine. Main themes covered where: iPSCs reprogrammation and differentiation, iPSCs disease models, iPSCs in drug discovery, iPSCs in cell therapies, and organoids derived from iPSCs.

LES CELLULES SOUCHES : PANACÉE OU BOÎTE DE PANDORE ?

LE STUDIUM LECTURES

Prof. Christian Andres (University of Tours, Inserm U1253 iBrain, Team 2 The Neurogenomics and Neuronal Physiopathology & CHRU Tours – France) gave a thorough review of societal challenges regarding stem cells. Stem cells are cells capable of dividing indefinitely and transforming into different cells that make up a living organism. There are different kinds of stem cells, ranging from embryonic stem cells derived from the embryo, capable of producing a complete individual, to stem cells artificially induced from skin cells of an adult person. Stem cells have also been discovered in the brain, where it was long thought that neurons were not capable of dividing. There is great hope for these cells. Numerous trials are currently underway in France and around the world to test the potential of these cells in diseases as varied as diabetes, myocardial infarction or macular degeneration of the retina. Many difficulties remain to be overcome: the control of the immune response, the long-term control of these cells, the formation of certain cell types that are difficult to obtain, for example. These cells also sometimes make it possible to replace animal models in research, by reproducing certain stages of diseases and making it possible to test new therapeutics in a culture dish. Unfortunately, a flowering of unscrupulous societies are offering at a high price non-validated uses of these cells, very often with no effect, or even deleterious effects. Moreover, the regulations and the ethical context of this work vary from country to country and do not always show a very clear picture of each situation. It is essential for citizens to participate in these discussions so as not to leave the door open to charlatans and to fully grasp the advantages and disadvantages of these new approaches.

AROUND THE PROJECT:

Oral communication

- **De Assis, D.R.** "ALS: An update about the effects of TDP-43 on calcium signalling and mitochondrial bioenergetics", Lecture presented at the conference "Induced pluripotent stem cells (iPSCs): From disease models to mini-organs", Tours, 29/01/2019.

Publication

- Hergesheimer RC, Chami AA, **de Assis DR,** Vourc'h P, Andres CR, Corcia P, Lanznaster D, Blasco H. The debated toxic role of aggregated TDP-43 in amyotrophic lateral sclerosis: a resolution in sight? Brain., 2019 142(5):1176-1194.

Dr Arlette Richaud-Torres

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Autonomous Metropolitan University Unidad Iztapalapa - MX

In residence at: Extreme Conditions and Materials: High Temperature and Irradiation (CEMHTI) - Orléans

Nationality: Mexican

Dates: **June 2019 to May 2020**

I am Chemist by the Chemistry Faculty, UNAM (Mexico) were I acquired experience on the synthesis and characterisation by analytical and spectroscopic methodologies of coordination compounds models of metalloenzymes active sites. I obtained my PhD in Chemistry (UAM, Mexico) getting experience on theoretical studies about the reactivity of nitrogenated heterocycles and its applications to the design of antioxidant coordination compounds. I have been referee of international journals, chemistry professor at UAM (Mexico), and invited professor at Donostia International Physics Center (Basque Country, Spain), Euskal Herriko Unibertsitatea (Basque Country, Spain), Valladolid University (Spain). Currently, I am Marie Skłodowska-Curie Research Fellow by Le Studium, National Researcher (SNI I) by CONACyT-Mexico and since 2013 co-organiser of the NMR symposia in Mexico.

Dr Pierre Florian

Host scientist

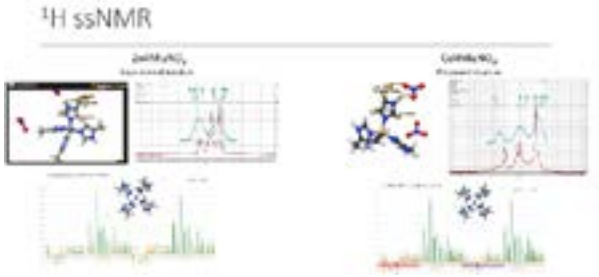
He is an expert and international reference on Solid-State Nuclear Magnetic Resonance, especially on about spectroscopy of crystalline and amorphous phases, structure of oxide glasses, structure and dynamics of very high–temperature molten oxides. He has performed in joint with Dr Massiot the network Research infrastructure Magnetic Nuclear Resonance, Very High Fields in France. Actually, he has more than 104 peer-reviewed publications, with an average citation per article of 28.5 and his h-index is 31. He has co-organized and participated as lecturer in more than 20 international conferences where the high quality of his research has been shown. He is part of the organising committee of the Rocky Mountain Conference on Magnetic Resonance (July,2020 Colorado USA) and the NMR Symposia in Mexico.

COORDINATION COMPOUNDS AS ANTIOXIDANTS: ACTIVITY EVALUATION BY COMBINING FIRST-PRINCIPLE CALCULATIONS AND SOLID-STATE NMR

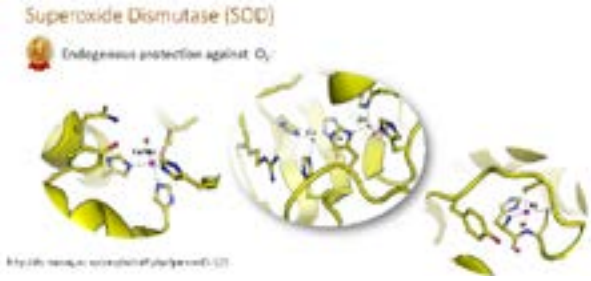
To study the relationship between chemical reactivity parameters and structural data obtained by solid state NMR of coordination compounds models of antioxidant enzymes that contains redox metals.

Achievements to date: We have proved our methodology with zinc (II) and cadmium (II) imidazolates obtained with different metallic salts. For zinc (II) and cadmium imidazolates with nitrates as counter ions, structural data was obtained by single crystal X-ray diffraction.

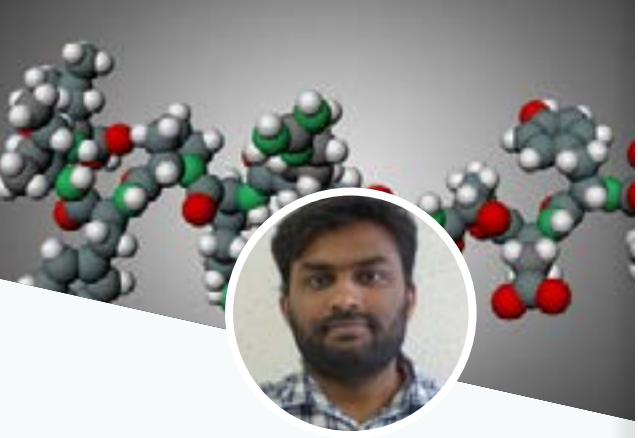
Those structural data were used to calculate their chemical reactivity parameters obtained by the Hard and Soft Acids and Basis Principle (HSAB) supported by the Density Functional Theory (DFT) theory, as well as their NMR parameters using DFT and first principle calculations. The experimental ^{1}H, ^{13}C and ^{15}N Solid State NMR spectra for each compound were also determined.



The isotropic chemical displacement observed in the experimental ^{1}H, ^{13}C and ^{15}N solid state NMR spectra were in agreement with the electronic density characteristics revealed by the reactivity parameters obtained for each site in the testing molecules.



The results of the first principle calculations of NMR parameters were also in agreement with their respective experimental NMR spectra. Using the proved methodology on cadmium (II) and zinc (II) imidazolates with bromide and chlorides, we were able to confirm their structure and predict their electronic density that leads the reactivity of each site. Those coordination compounds initially studied, model the enzymatic site of carbonic anhydrase and one of the two metallic sites in the superoxide dismutase (SOD).



Dr Thimmalapura Marulappa Vishwanatha

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University Medical College Groningen - NL

In residence at: Center for Molecular Biophysics (CBM) - Orléans

Nationality: Indian

Dates: **February 2019 to May 2020**

I have joined the Prof. Sureshbabu's laboratory (Bangalore University, India) in July 2009 for a PhD programme. The main objectives of my research work were the design and synthesis of a novel class of peptidomimetics. After finished my PhD in 2014, Alexander Dömling (University of Groningen, The Netherlands) offered a postdoc position to work on multicomponent reactions. I am very fortunate to have had an additional experience to work on radiochemistry laboratory at the medical college under the guidance of Prof. Elsinga. I have committed for the opportunity to expand my ideas and past research activities for the synthesis of complex structures such as peptides and proteins. I worked as a postdoc in Dr Aucagne's group on drug discovery and organosulfur-based peptidomimetic synthesis. I received several award grants such as CSIR senior research fellowship, travel grants to attend the 2018 International Symposium on Chemical Biology in Switzerland and 2019 American Peptide symposium in the USA.

Dr Vincent Aucagne

Host scientist

Vincent Aucagne received his PhD from the University of Orléans (2002), working with Patrick Rollin on the development of synthetic methodologies to elaborate carbohydrate mimics. Following post-doctoral research with Prof. David Leigh at the University of Edinburgh (2003-2006) in the field of mechanically-interlocked architectures and molecular machines, he returned to Orléans to join the CNRS Center for Molecular Biophysics (CBM), as a CNRS Chargé de Recherche (2006) in the group of Dr Agnès Delmas. He currently holds a Director de Recherche position, leads the "Synthetic Proteins and Biorthogonal Chemistry" research group, and is the coordinator of the "Molecular, Structural and Chemical Biology" team. His current research interests focus on the development of synthetic methodologies for the chemical synthesis of proteins for application to the deciphering of biological processes at the molecular level.

DEVELOPMENT OF NOVEL CHEMOSELECTIVE LIGATION TECHNIQUES FOR PROTEIN SYNTHESIS

The production of proteins by chemical synthesis is a very promising alternative to biotechnological techniques for applications to the deciphering of biological mechanisms at the molecular level, drug discovery and synthetic biology. It is particularly useful for accessing site-specifically modified proteins. Current technologies focus on the modular assembly of unprotected peptide fragments through highly chemoselective reactions called "chemical ligations".

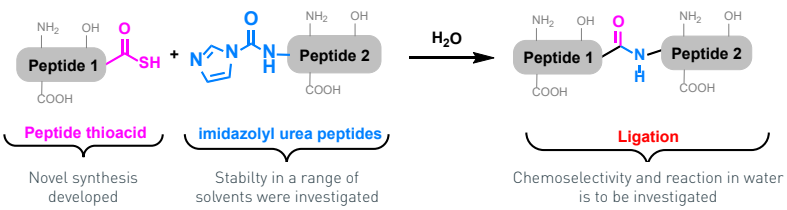
This approach revolutionised the field about thirty years ago, but there is still only a very few reactions compatible with this purpose available to date. The overall goal of the project is to develop novel ligation reactions for chemical protein synthesis. In particular, the chemical ligation of peptide thioacids with N-activated peptides (imidazolyl ureas) has been investigated, with the goal to transform a known non-chemoselective reaction (carboxylic acid/imidazoylurea coupling devellopped by Campagne) into a chemo and regio-selective reaction compatible with aqueous environments typically used for the ligation of unprotected peptides.

The rational behind the idea to replace carboxylic acids by thioacids is that, under acidic conditions, thioacids are reactive whereas side chain functional groups in the peptides such as amines and carboxylic acids are expected to be unreactives.
The ligation reaction between peptide thioacids and imidazolyl urea peptides involves three key challenges:

1. synthesis of unprotected peptide thioacids
2. synthesis of imidazolyl urea peptides and
3. ligation under aqueous conditions.

First, I investigated the synthesis of unprotected peptide thioacids which are notably difficult to prepare, and rather unstable. A model peptide was synthesized having a C-terminal hydroxy-benzyl cysteine group at the C-terminus (so called crypto-thioester) as described previously in the host laboratory. After the elongation on solid support, the peptide was released in solution and purified through HPLC. This crypto-thioester peptide was treated with trimethoxy benzyl thiol (Tmob-SH) leading to the formation of trimethoxy benzyl thioester peptide which was purified by HPLC. Very conveniently, trimethoxy benzyl thioester peptide is efficiently converted into peptide thioacid by a simple acidic treatment prior to use in ligation reactions. The second challenge was the synthesis of imidazolyl urea peptides. For this, activation of amine was carried out on solid support by the treatment with carbonyl diimidazole.
The imidazolyl urea activated peptide was then released from resin. I systematically studied the stability of model imidazolyl urea peptide in aqueous conditions. It was found that, the imidazolyl urea activated peptides are reasonably stable in water at acidic pH, thus compatible with the reaction with peptide thioacids.

Next step will be to carry out ligation reaction between unprotected peptide thioacids and unprotected Imidazolyl urea peptide under acidic pH based on a previously synthesized dipeptide Boc-Phe-Ala-OMe as a solid proof of concept.



Prof. Georg von Samson-Himmelstjerna

LE STUDIUM Guest Research Fellow

From: Freie Universität Berlin - DE

In residence at: Infectiology and Public Health (ISP) - Tours

Nationality: German

Dates: **October 2019 to September 2020**

Following his degree in veterinary medicine Georg von Samson-H. obtained a Dr med. vet. degree in veterinary parasitology and then spent four years as laboratory head in the pharmaceutical industry before returning to academia.

He successfully pursued his research carreed in veterinary parasitology by receiving his habilitation in 2003 and his first full professor position at the Institut of Parasitology, University of Veterinary Medicine in Hannover, Germany in 2005.

Since 2009 he is University Professor at the Institute for Parasitology and Tropical Veterinary Medicine, Freie Universität Berlin, Germany.

His main research topics include mechanisms of anthelmintics and the occurrence as well as molecular mechanisms of anthelmintic resistance.

He has published over 200 scientific papers in journals with peer review (current web of science H-index: 35, sum of citations: 4730) and attracted over 70 extramurally funded research projects.

Dr Cédric Neveu

Host scientist

Following a PhD thesis and a post doc on the pathogenic bacteria Helicobacter pylori, Cédric Neveu focused on plant resistance and the mechanisms by which the parasitic nematode Meloidogyne incognita overcomes these defences. He was recruited to the French National Institute for Agricultural Research (Inra) in 2005. Currently, he is in charge of a research team working on gastro-intestinal parasitic nematodes of small ruminants. The main focus of his research work concerns identification of molecular mechanisms involved in anthelmintic resistance and the development of alternative control strategies.

THE ROLE OF PARASITE DERIVED P-GLYCOPROTEINS AS MEDIATORS FOR ANTHELMINTIC RESISTANCE

The main objectives of the Host laboratory at INRAE Centre Val de Loire (Multiresistance and pathogeny factors from parasitic nematodes headed by Cedric Neveu) and the Institute for Parasitology and Tropical Veterinary Medicine (IPTVM) at Freie Universität Berlin (headed by Prof. Georg van Samson-Himmelstjerna) are innovative contributions to the sustainable control of gastro-intestinal parasitic nematodes (GIN) in livestock industry. Currently, the control of GIN infections remains largely based on anthelmintic treatments, but increasing anthelmintic resistance has reduced their efficacy.

In that respect, during the past decade, both groups have investigated anthelmintic resistance (AR) on several different aspects from field studies to molecular characterization of parasite anthelmintic targets, new drug target discovery and host-pathogen crosstalk and the development of alternative control strategies.

The current project focusses on the investigation of metabolic pathways of anthelmintics, in particular the P-glycoproteins (Pgp) and their mutations in the context of drug transport, specifically concerning macrocyclic lactones (ML). This significant complementary expertise will produce synergy and allow for a more comprehensive approach to elucidating the metabolism of MLs as well as the mechanism of resistance against this drug class.

As it is to date not feasible to perform forward or reverse genetic studies in parasitic nematodes and thus also not possible to study the effects of gene modifications directly in these organisms, scientists employ model organisms such as the earth nematode Caenorhabditis elegans in which the respective parasite derived genes are being functionally expressed. This is also the main research approach chosen in this project.

Specifically the Pgp11 gene of the equine GIN Parascaris univalens will be cloned into wild-type as well as Pgp11 knock-out lines of C. elegans. This will be performed using the CRISPR/Cas9 technology which is well established in the host institution. Based on previous findings in the laboratory of the Le Studium fellow there is circumstantial evidence showing that specific single nucleotide polymorphisms in the Parascaris Pgp11 coding sequence are associated with reduced ML efficacy.

To investigate the functional relevance of these polymorphisms recombinant C. elegans lines expressing Parascaris Pgp11 with and without these polymorphisms will be generated. To date the required plasmid DNA constructs have successfully been generated and a first C. elegans line carrying the Parascaris Pgp11 was created.

Prof. Anand Yethiraj

LE STUDIUM Guest Research Fellow

From: University of Newfoundland - CA

In residence at: Molecular Biophysics Center (CBM) - Orléans

Nationality: Canadian

Dates: **September 2018 to August 2019**

Anand Yethiraj completed his PhD at Simon Fraser University, Canada in 1999. His PhD thesis addressed, experimentally, a long-standing question in liquid crystal physics (and received the Glenn H. Brown prize for outstanding PhD thesis from the International Liquid Crystal Society).

After postdoctoral stints at the FOM Institute for Atomic and Molecular Physics, The Netherlands, and the University of British Columbia (Canada), he has been working as a professor at Memorial University of Newfoundland (Canada).

He has made key contributions in three areas of experimental soft matter: tunable colloids, electro-hydrodynamically driven chaotic motions in emulsions, and to employing the pulsed-gradient NMR technique to study multi-component diffusion in complex media.

The focus of this research has been probing soft materials near and far from equilibrium.

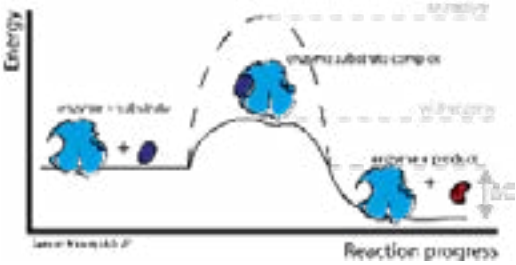
Prof. Francesco Piazza

Host scientist

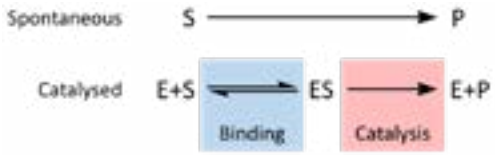
Francesco Piazza is Professor at the CNRS laboratory, Centre for Molecular Biophysics, affiliated with the University of Orléans. A physics graduate of the University of Florence in Italy, he obtained his PhD at Heriot-Watt University, Edinburgh, UK in 2002. He was a research and teaching associate at 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.

MACROMOLECULAR CROWDING: A PHYSICIST'S PERSPECTIVE ON UNDERSTANDING MOLECULAR MOTIONS IN THE COMPLEX ENVIRONMENT OF A LIVING CELL

Inside a living cell, approximately 30 - 40% of the available volume is occupied by large («macro») molecules, as well as cytoskeletal fibres and organelles. There are many types of these macro-molecules and they can be extended in form (e.g. nucleic acids) or globular (e.g. proteins). This crowded environment can affect the shape and the motions of a given macromolecule, such as a protein, profoundly. It is amazing that all the biochemical reactions that are necessary for the proper functioning of a cell occur within a confined and crowded cellular environment. In this talk, I will introduce the physicist's point of view of macromolecular crowding, starting with very simple systems and building complexity step-by-step from the bottom up. Life itself is represented by processes that are intrinsically out of equilibrium and consume energy. How does being out of equilibrium contribute to macromolecular dynamics in a crowded environment?

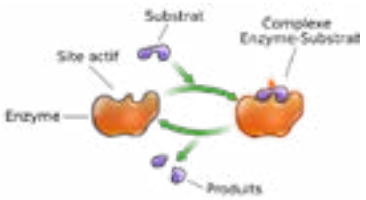


The premise of this work is based on recent research that indicates that enzymes are physically propelled when they are catalyzing a reaction .
During the catalysis process, enzymes catalyze (i.e. greatly enhance the speed of) the transformation of "substrate" molecules into product species. Enzymes are seen to exhibit both chemotaxis and anti-chemotaxis , i.e., they exhibit motion either upward or downward, along or against the substrate concentration gradient. Follow-up work in groups in the USA , South Korea and Spain appear to confirm the observation, of enhanced motions, while other research suggests that this observation might simply be a fluorescence artifact .



We pursued (and continue to pursue) enzyme-nanoparticle attachment chemistry for multiple reasons:

1. Using the nanoparticle as probe, we look for enhanced motions in the presence of substrate without fluorescence measurements, thus avoiding possible artifacts.
2. The resulting functionalized nanoparticles would be "active nano-motors" that would have very fascinating non-equilibrium properties and would serve as an excellent model system for non-equilibrium soft matter.
3. These active nanoparticles can serve as active crowders in mimics of the crowded cellular environment.



Dr Franck Bonnier

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | **ARD 2020 COSMÉTOSCIENCES**

Franck Bonnier obtained his PhD from the Department of bio-spectroscopy for life sciences as a member of the Médian CNRS group, Université de Reims Champagne-Ardenne, France. Following his PhD, he joined the FOCAS Research Institute, DIT in 2008 as a post-doctoral research engineer under the National BioPhotonics and Imaging Platform, Ireland. In September 2014, Franck Bonnier joined the Nano-Medicine and Nano-Probes research group (NMNS EA 6295) at the University de Tours (France) as associate professor. His main field of expertise is the development of methodologies towards implementation of spectroscopic techniques coupled to chemometrics approaches as clinical and industrial tools. His work addresses concerns about diagnostic, therapeutic and cosmetic applications. He is strongly involved in the ARD 2020 Cosmetosciences programme, exploring translational research to position infrared and Raman spectroscopy for quality control and for skin analysis as part of objectivation of cosmetic products.

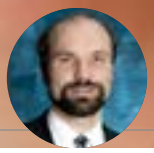
MONITORING OF MOLECULAR DYNAMICS INTO THE SKIN BY MEAN OF RAMAN SPECTROSCOPY

In frame of the ARD2020 Cosmétosciences Programme the NMNS lab (Faculty of pharmaceutical sciences – Tours, France) has positioned itself as a multidisciplinary research group exploring both the optimisation of innovative formulations based on complex encapsulation methods and the development of new techniques for biological assessment (objectivation) exploring Raman Confocal Imaging (RCI). Raman spectra are considered as molecular fingerprint with the different peaks observed corresponding to specific vibrational modes of atoms thus reflecting the chemical structures of molecules investigated. Consequently, molecules deliver unique spectra based on their chemical structure enabling their identification according to both Raman bands positions and intensities. Applied to biological materials such as the skin the spectra result from combined contribution of all the biomolecules illuminated by the laser source, generating complex but yet extremely rich spectral data. Using appropriate data mining methods, known as multivariate analysis, the presence of an exogenous molecule such as active cosmetic ingredient (ACI) can be mapped out based on its specific spectral bands while other regions of the spectra will inform about changes in the skin constituents organisation and conformation. For instance, the proteins matrix and lipid edifice play key roles in maintaining the stratum corneum integrity and ensure optimal barrier function. Therefore, one spectral image can deliver information about both the penetration profile of a given ACI and effects of the formulation on the skin physiological status.

Following developments achieved in recent years, numerous experimental challenges associated with the measurement of chemical and physical inhomogeneity can be surmounted, further strengthening the Raman capability for skin analysis. Its potential for dermatological application has been demonstrated, whereby the spectral information can be used to assess the chemical integrity of the skin, the hydration state, oxidative stress and the ability to individually track various ingredients of a formulation. The technique is label free, non-destructive and can be operated in confocal conditions giving access to non-invasive measurements. While Raman spectroscopy can be employed as tool for process monitoring, quality control of cosmetic products or detection of adulteration/counterfeits, the main leap forward in recent years remains transferability towards in vivo applications. Thanks to dedicated systems molecular dynamics of the skin can be investigated directly on volunteers for objectivation of cosmetic products or into clinics for diagnosis purposes.

Conclusion after meeting 1: The participants of the consortium have agreed to prepare and submit a European proposal in 2021 on the topic "Establish confocal Raman in vivo for drug penetration".

PARTNERS



Dr Stephan Bielfeldt
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Dr Gerwin Puppels
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Dr Eric Ziemons
University of Liège - BL

AROUND THE PROJECT

Oral communications

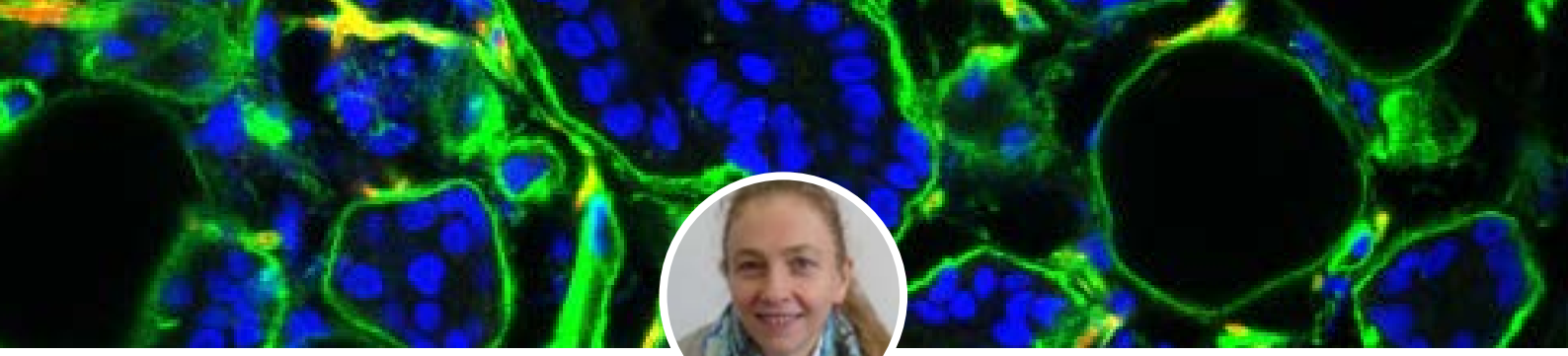
- E. Munnier*, L. Miloudi, H.T.P. Nguyen, F. Yvergnaux, F. Vial, M. Soucé, I. Chourpa and **F. Bonnier** "Core-shell encapsulation systems as a help to formulate active cosmetic ingredients and enhance their skin penetration." Formulation days 2019 (Lyon, France, 10-11 Jan. 2019)
- A. Stella, **F. Bonnier**, L. Miloudi, A. Tfayli, F. Yvergnaux, Emilie Munnier, Clovis Tauber "Estimation of penetration profiles with unsupervised unmixing approaches in Raman spectroscopic imaging" Chimiométrie 2019 – Montpellier – 30 Jan – 1st Feb. 2019
- **F. Bonnier***, L. Miloudi, S. Henry, F. Yvergnaux, X. Perse, I. Chourpa, E. Munnier «Nanovecteurs de bioactifs: Innovations in formulation and tools for characterization and objectivation ». Colloque Cosmétosciences (Orléans, 15 Feb. 2019).
- C. Eklouh-Molinier*, Y. Dancik, L. Gressin, G. Gillet, J. Pétrignet, N. Huang, I. Chourpa, E. Munnier, **F. Bonnier** « Benefts of ultrasound emulsification in skin penetration of cosmetic active ingredients» GDR cosm'actif - Vannes 23-24 May 2019
- Y. Dancik*, C. Eklouh-Molinier, H. Kichou, M. Souce, A. Al Assaad, E. Munnier, I. Chourpa, **F. Bonnier** « Investigating storage conditions on the skin barrier function of reconstrcuted human skin by means of Raman». Colloque du GDR Cosm'actifs (Vannes, 23-24 may 2019)
- Eklouh-Molinier C.*, Dancik Y., Soucé M., Gressin L., Gillet G., Pétrignet J., Chourpa I., Munnier E., **Bonnier F.** « Benefts of ultrasound emulsification in skin penetration of cosmetic active ingredients» Séminaire Cosmétosciences 2019, 13 Jun. 2019, Orléans, France.
- Aline Stella, **Franck Bonnier,** Ali Tfaily, Florent Yvergnaux, Emilie Munnier, Clovis Tauber "Simultaneous estimation of spectra and penetration profile by non-supervised MCR-ALS: application to active cosmetic ingredient tracking into the skin" LE STUDIUM conference 2019 – 2-4 Dec. 2019, Tours, France

Scientific publication

- **Bonnier F.**, L. Miloudi, S. Henry, D. Bertrand, C. Tauber, X Perse, F. Yvergnaux, H. J. Byrne, I. Chourpa, E. Munnier Quantification of low content encapsulated active cosmetic ingredients in complex semi-solid formulations by means of Attenuated Total Reflectance-Infrared spectroscopy, Accepted ABC October 2019.

Posters

- **F. Bonnier**1*, L. Miloudi1, Sandra Henry1, Kevin Barreau1, D. Bertrand2, X. Perse1, F. Yvergnaux3, H.J. Byrne4, I. Chourpa1, E. Munnier1 « Quantitative analysis of active cosmetic ingredients using infrared spectroscopy coupled to multivariate analysis » Chimiométrie 2019 – Montpellier – 30 Jan – 1st Feb.2019
- **F. Bonnier**, C. Tauber, A. Al Assaad, F. Mahut, A. Stella, F. Ta, L. Van Gheluwe, A. Tatibouet, C. Sinturel, F. Yvergnaux, A. Boucaud, E. Munnier « Smart materials for stimulated release of cosmetic bioactives» Colloque Cosmétosciences (Orléans, 15 Feb. 2019).
- A. Stella, **F. Bonnier**, L. Miloudi, A. Tfayli, F. Yvergnaux, E. Munnier, C. Tauber. « Estimation of prenetration profils based on unsupervised unmixing approaches applied to Raman imaging» Colloque Cosmétosciences (Orléans, 15 Feb. 2019).
- Eklouh-Molinier C., Dancik Y., Soucé M., Gressin L., Gillet G., Chourpa I., Munnier E., **Bonnier F.** « HPLC and Raman spectroscopy for the monitoring skin penetration of cafeine in emulsion stabilised by ultrasound» Colloque Cosmétosciences 2019, 15 Feb. 2019, Orléans, France.
- C. Eklouh-Molinier, Y. Dancik, L. Gressin, G.Gillet, I.r Chourpa, E. Munnier, **F. Bonnier**1* « Evaluation of emuliosns skin penetration with Raman spectroscopy " RITS 2019 – Tours – 20-22 May 2019
- A. Stella, **F. Bonnier**, L. Miloudi, A. Tfayli, F. Yvergnaux, E. Munnier, C. Tauber « Estimation of penetraton profils by unsupervised unmixing method applied to Raman imaging» RITS 2019 – Tours – 20-22 May 2019
- A. Stella, **F. Bonnier**, L. Miloudi, A. Tfayli, F. Yvergnaux, E. Munnier, C. Tauber « Minimum Volume Constrained Non-negative Matrix Factorization Applied to the Monitoring of Active Cosmetic Ingredient into the Skin in Raman Imaging "CPRS 2019: 10th International Conference on Pattern Recognition Systems 8-10 Jul. 2019 Tours
- C. Eklouh-Molinier, Y. Dancik, L. Gressin, G. Gillet, J. Pétrignet, I. Chourpa, E. Munnier, **F. Bonnier** « Comparative study of emulsification process by Raman spectral imaging » GSFV 2019 – Lyon -13-15 May 2019
- A. Al Assaad, F. Mahut, C. Sinturel, F. Yvergnaux , M. Vayer, I. Chourpa, E. Munnier, **F. Bonnier**,* « Nano-encapsulated active cosmetic ingredient in polymeric films: Analysis of the distribution by Raman Imaging" GSFV 2019 – Lyon - 13-15 May 2019
- **F. Bonnier***, S. Elderderi, D. Bertrand, X. Perse, F. Yvergnaux, I. Chourpa, E. Munnier « Vibrational Spectroscopy for quality control of complex semi-solid cosmetic formulations » GSFV 2019 – Lyon - 13-15 May 2019
- **F. Bonnier**, L. Miloudi, S. Henry, D. Bertrand, X. Perse, F. Yvergnaux, H.J. Byrne, I. Chourpa, E. Munnier « Non-destructive quantitative analysis of semi-solid forms loaded with encapsulated active molecules (by vibrational spectroscopy) » SKIN & FORMULATION - 5th SYMPOSIUM & 17th SKIN FORUM – Reims- 23-24 Sept. 2019
- **F. Bonnier**, A. Stella, A. Tfayli, F Yvergnaux, I. Chourpa, C. Tauber, E. Munnier "Monitoring of active ingredients penetration by Raman imaging of skin" SKIN & FORMULATION - 5th SYMPOSIUM & 17th SKIN FORUM – Reims- 23-24 Sept. 2019
- Y. Dancik, C. Eklouh-Molinier, H. Kichou, M. Soucé, L. Miloudi, E.Munnier, I. Chourpa, **F. Bonnier** "Study of the effets of storage conditions on the barrier function of reconstructed human epidermis by confocal Raman spectroscopy" SKIN & FORMULATION - 5th SYMPOSIUM & 17th SKIN FORUM – Reims- 23-24 Sept. 2019
- Christophe Ekhouh-Molinier, Yuri Dancik, Laurianne Gressin, Guillaume Gillet, Julien Pétrignet, Nicolas Huang, Igor Chourpa, Emilie Munnier, **Franck Bonnier** "Comparative study of emulsification processes using chromatography and Raman spectral imaging" LE STUDIUM conference 2019 – 2-4 Dec. 2019, Tours, France
- Hichem Kichou, Yuri Dancik, Martin Soucé, Xavier Perse, Igor Chourpa, Emilie Munnier, **Franck Bonnier** "Evaluation of the Strat-MTM synthetic skin model for the study of penetration kinetics" LE STUDIUM conference 2019 – 2-4 Dec. 2019, Tours, France
- Kamilia Kemel, Almar Al Assaad, Frederic Mahut, Marylène Vayer, Christophe Sinturel, Florent Yvergnaux, Emilie Munnier, **Franck Bonnier** "Nano-encapsulated active cosmetic ingredient in polymeric films: Analysis of Delipidol® distribution by Raman Imaging" LE STUDIUM conference 2019 – 2-4 Dec. 2019, Tours, France



Dr Svetlana Eliseeva

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Dr Svetlana V. Eliseeva is a permanent CNRS researcher working at the Centre de Biophysique Moléculaire in Orléans. She moved in France in 2011 as a Le Studium Research Fellow then as a FP7 IEF Marie Curie Fellow (project DENDRIMAGE). She graduated from Lomonosov Moscow State University (Moscow, Russia), earning a PhD degree in inorganic chemistry in 2006. In addition to different prestigious scholarships granted by educational and scientific organisations in Russia, as well as from industrial companies, Dr Svetlana V. Eliseeva was awarded in 2011 the Scopus Award Russia as «an author of the most significant and actual scientific publications in international literature in chemistry in 2010». She is a recipient of the CNRS scientific excellence award (2019-2022) and a co-author of 95 papers in peer-review journals, including 7 reviews and 2 book chapters (h-index: 31). She is an expert in lanthanide coordination chemistry and spectroscopy with the current interest for the design of functional (nano) materials for near-infrared optical imaging and energy conversion.

LANTHANIDE-BASED AGENTS FOR SENSITIVE AND SELECTIVE NEAR-INFRARED IMAGING OF LIVING BIOLOGICALS SYSTEMS

This Consortium brought together experts in different and complementary scientific fields, in particular synthetic chemistry (organic and inorganic), physical chemistry, biology, clinical pharmacy, advanced spectroscopy, formulation chemistry, microfluidics, imaging modalities in cells and small animals.
The goal was to pursue synergistically the common goal of creating new generations of near-infrared emitting imaging agents suitable to solve important issues in medicine such as early-stage *in vivo* detection of cancer or fungal infections.

These imaging agents take advantage of the unique optical properties of lanthanide (III) ions combined with a metallacrown (MC) scaffold and will be smartly formulated to address specific requirements of a particular application. The meetings in Orléans were very productive and allowed deep, fruitful and constructive discussions to crystallize ideas for the creation of near-infrared imaging agents of the future based on lanthanide metallacrowns, make them possible to be applied for the real-time *in vivo* monitoring of drug delivery. The expertise of Prof. Carlos is highly useful for the design of a new generation of nanothermometers allowing unprecedented perspectives for the monitoring of extremely small temperature changes in cells associated to changes of metabolism (Manuscript in preparation).

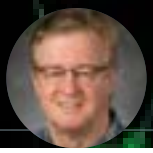
The expertise of Prof. Needham is essential for the formulation and functionalization of imaging agents in order to obtain the required specificity and/or delivery the synthesized systems to the desired location. Another important achievement is the design, synthesis and tests of energy upconverting MCs as well as dendrimers based on MCs (Provisional US patent application filed: Lopez-Bermudez B., Pecoraro V.L., Petoud S., Eliseeva S.V., Dendritic Metallacrowns. Provisional Patent Application, UMJ-228-B). The creation of dendritic macromolecules with dimeric MC core allowed to improve the water solubility and biocompatibility of gallium(III)/lanthanide(III) MCs. Through the selective iodination of the core or of bridging ligands forming the dimeric gallium(III)/lanthanide(III) MC structure, a new family of potential bimodal agents suitable for combined NIR luminescence and X-ray computed tomography (XCT) imaging has been synthesized.

In addition, an application for an Innovative Training Networks (ITN) programme within H2020 Marie Sklodowska-Curie Actions that brings together chemists, physicists, material scientists and biologists, as well as industrial partners from United Kingdom, United States, Canada, Sweden, Portugal, Spain, Estonia and France which aims at the creation of the optical imaging agents of the future will be submitted in the first days of 2020.

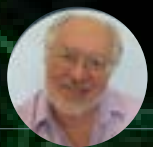
PARTNERS

Prof. Luis Carlos
University of Aveiro - PT

Prof. Peggy Carver
University of Michigan - USA



Prof. David Needman
University of Southern Denmark - DK



Prof. Vincent Pecoraro
University of Michigan - USA

Prof. Stéphane Petoud
CNRS - FR

AROUND THE PROJECT

Oral communications

- Salerno E.V., **Eliseeva S.V.**, Petoud S., Pecoraro V.L. Synthesis and luminescence of a series of new lanthanide(III) metallacrowns with an 8:1 antenna: emitter ratio. 8th International Meeting of the Institute of Metals in Biology of Grenoble. Villard-de-Lans, France, September 22-27, 2019
- Petoud S., Collet G., **Eliseeva S.V.**, Hrvat A., Muldoon P., White K., Chengelis D., Gogick K., Rosi N. Metal-organic Frameworks as Near-Infrared Emitting Materials Based on Lanthanide Cations: from Fundamental Science to Biological Imaging. 8th International Workshop on Photoluminescence in Rare Earths: Photonic Materials and Devices. Nice, France, September 4-6, 2019 invited talk
- **Eliseeva S.V.**, Lutter J.C., Nguyen T.N., Martinic I., Collet G., Sobilo J., Lerondel S., Pecoraro V.L., Petoud S. Challenges and Imaging Applications of Lanthanide(III)-Based Metallacrowns Emitting in the Near-Infrared Range. 19th International Conference on Biological Inorganic Chemistry. Interlaken, Switzerland, August 11-16, 2019 invited talk
- Petoud S., **Eliseeva S.V.**, Collet G., Martinic I., Lutter J.C., Nguyen T.N., Delatouche R., Chopin N., Suzenet F., Pecoraro V.L. Near-infrared Emitting Lanthanide Probes for Optical Imaging Agents with Different Sizes: Small Molecules, Metallacrowns and MOF Nanomaterials. 19th International Conference on Biological Inorganic Chemistry. Interlaken, Switzerland, August 11-16, 2019 invited talk
- **Eliseeva S.V.**, Nguyen T.N., Lutter J.C., Martinic I., Collet G., Sobilo J., Lerondel S., Pecoraro V.L., Petoud S. Functional Properties and Applications of Lanthanide(III)-Based Metallacrowns Emitting in the Near-Infrared Range. XXIX. Tage der Seltenen Erden— Terrae Rarae 2019. Stockholm-Finland, Sweden, May 30-June 1, 2019 invited talk

Scientific publication

- Lutter, J. C.; **Eliseeva, S.V.**; Collet, G.; Martinic, I.; Kampf, J. W.; Schneider B.L.; Carichner, A.; Sobilo, J.; Lerondel, S.; Petoud, S.; Pecoraro, V. L. Iodinated Metallacrowns: Toward Combined Bimodal Near-Infrared and X-Ray Contrast Imaging Agents, Chem.-A Eur. J., DOI: 10.1002/chem.201905241.

Poster

- Lopez Bermudez B.A., **Eliseeva S.V.**, Collet G., Petoud S., Pecoraro V.L. Development of Lanthanide(III)n-Based Dendrimeric Metallacrowns for Biological Imaging. 8th International Meeting of the Institute of Metals in Biology of Grenoble. Villard-de-Lans, France, September 22-27, 2019

Dr Christophe Hano

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | **ARD 2020 COSMÉTOSCIENCES**

Dr Christophe Hano is an associate professor at the University of Orléans and conducts his research activity at the LBLGC Lab (INRAE USC1328), focusing mostly on plant physiology, molecular biology, and biochemistry. He mostly works on the regulation aspects controlling polyphenol biosynthesis in plants as well as on the development of methods of their extraction. The main objectives of his work are to elucidate the mechanisms of the regulation of the biosynthesis of these compounds with high potential for cosmetic and pharmaceutical applications, to provide information dealing with their biological activities and to develop green sustainable extraction methods. He is Associate Editor of Plant Cell, Tissue and Organ Cultures, Biomolecules and Cosmetics, secretary of the French Network on Plant Specialized Metabolism, member of the Polyphenols Group and the Phytochemical Society of Europe.

COSMENOVIC: PLANT NATURAL PRODUCTS PRODUCTION BY NOVEL IN VITRO CULTURE APPROACHES FOR IMPROVED COSMECEUTICALS EFFICIENCY AND SECURITY

Plants are an unrivalled source of natural compounds capable of presenting an interest as innovative bioactive compounds for cosmetics applications and/or replace synthetic compounds. Indeed, most of antioxidants, preservatives or UV filters already present in cosmetic products are still mainly synthetic products, however there is still a guarded opinion on their innocuousness. As such, it is important, be it in public health, environmental protection or in public relations for the cosmetic industries to quickly find and propose an alternative solution to these synthetic products. In the wild, and in particular in the vegetal world, a lot of compounds can show properties enabling them to replace the synthetic compounds. However, this large potential of active ingredients of plant origins lays still unexplored and as such, underexploited. Recent progress in functional genomics, processes of extractions and in metabolic profiling now offers unmatched possibilities to use biochemical capacities of plants to produce and design compounds of high added value.

Although the applications of these bioproduction techniques have been used for several years in the pharmaceutical sector, these scientific concepts also have huge potential in the cosmetics sector. Therefore, the Cosmenovic Consortium aims to efficiently produce plant natural products through innovative approaches in order to improve cosmeceuticals efficiency.

This Consortium aims to put in place integrated metabolic engineering strategies for the industrial size production of metabolites interest. The implementation of holistic systemic biological data (an approach aiming at understanding the dynamic functioning of a cell or an organism at the global scale) obtained by integrative approaches should allow the optimisation of the secondary metabolites production in plants, and the conception of de novo metabolite modules with increased synthesis capacity using *in vitro* systems.

PARTNERS

Prof. Nathalie Guivarc'h
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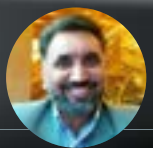
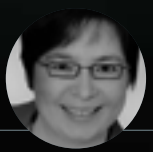


Dr Bilal Haider Abbasi
Quaid-i-Azam University, Islamabad - PK

Prof. Randolph Arroo
Leicester University - UK



Dr Elisabeth Fuss
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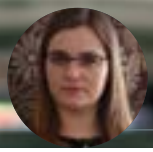
Dr Vasil Georgiev
University of Sofia - BG

Prof. Stéphane Maury
University of Orléans - FR

Prof. Sergio Ochatt
INRAE - FR



Dr Agnieszka Szopa
Jagiellonian University - PL

AROUND THE PROJECT

Scientific publications

- **Abbasi BH**, Zahir A, Ahmad W, Nadeem M, **Giglioli-Guivarc'h N**, **Hano C**.
Biogenic zinc oxide nanoparticles-enhanced biosynthesis of lignans and neolignans in cell suspension cultures of Linum usitatissimum L.
Artif Cells Nanomed Biotechnol. 2019 Dec; 47(1):1367-1373

- **Abbasi BH**, Siddiquah A, Tungmunnithum D, Bose S, Younas M, Garros L, Drouet S, **Giglioli-Guivarc'h N**, **Hano C**.
Isodon rugosus (Wall. ex Benth.) Codd In Vitro Cultures: Establishment, Phytochemical Characterization and In Vitro Antioxidant and Anti-Aging Activities.
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A Comparative Evaluation of the Antiproliferative Activity against HepG2 Liver Carcinoma Cells of Plant-Derived Silver Nanoparticles from Basil Extracts with Contrasting Anthocyanin Contents.
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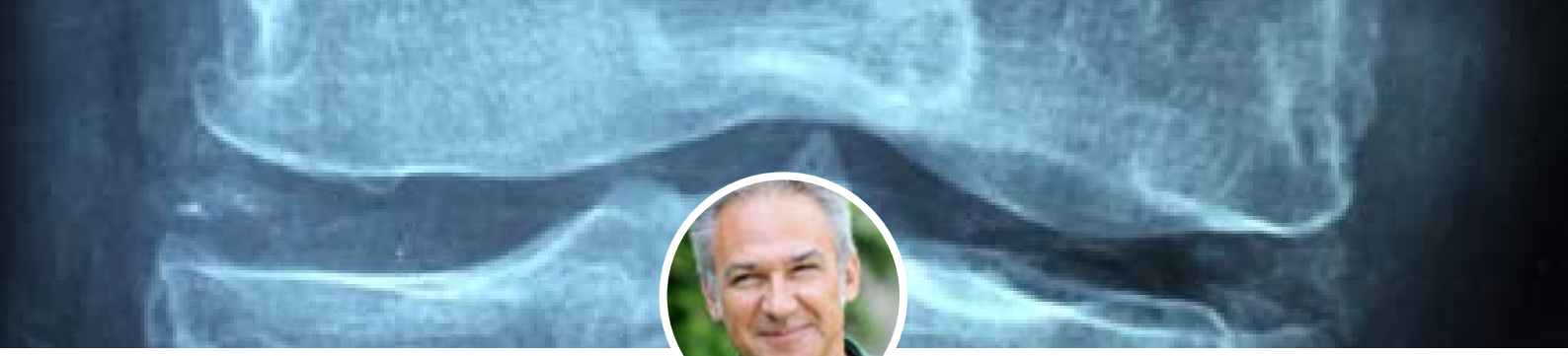


Dr Eric Lespessailles

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Eric Lespessailles M.D, HDR, Ph.D, is the Director of the Multimodal and multiscale Imaging of Bone and Cartilage laboratory (EA 4708-I3MTO) and Vice scientific Director of the Translational Medicine Research Platform (Regional Hospital of Orleans).
He is working as MD in the rheumatology department at Hospital Regional of Orleans in France. He is an Associate Professor and received his Ph.D degree in Sciences and Techniques of Physical Activities and Sports at the University of Orleans. He has qualified as an associate professor in Physiology.

KNEE OSTEOARTHRITIS PREDICTIVE IMAGING CONSORTIUM

Thanks to the large amount of studies, it is now established that imaging markers have the potential to provide predictive models for knee osteoarthritis. The major issue with the rich literature is the lack of a consensus about a predictive model. Nevertheless, it also has been shown that several algorithms might provide comparable results when applied following common guidelines.

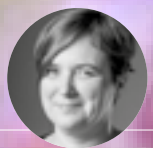
This consortium aims to unify the multiple models that have been developed and published over the past years. The gathering of leading research teams studying the knee osteoarthritis aims to provide both a unified predictive tool but also the guidelines for its establishment and the physiologic explanation of its components.
The first objective of this consortium is to provide a full and clear state of the art in the KOA predictive imaging area. However, contrary to what is casually done, the aim is to apply every one of the previous methodologies on a unified database, with common case / control definitions and using the native algorithms. This first milestone aims to provide both with:
- A unified and extensively documented test database with identified subjects
- Guidelines for modeling generation and statistical analysis
- A standardised comparison of the existing algorithms / processing pipelines

The second objective is to melt the knowledge accumulated by the original review / comparison into a single predictive model. Such tool has to be defined not only based on radiographic imaging features, but also according to multi-modal pathology-related knowledge. In addition, such modeling tool variations has to be investigated and reported along with the proper model.
- A predictive model with explicitly documented and correlated features.
- A full analysis of the model variations (based on the input data, feature extraction methodology, algorithm implementation...)

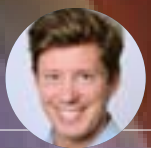
Finally, the ultimate objective is to package the consensus model into an open-access front-ended software module. This part would be the achievement of the consortium, providing to both clinicians, scientists and pharmaceutical industries a concrete reference tool for KOA prediction.

The consortium group already met twice in 2019 in June and November to pursue its mission and to work on the preparation of a proposal to ANR-PRCE - AAPG2020 for a project entitled "MIMOSA" (Machine learnIng and Multimodal imaging for knee OSteoArthritis prediction).

PARTNERS



Prof. Ilse Jonkers
Catholic University of Leuven - BL



Dr Richard Ljuhar
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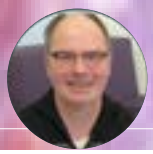
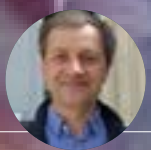


Dr John Lynch
University of California San Francisco - US



Dr Pawel Podsiadlo
Curtin University - AU

Dr Simo Saarakkala
University of Oulu - FI

Dr Eric Robert

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | **ARD 2020 COSMÉTOSCIENCES**

Eric ROBERT is a CNRS senior Scientist at GREMI laboratory, Orléans, France. He has been involved in the development, diagnostics and applications of gas discharge plasmas for light source, micro electronics, X-rays diagnostics, and from ten years in the biomedical technologies. His recent publications concern the physics of plasma jets, the antitumour action of atmospheric pressure cold plasma jets, the combination of plasma treatment with electrochemotherapy, the use of plasmas for skin treatment in anti-aging strategies. He is assistant director of the GREMI laboratory, in charge of the «plasma for biomedical applications» team, and director of the French network «HAPPYBIO» gathering fourty teams connected with the researches on the use of plasmas, pulsed electric field and dynamic phototherapy for biology. He is a board member of the International Society for Plasma Medicine and of the International Plasma Chemistry Society. He was the awardee of the Cosmetic Victories in 2017 for the development of cold plasma technology for cosmetics.

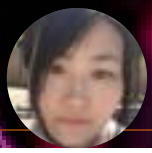
PLASMA COSMETIC CONSORTIUM

The "Plasma Cosmetic Consortium" (PCC) consits in an interdisciplinary team gathering plasma physicists, skin biologists, chemical and biomolecular engineers, pharmacists, electronicians and pulse power engineers all previously involved in "Plasma Medicine". Plasma medicine targets the development of innovative therapeutics for challenging diseases where gas discharges have recently shown to offer tremendous opportunities alone or in combination with more conventional treatments.

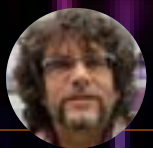
The main objective of the PCC is to assess the potentialities of cold plama technology, i.e gas discharges in ambient air at atmospheric pressure and at temperature lower than 40°C, for cosmetic industry.
One first challenge was to have a clear vision of the very broad needs and market of cosmetics industry, ranging from skin/nails/hair care, cosmetic products extraction/formulation and packaging. Then the aim was to translate the achievements from Plasma Medicine (specially from plasma dermatology) and plasma technology to Cosmetics. Another objective is to reach safe, non toxic plasma approach offering a new physical vector (such as ultrason, light, mechanical stimulation) for skin care. In this perspective, dedicated plasma applicators, meeting consumers demand, skin tissue models allowing the evaluation of plasma application for skin care (of course banning animal testing), and innovative plasma-assisted production of cosmetic products and packaging have to be addressed. The PCC consortium was formed to answer the all constraints and taking into account all positive assets: the French industrial leadership, the unique status of the Centre Val De Loire region, the Cosmetic Valley network, and the worldwide and continuously increasing market. PPC is working on establishing an international conference focusing on the science and technology of plasma for cosmetics, initiating a new branch of cold plasma technology for biomedical/biological applications and building up and strengthening an international community focused on research and innovation for sustainable, environmentally and user-friendly cosmetic industry.

So far, the international consortium was shaped, met two times and experienced numbers of exchanges to define the list of topics correlated with Plasma Cosmetics, organized the First International Meeting on Plasma Cosmetic Science (IMPCS-1) in Orleans in November 2019, initiated the writing of an opinion paper on "opportunities for plasma-inspired innovation in cosmetic biotechnology", reached a first consensus on the definition of the "Plasma Cosmetic Science" asside other plasma aesthetics approaches based on "hot plasmas" or laser tools, and launched the organisation of IMPCS-2 in Japan in 2021.

PARTNERS



Prof. Ihn Han
Kwang Woon University - KR



Prof. Vittorio Colombo
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Prof. David B. Graves
University of California Berkeley - US

Dr Catherine Grillon
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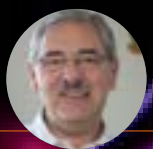
Dr Jun-Seok Oh
Osaka City University - JP



Dr Jean-Michel Pouvesle
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Dr Endre Szili
University of South Australia in Adélaïde - AU

Prof. Thomas Von Woedtke
Leibniz Institute for Plasma Science and Technology - DE

Dr Sébastien Roger

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Dr S. Roger is Associate Professor in Physiology at the University of Tours and a nominated member of the University Institute of France (IUF).
His research is performed in the "Transplantation, Immunology, Inflammation" lab, where he studies the involvement of ion channels and transporters in the invasive properties of carcinoma cells and the metastatic progression of tumours.

His research is aimed at exploring new therapeutic opportunities for the prevention of cancer progression. He was awarded the Prize « Ruban Rose Avenir » in 2017. S. Roger serves as an associate editor in Scientific Reports (Nature Publishing Group), Cancer cell International (BMC, Springer Nature), Frontiers in Pharmacology and Frontiers in Cellular Biochemistry.

He is co-responsible for the "Physiopathologies" axis at the Doctoral School "Health, Biological Science and Chemistry" (ED549, Tours-Orléans), and responsible for the Master "Biology and Health" at the University of Tours.

PHARMACOLOGICAL AND NUTRITIONAL TARGETING VOLTAGE-GATED SODIUM CHANNELS IN THE TREATMENT OF EPITHELIAL CANCERS

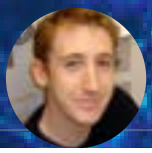
The primary objective of this consortium is to create a solid scientific network between internationally recognized researchers and clinicians, with different and complementary expertise and approaches, in order to develop collaborative strategies for:
1) Understanding the molecular and cellular mechanisms by which NaV channels promote cancer progression by controlling cell invasiveness and metastases development.
2) Identifying NaV channels and associated signaling pathways as cancer markers and prognostic factors.
3) Assessing the possibility that NaV channels could serve as new pharmacological targets for anticancer treatments and for reducing cancer-associated pain.

This consortium represents the unique opportunity to gather, in the Centre-Val de Loire region, specialists of NaV channels, in different biological systems, with researchers in cancer cell biology and electrophysiology, medicinal chemists, anesthesiologists, clinicians, surgeons, in order to develop new strategies to target epithelial cancers and associated pain. Ambitions of this consortium are first to generate a solid scientific and clinical international network specifically addressing the "involvement of Ion channels in the cancer disease".

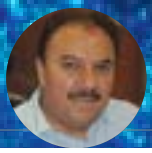
It is expected that this collaborative work will provide critical preliminary results for original research articles, reviews, patents and will support applications to European/international grants, benefit to the training of master's and PhD students and result in the generation high quality researchers with an international scientific network and lead to the organisation of international scientific meetings on Sodium Channel in Physiopathology. So far, partners of this consortium met three weeks in Tours: 19-23 February 2018, 02-06 July 2018 , 18-22 February 2019 and 04-08 November 2019.

To date, scientific presentations have been performed, partners applied to a Medical Research Council (UK) call for Cancer Research and Global Health Initiative, invited new potential international partners (from Spain) and specialists of animal models of cancer and dedicated imaging, initiated collaborative work that already led to the publication of one original research article (Dutta S. et al., Bioorg Med Chem. 2018 May 15;26(9):2428-2436).

PARTNERS



Dr William Brackenbury
University of York - UK



Dr Juan-Carlos Gomora
National Autonomous University of Mexico - MX

Prof. Timothy G. Hales
University of Dundee - UK

Prof. Sadanandan Velu
University of Alabama in Birmingham - USA

AROUND THE PROJECT

Oral communications

- **S. ROGER** - iPSCs: From Disease Models to Mini-Organs, Tours, France. "Role of ion channels in cancer cell invasiveness, mammary tumour growth and metastatic progression" (29 January 2019)

- **S. ROGER** - UTL - Université du temps libre, Université de Tours: «Electricité cellulaire et développement des cancers : vers de nouvelles stratégies de traitements » (05 Feb 2019)

- **S. ROGER**: Declics 2019 – Dialogues entre chercheurs et Lycéens pour les intéresser à la Construction des Savoirs (04 Dec 2019) : « La recherche biomédicale, exemple du projet sur l'électricité cellulaire dans l'invasion cancéreuse et le développement des métastases ».

- O LOPEZ-CHARCAS, S Dutta, W Brouillette, **S Roger** and S E. Velu Biophysical characterization of new small-molecule blockers of nNaV1.5 channels expressed in breast cancer cells. 30th Ion channel meeting. Sètes, FR (8-11 Sept 2019)

Scientific publications

- **ROGER S.** Na+ /H+ exchanger type-1: a shepherd for cellular transhumance. J Physiol. 2019 Feb;597(3):661-662.

- AUZOUX J, BOSCHETTI G, ANON B, AUBOURG A, GAULET M, POISSON L, BESSON P, LECOMTE T, **ROGER S**, PICON L, NANCEY S, MOUSSATA D, FLOURIE B. Usefulness of confocal laser endomicroscopy for predicting postoperative recurrence in patients with Crohn's disease: a pilot study. Gastrointest Endosc. 2019 Jul;90(1):151-157.

- GRADEK F., LOPEZ-CHARCAS O., CHADET S., POISSON L., OULDAMER L., GOUPILLE C., JOURDAN M.-L., CHEVALIER S., MOUSSATA D., BESSON P. & **ROGER S.** Sodium channel NaV1.5 controls epithelial-to-mesenchymal transition and invasiveness in breast cancer cells through its regulation by the salt-inducible kinase-1. Scientific reports. 2019 Dec 9;9(1):18652.

Posters

- Lucile Poisson, Osbaldo Lopez Charcas, Widad Lahlou, Adrien Petereau, Emiliane Taillebois, Adélaïde Doray, Mehdi Ouaissi, **Sébastien Roger,** Pierre Besson and Driffa Moussata. Expression of pore-forming and auxiliary subunits of voltage-gated sodium channels (NaV) in colorectal cancer, roles in pH regulation and invasive properties. 30th Ion channel meeting. Sètes, FR (8-11 Sept 2019)

- Adélaïde Doray, Lucie Brisson, Stéphanie Chadet, Lucile Poisson, Osbaldo Lopez Charcas, Caroline Goupille, Lobna Ouldamer, Christophe Baron, Pierre Besson, **Sébastien Roger**. The role of the auxiliary NaVβ4 subunit in maintaining epithelial phenotype. 30th Ion channel meeting. Sètes, FR (8-11 Sept 2019).

- Adélaïde Doray, Lucie Brisson, Stéphanie Chadet, Lucile Poisson, Osbaldo Lopez Charcas, Caroline Goupille, Lobna Ouldamer, Christophe Baron, Pierre Besson, **Sébastien Roger**. The role of the auxiliary NaVβ4 subunit in maintaining epithelial phenotype. 32nd Colloque Biotechnocentre, FR (10-11 Oct 2019). Best poster award.

- Adélaïde Doray, Lucie Brisson, Stéphanie Chadet, Lucile Poisson, Osbaldo Lopez Charcas, Caroline Goupille, Lobna Ouldamer, Christophe Baron, Pierre Besson, **Sébastien Roger**. The role of the auxiliary NaVβ4 subunit in maintaining epithelial phenotype. Journée recherche Biomédicale 2019, Facultés de médecine de Tours et d'Angers (13 Dec 2019).

3

EARTH, ECOLOGY & ENVIRONMENT SCIENCES

HOST LABORATORIES IN EARTH ECOLOGY & ENVIRONMENT SCIENCES

BIOLOGIE INTÉGRÉE POUR LA VALORISATION DE LA DIVERSITÉ DES ARBRES ET DE LA FORÊT (BioForA)
UMR 0588 - CENTRE INRAE VAL DE LOIRE, ONF

The UMR 0588 BioForA (ex-AGPF) is an INRAE Research Unit belonging to INRAE Val de Loire and located near the Orléans University campus. BioForA depends on the INRAE EFPA department (Ecologie des Forêts, des Prairies et des milieux Aquatiques), which coordinates environmental studies carried out on forests, grassland and fresh waters. BioForA brings together specific skills in breeding, genetics, genomics, physiology and wood sciences applied to forest trees. BioForA develops integrative biological approaches to produce knowledge on the genetic determinism of complex traits involved in tree development (phenology, growth, wood properties) and on the mechanisms of tree adaptation to environmental constraints, such as resistances to pathogens, climate, including, through collaborations, resistance to drought. In BioForA, the breeding programs developed on different forest tree species (poplar, Douglas-fir, larch, ash, Scots pine and wild cherry) rely on innovative strategies for the selection and dissemination of genetic gains. In addition, BioForA scientists assess and manage forest tree genetic diversity to define the most effective strategies for combining short-term adaptation towards environmental and economic challenges and preserving long-term conservation of the genetic resources. Therefore, the research leads to a variety of scientific productions ranging from scientific papers to new forest varieties.

UNITÉS ISOTOPES - BRGM

The BRGM is a public institution, created in 1959, acting as French Geological Survey since 1968. In addition to contributing to the advancement of fundamental knowledge in the field of earth sciences and resources management, its research activities aim to provide support for public policies and decision making, and also to contribute the development of innovative technologies in public-private partnership. With a staff of 1050, BRGM combines the experience and skills of specialists in the following fields: earth modelling, management of water and mineral resources, natural hazards, industrial environment and processing procedures, energy (geothermics – underground storage), environmental metrology and environmental economics.

HOST LABORATORIES IN EARTH ECOLOGY & ENVIRONMENT SCIENCES

CITÉS, TERITOIRES, ENVIRONNEMENT, ET SOCIETÉS (CITERES)
UMR 7324 - UNIVERSITÉ DE TOURS, CNRS

CITERES was created in 2004 with a focus on cities and territories, today more than 100 permanent researchers, ca. 80 PhD students and 20 other staff contribute to four study groups. Its objective is analysis of the spatial and territorial dynamics and of social groups. CITERES' four principal fields are urban research, environmental research, and studies of territories and of contemporary social dynamics, including archeology. The research includes exploring the transformation of natural environments and human impact on the organisation of space, and the scientific baselines for sustainable management and policies for urban and landscape development. 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 part of the Mediterranean. The work group on environmental dynamics (DATE) to which the coordinators of the Consortium belong, works i.a. on the restoration and management of rivers.

INSTITUT DE COMBUSTION AÉROTHERMIQUE RÉACTIVITÉ ET ENVIRONNEMENT (ICARE)
UPR 3021 - CNRS

ICARE was founded on January 1st, 2007. It is a laboratory fully funded and managed by CNRS. It depends on the Institute for Engineering and Systems Sciences (INSIS). It is the result of the merger of two laboratories: the "Laboratoire d'Aérothermique" and the "Laboratoire de Combustion et Systèmes Réactifs". Today, ICARE is a major player in the field of reactive systems, with leading experimental facilities, at national and even global level. The main areas of research concern the chemical transformation of energy, the environment, propulsion and space. The laboratory develops four main research themes: - Chemical kinetics of combustion and reactive systems - Dynamics of combustion and reactive systems - Atmospheric reactivity - Space propulsion and high speed flows.

UNITÉ INFOSOL - CENTRE NATIONAL DE RESSOURCES SUR LES SOLS - US 1106 - CENTRE INRAE VAL DE LOIRE

The general mission of the INRAE InfoSol unit is to set up and manage national information systems on soils, their spatial distribution, their properties and the evolution of their qualities. The unit carries out or coordinates the acquisition of the necessary data and ensures quality control. It creates and feeds the databases for archiving and processing the information. It ensures access of applicants in compliance with the rules of deontology and the agreements signed with the partners of the programmes it carries out. It contributes to their dissemination and development by ensuring in particular the linkage with the knowledge bases on soils and the thematic exploitation tools produced by the Institute's research. The unit manages a national conservatory of soil samples. The unit's activity is carried out within the framework of INRAE's participation in a «Soil» Scientific Interest Grouping that includes the Ministry of Regional Planning and the Environment, the Ministry of Agriculture and Fisheries, ADEME, Ifen and INRAE.

INSTITUT DES SCIENCES DE LA TERRE D'ORLÉANS (ISTO) UMR 7327 - UNIVERSITÉ D'ORLÉANS, CNRS, BRGM

The ISTO is a research laboratory in earth sciences, studying the external envelopes of the Earth (upper mantle, continental crust, atmosphere) and the exchange processes between interfaces. The research subjects in the institute include primary mineral, energy and water resources, volcanic hazard, as well as the environmental impacts of anthropogenic activity affecting the critical zone and aquifers. The ISTO was born in January 2000 from the regrouping of three specific units with some subsequent additions that conformed a joint research unit (UMR), with three bodies to date: University of Orleans (UO), Centre National de Recherches Scientifiques (CNRS) and Bureau de Recherches Géologiques et Minières (BRGM); and it is attached to the Observatory of Sciences of the Universe in the Centre-Val de Loire region (OSUC). The Peatlands Group is part of the Biogeosystems Team, one of the research teams at the institute, which is aimed to understand the physical, chemical and biological processes that govern the functioning and evolution of continental biogeosystems, in order to modelling the interactions between Climate, People, Environment, past, present and future.

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

The laboratory is devoted to the analysis of biological processes using insects as model organisms. This is developed at all levels of biological organization, studying aspects ranging from sub-cellular signaling to ecosystemic properties. Since its founding 50 years ago, work at the IRBI has been characterised by an integrative approach in which methods from multiple disciplines are applied to tackle study targets. The scientific staff of the institute includes specialists in molecular biology, chemistry, biochemistry, physiology, behaviour, biophysics, mathematics, ecology and evolutionary biology, as well as technicians whose specific skills support projects in these various fields. This integrative approach is mainly oriented towards the understanding of interactions between insects and their environment, both for its biotic and abiotic components. While the main focus of the institute is on basic research, several projects also address problems through applied research. The latter including sustainable agriculture and the biological control of insect pests; the development of control strategies for pests, invasive species and insect vectors of human disease, and use of basic knowledge towards bioinspired engineering.

Dr Marcelo Gustavo Lorenzo

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Oswaldo Cruz Foundation - BR

In residence at: Insect Biology Research Institute (IRBI) - Tours

Nationality: Argentina

Dates: **May 2018 to May 2019**

Marcelo Lorenzo graduated in Biology at the University of Buenos Aires (1991), then became PhD at the same university (1997). He had postdoctoral experience in CPqRR-FIOCRUZ (1999-2002) and the Swedish Agricultural Univ (2009-2011). He was an Invited professor at University of Tours (May 2016) and since May 2018 has initiated a stay funded by Le Studium Institute for Advanced Studies. Main experience on insect physiology (emphasis on behavioral physiology), acting on topics such as behavior, pheromones, functional genomics, triatomines, development of baits and traps. 60 papers published on insect neuroethology. Expert ad hoc for CNPq, Le Studium, CONICET, FAPEMIG, FAPESP and other international institutions. Editorial board member for PLOS ONE, Frontiers in Ecology and Evolution and Neotropical Entomology. Recently elected Vice-President of Latin American Association of Chemical Ecology.

Prof. Claudio Lazzari

Host scientist

Claudio Lazzari has obtained his Master degree and PhD in Biological Sciences at the Univ. of Buenos Aires (Argentina). He specialised in Biocybernetics and neuroethology at the University of Tübingen in Germany. After having occupied positions at the University of Buenos Aires and CONICET (Argentina), C. Lazzari moved to France in 2003 as a full professor at the Univ. Tours, keeping strong collaborative bonds with Argentinean and Brazilian laboratories. He is interested in the behavioural physiology of insects, in particular disease vectors as mosquitoes and kissing-bugs. His research focuses on the adaptations to the haematophagous life, using an integrative approach. He has been distinguished with the RAICES award to scientific collaboration by the Argentinean Ministry of Science, and named Honorary Professor by the University of Buenos Aires and Corresponding Fellow by the National Research Council of Argentina.

GENOMICS OF LEARNING AND MEMORY IN DISEASE VECTOR INSECTS

Our project focused on the following goals and objectives:
Goals:

1. Understanding the underlying mechanisms to vector behaviour;
2. Unravelling the molecular and genetic bases of learning and memory in vectors.

Specific objectives:

1. determining whether bug learning through the PER protocol depends in a form of protein-dependent memory formation (LTM);
2. characterizing changes in expression profiles of known memory-related genes in the brain of R. prolixus exposed to a learning protocol, as compared to naïve ones;
3. and identifying a novel set of genes in the brain of R. prolixus whose expression shows clusterisation with the memory-related genes above.

We have been able to set up adequate experimental conditions, biological bioessays and molecular protocols for further study.

Experimental procedures have been evaluated through preliminary trials to allow adjusting our protocol for the transcriptome study (e.g., RNA extraction and bug learning protocols). Necessary reagents and small equipment have been ordered and some have been already incorporated in our stock.

The development of drug injection protocols has been initiated for the remaining experimental approach. In parallel, we have initiated experiments to uncover the molecular bases of heat perception in triatomine bugs.

This experiment is intended to determine which receptor proteins are necessary for the detection of infrared radiation emitted by hosts, which is the key stimulus utilized for the learning protocols used in the main project.

These assays will require the down-regulation of target gene expression (with three independent genes called TRPA1, inactive and waterwitch) through the injection of specific dsRNA (a methodology named RNA interference).

Injected insects will then be used for testing their ability to respond to thermal stimuli in comparison to intact bugs than have not been injected or bugs injected with dsRNA for a mammal gene not found in insects (mock control).

NEW AVENUES FOR THE BEHAVIORAL MANIPULATION OF DISEASE VECTORS

LE STUDIUM CONFERENCES

The objectives were to promote scientific exchanges between leading scientists in the field of vector arthropod behaviour. It was a very successful conference that gathered more than 60 scientists from 10 different countries. Talks and posters included many top-quality studies about diverse topics involving the behavior of mosquitoes, kissing-bugs and other vector arthropods. One relevant outcome is the potential publication of a book on the sensory ecology of disease vectors including contributions by several participants and other top-scientists in the field. The book is scheduled for the end of 2021.

There were 22 talks and many posters presented during the conference. Talks were given exclusively by invited speakers that covered the many aspects being studied in the field.

BIOLOGIE D'UN ENVAHISSEUR : LE MOUSTIQUE TIGRE AEDES ALBOPICTUS

LE STUDIUM LECTURES

Dr Guillaume Lacour, from Altopictus & Pasteur Institute in Guyane gave a thorough presentation of the tiger mosquitos Aedes from its origin to recent expension in Europe.

Native to the forests of Southeast Asia, the tiger mosquito Aedes albopictus has recently expanded its global range at a rate unprecedented for a mosquito species. Aedes albopictus settled on the French Mediterranean coast in 2004 and since then has continued to expand throughout France, establishing itself in Centre-Val de Loire in 2017.

The spread of this species is creating a new health problem in Europe, as the tiger mosquito is capable of transmitting arboviruses normally confined to tropical regions. Aedes albopictus is responsible for the sporadic circulation of dengue in Europe and for several outbreaks of chikungunya in Italy and France since 2007, with more than 600 human cases recorded.

The tiger mosquito is closely linked to humans, who provide it with food and shelter; this biting relationship generates a nuisance that is often unheard of in peri-urban areas, with real economic and societal consequences.The bio-ecology of the tiger mosquito and its adaptive success in the era of globalisation and global warming conducted to a huge impact at the community and individual levels.

AROUND THE PROJECT:

Oral communications

- Le Studium Thursday, Orleans, France. On a neglected insect-borne disease, its vectors and the rational control of parasite transmission. January 2019.
- International Congress of Invertebrate Neuropeptides, Campeche, Mexico. Neuropeptide synthesis in antennae: gene expression profiles emerging from insect phylogeny. February 2019. Presenter: **Dr Lorenzo**.
- MIVEGEC-IRD, Montpellier, France. Transcriptomic correlates of behavioral state-dependency. April, 2019. Presenter: **Dr Lorenzo**.
- 8- Vector behavioural Plasticity: a dimension needing attention, Le Studium Conference "New avenues on the Behavioural manipulation of vector behaviour". Tours, May 2019. Presenter: Prof. Lazzari.

Scientific publications

- LATORRE-ESTIVALIS, JOSE MANUEL ; **Lorenzo**, Marcelo G . Molecular bases of sensory processes in kissing bugs, vectors of Chagas disease. Current Opinion in Insect Science, v. 34, p. 80-84, 2019.
- FERREIRA, R.A. ; GUARNERI, A.A. ; **LORENZO**, M.G. Activity and shelter-related behaviour in Rhodnius prolixus: The role of host odours. Acta Tropica, v. 196, p. 150-154, 2019.
- Lazzari, C.R. and Cohuet A. Vectors and medical and veterinary entomology: An integrative view. Current Opinion in Insect Science, 34, iii-iv. 2019.
- Lazzari, C.R. The thermal sense of blood-sucking insects: why physics matters. Current Opinion in Insect Science, 34, 112-116. 2019.

Dr Max McGillen

LE STUDIUM Research Fellow
ARD 2020 PIVOTS Programme

From:University of Bristol - UK

In residence at: The Institute of Combustion Aerothermal Reactivity and Environment (ICARE) - Orléans

Nationality: British

Dates: **September 2018 to December 2018**
April 2019 to September 2019

Dr Max McGillen has worked in several laboratories in the UK, and has earned international experience in the USA, Ireland and France. He has worked in a variety of areas including laboratory measurements, field measurements and structure activity relationships. This has resulted in a broad understanding of atmospheric chemistry. Max has been the recipient of an ESF exchange grant, a Marie Skłodowska Curie Research Fellowship, and is now enjoying his status as a Le Studium Fellow. He is also an active member of an international expert panel on the evaluation of structure-activity relationships, and is currently leading their efforts to compile and review an extensive atmospheric kinetic database;

Dr Abdelwahid Mellouki

Host scientist

Dr Abdelwahid Mellouki's undergraduate and graduate studies were conducted in the Universities of Tours, Orleans and Paris 7 (France). He spent two years as a Research Associate at the National Oceanic and Atmospheric Administration's Aeronomy Laboratory (Boulder-Colorado). His main research fields are Chemical Kinetics, Atmospheric Chemistry, Air Pollution and Climate change. He joined the CNRS in 1992, where he is currently a Research Director at ICARE in Orléans (France), leading the Atmospheric Reactivity Group. He has been nominated National Distinguished Professor at Shandong University (China) and Guest Professor at the Chinese Academy of Science (CAS/ RCEES-Beijing) and Fudan University (Shanghai). His research over focus on many aspects of atmospheric chemistry, including the study of the atmospheric oxidation mechanisms of anthropogenic and biogenic carbon-containing species and halogen chemistry. He is author or coauthor of over 200 scientific publications/chapters related to atmospheric chemistry.

EXPERIMENTAL MEASUREMENTS OF ATMOSPHERIC CHEMICAL REACTIONS

The goal of this project is to obtain accurate and precise data on the rates and products associated with chemical reactions occurring in the atmosphere, using a wide variety of measurement techniques available at ICARE. Some of these measurements are challenging and the fellow will be required to utilize his experience to try to address long-standing uncertainties within atmospheric chemistry. He will also helping to develop experimental protocols and techniques at the host laboratory.

Achievements so far: The fellow has been focusing on the reaction of sulphur dioxide with the OH radical. This is a very important reaction in atmosphere, since it leads to the formation of sulphuric acid, which is of crucial importance to aerosol formation, and therefore has a major effect in terms of air pollution and climate change. However, there remain some key uncertainties in this reaction rate, primarily related to the effect of pressure on this reaction. To begin with, a thorough survey of the literature regarding this reaction was performed, and the gaps in the knowledge were assessed. Accordingly the fellow has conducted a series of careful measurements in the presence of a variety of bath gases (helium, nitrogen and argon) using the pulsed laser photolysis–laser induced fluorescence (PLP-LIF) technique. The maximum pressure available to the PLP-LIF technique is ~400 Torr (below atmospheric pressure), and therefore to complement this technique, a series of simulation chamber measurements have been made in the presence of nitrogen, oxygen, argon and air at 760 Torr. By measuring this reaction using different techniques over a wide range of conditions, we have made definitive progress regarding understanding the pressure dependence of this reaction. This allows us to compare with previous measurements, and to determine, which, if any, are accurate. It is expected that this work will result in a publication that will be of interest to the atmospheric chemical community. The fellow has also taken the responsibility of instructing a PhD student, Ms. Hajar Elothmani, in atmospheric chemistry and the techniques involved in making accurate gas-phase kinetic measurements. Dr McGillen has also supervised a project of a post-doctoral appointee, Dr Soukaina Foulal, which investigates the impact of jet-fuel emissions upon air quality. This has led to an ongoing collaboration with Dr Bernard Aumont at the Laboratoire Interuniversitaire des Systèmes Atmosphériques in Paris, which will also be worthy of publication in the future.

Dr McGillen was also able to provide his experience and expertise in a groundbreaking field measurement campaign in the Atlas Mountains in autumn 2019, where the ICARE team led an international effort in making some of the first detailed atmospheric chemical measurements in North Africa.

Dr Juanita Mora-Gómez

LE STUDIUM Research Fellow
ARD 2020 PIVOTS Programme

From: Bangor University - UK

In residence at: Earth Sciences Institute of Orléans (ISTO) - Orléans

Nationality: Colombian

Dates: **April 2019 to September 2020**

Juanita Mora-Gómez is a PhD in Biology. After obtaining her doctoral degree at the University of Girona, Spain in 2014, she was granted with a Marie Skłodowska-Curie Individual Fellowship (MSCA-IF) to develop a research project on peatlands at the School of Natural Sciences in Bangor University, UK. Currently, she is a LE STUDIUM RESEARCH FELLOW working at ISTO (Institut des Sciences de la Terre d'Orléans) in France. Her main research interest focuses on the role of microbes on the organic matter degradation and carbon cycle, and the links to the greenhouse gas emissions. Her experience covers contrasting environments, such as aquatic and terrestrial ecosystems from tropical, temperate, and arctic regions. The fellow is author of more than a dozen of publications, including scientific articles and book chapters, and has participated in several international and European scientific meetings.

Dr Fatima Laggoun

Host scientist

She is an expert on biogeochemistry and functioning of peatlands with more than 20 years of research experience. She has coordinated numerous research projects funding by local and international institutions, has 85 articles in peer-reviewed journals and ca. 125 conference communications. Former Co-Head of the ISTO, she is currently Scientific Head Deputy of CNRS – INSU, France. She has an outstanding academic record, supervising over 16 PhD theses, 4 post-docs and ca. 25 Masters during her career.

Dr Sébastien Gogo

Host scientist

He is PhD in Environmental Sciences from Oxford Brookes University. He is a researcher at ISTO and coordinates the French Peatland Observatory System. He has a broad experience in the study of the peatland responses to global change at different scales, including laboratory and in situ experimentations, and ecosystem-wide observations, and part of his research is heading towards ecosystems restoration. He has more than 30 peer-reviewed scientific publications and numerous participations in national and international scientific conferences.

ROLE OF MICROORGANISMS IN THE CARBON CYCLING OF PEATLANDS

Peatlands are strategic ecosystems in the global carbon cycle as they keep 1/3 of the carbon stored in the soil. Carbon cycling in peatlands is limited by a slowed microbial degradation of dead plant organic matter (POM) due to constrained environmental conditions, e.g. low pH and anoxic conditions. In the soil, POM's polymers are degraded by Extracellular Enzymes Activities (EEA) produced by microorganisms, eventually resulting in the emission of CH_4 and CO_2 to the atmosphere. Environmental variations, both natural or anthropogenic, may affect POM processing by micro-organisms and in consequence the total carbon cycle and gas emissions. Globally, there are still many gaps in our knowledge of the mechanisms behind microbial carbon cycling and filling them is essential to propose mitigation strategies to solve urgent environmental issues, such as the ongoing climate change. This research project aims to improve our understanding of those mechanisms in French peatlands and support an existing research project in the laboratory (GHG Exchange between Soils and the Atmosphere in peatland - PESAt) in the framework of the ARD 2020 PIVOTS Programme. The objectives and achievements so far are explained below:

1. To set up the experimental protocol for measuring EEA in peat soil and pore water. EEA protocol is already set up in the host laboratory. Protocol development included from acquisition of equipment and consumables (e.g. a plate reader) to standardisation of EEA measures (substrate concentration and incubation time settings).
2. To evaluate the effect of temperature increase on microbial metabolism (EEA) of peat soil. The fellow is collaborating with a PhD student in a mesocosm experiment where some peat soil cores are exposed to a warming treatment. EEA in pore water are measured every two months, and peat soil EEA will be assessed at the end of the experiment (autumn 2020).
3. To study the links between microbial metabolism (EEA) and CO_2 production at different soil depths in the La Guette peatland. EEA in soil and pore water are measured every two months during an annual cycle in two depth profiles installed in the La Guette peatland, together with continue recording of CO_2 production and emission (Fig. 1).

***Figure 1**. General view of the experimental setting for studying a depth profile in the La Guette Peatland. Holes were filled after CO_2 probes and rhyzons were installed.*

4. Additionally, the Fellow is conducting a research project on the effect of microplastics on microbial carbon cycle in peatlands, in collaboration with researchers from the ISTO, Bangor University (UK) and Yugra University (Russia), and she conducted a fieldwork trip to Siberia in Sep 2019 (Fig. 2).

***Figure 2.** General view of a peatland. Fieldwork conducted in Siberia in September 2019.*

Prof. Akkihebbal Ravishankara

LE STUDIUM Research Professor
Smart Loire Valley General Programme

From: Colorado State University - US

In residence at: Institute of Combustion Aerothermal Reactivity and Environment (ICARE) - Orléans

Nationality: American

Dates: **June 2017 to July 2017**
May 2018 to July 2018
May 2019 to July 2019

Ravishankara currently is a Professor in the Departments of Chemistry and Atmospheric Science at Colorado State University. He chairs the US National Academy's Board on Atmospheric Science and Climate, serves on the Editorial Board of the Proceedings of the National Academy of Science (USA), and a member of the Science Advisory Panel of the Climate Clean Air Coalition of UNEP. In 2019, Prof. Ravishankara was elected a Foreign Member of the Royal Society (London). Before that he was the Director of the National Oceanic and Atmospheric Administration's Chemical Sciences Division of Earth System Research Laboratory where he served for nearly 30 years in Boulder, CO. Prof. Ravishankara's work relates to stratospheric ozone depletion, climate change, and regional air quality. His measurements in the laboratory and in the atmosphere have contributed to deciphering the ozone layer depletion, including the ozone hole; to quantifying the role of chemically active species on climate; and to advancing understanding of the formation, removal, and properties of pollutants.

Dr Abdelwahid Mellouki

Host scientist

Dr Abdelwahid Mellouki graduated from the Universities of Tours, Orleans and Paris 7 (France). He spent two years as a Research Associate at the National Oceanic and Atmospheric Administration's Aeronomy Laboratory (Boulder-Colorado). Dr Mellouki is currently a Research Director at ICARE in Orleans (France). His research focused on many aspects of atmospheric chemistry, including the studies of the atmospheric oxidation mechanisms of anthropogenic and biogenic carboncontaining species and halogen chemistry. He has conducted a large number of experimental studies on the atmospheric fate of chlorofluorocarbons (CFCs) substitutes, as well as on CH_4 and N_2O which are considered to be important greenhouse gases (GHGs). is an Editor of the Journal of Geophysical Research, the premier journal in this field.

INTERLINKAGES IN THE CHEMISTRIES OF THE TROPOSPHERE AND STRATOSPHERE: IMPACTS OF NITROUS OXIDE ON EARTH SYSTEM

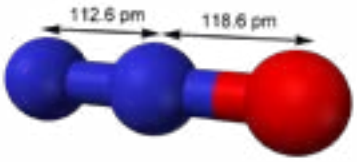
The mission of the project lays out the key needs to better understand the role of nitrous oxide in the Earth's climate and ozone layer depletion, and information needed to make any policy to curb N_2O emissions. The major need is to quantify the budget of nitrous oxides- i.e., quantification of various source, both natural and anthropogenic, and loss processes.

The goal of this proposed work is to provide that information on all the loss processes through a combination of laboratory studies, chemical calculations, field measurements, and atmospheric modeling.

The laboratory studies of the reaction of OH with N_2O were completed and manuscript describing this work was published. Theoretical studies were carried out in collaboration with a scientist from Lille in order to provide an explanation for the non-reactivity of N_2O with the OH radical. It was realized that we should also explore the potential reaction of N_2O with the ubiquitous NO_3 radical.

This work was carried out using a unique experimental system that was assembled in ICARE that utilized the cavity ring-down spectroscopy to detect NO_3 radicals at very low concentrations (part per trillion). Furthermore, quantum calculations were carried out examine the potential reaction of NO_3 with N_2O.

Based on the results from these three studies, we have been able to rule out any significant tropospheric chemical loss of N_2O. This work greatly improves our understanding of the atmospheric lifetime of N_2O.



While the experimental work was ongoing, we also undertook a quantum mechanical theoretical study of the reaction of NO_3 radicals with N_2O. The study showed that the reaction of NO_3 with N_2O is very slow. Further calculations showed that this pathway would not be very viable in Earth's atmosphere.

In addition, with Prof. Valery Catoire, we started a project looking at the vertical profiles of nitrous oxide in the stratosphere. Observations going back to 1970s were collected, quality controlled, and analyzed.

In collaboration with Dr Douglas Kinnison of the National Center for Atmospheric Research at Boulder, CO, USA, the community global model was used to calculate the vertical profiles of N_2O and compare them with observations. This work was done in collaboration with a post-doctoral researcher, Dr Vanessa Brocchi, of Orleans.

Some of the results this study was presented at the European Space Agency symposium in Essen, Germany, in the summer of 2019.

A laboratory study of the reaction of OH radicals with HNO_3, a product of N_2O degradation in the stratosphere, continued at ICARE in collaboration with Drs Yuri Bedjanian and Mellouki.
These experiments were completed, and the results being analyzed. Furthermore, theoretical calculations of this reaction are being planned.

CLIMATE, AIR QUALITY, AND HEALTH: LONG-TERM GOALS AND NEAR-TERM ACTIONS

LE STUDIUM CONFERENCES

The goal of this one-day symposium was to bring together the world-class experts in the area of climate change, air quality, and public health to emphasize the long-term goals and explore the near-term actions that benefit humanity.

Prof. Mario Molina, Nobel Laureate in Chemistry and renowned for his work on stratospheric ozone layer depletion, air quality in developing countries and climate change, presented the keynote address.

Seven other leading figures in this area made presentations. Charles Fournier, Vice-President of the Loire Valley Regional Council also took part in the discussions and introduced the first regional COP Centre-Val de Loire.

A large number of participants took part in the meeting. It involved Academia, industry, policy makers, and citizenry. The outcome of the meeting was the awareness of the key environmental issues facing the world, France, and the region, with a chance to discuss potential solutions.

AROUND THE PROJECT:

Scientific publications

- Thanh Lam Nguyen, Manolis N. Romanias, **A.R. Ravishankara**, Aristotelis M. Zaras, Philippe Dagaut, John F. Stanton, The atmospheric impact of the reaction of N2O with NO3:A theoretical study, Chem. Phys. Lett., 731, 136605, 2019.

- **A.R. Ravishankara**, A-L. Pele, Li Zhou, Y G Ren, A. Zogka, V. Daele, M. Idir, SS Brown, MN Romanais, A. Mellouki, Atmospheric loss of nitrous oxide (N2O) is not influenced by its potential reactions with OH and NO3 radicals, Phys. Chem. Chem. Phys., 21, 24592-24600, 2019.

Dr Dominique Arrouays

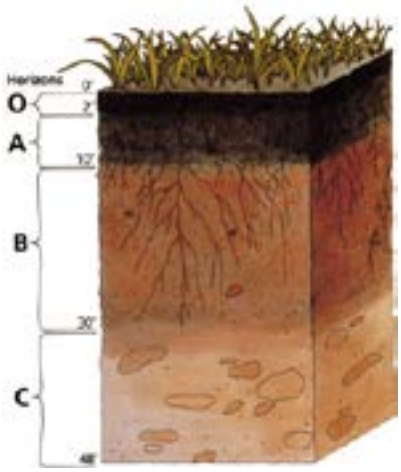
CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Dr Dominique Arrouays is a senior research Engineer at the InfoSol Unit, INRAE, Orléans. He has been the head of the unit from 2000 to 2011. He has been member of the IPCC who received the Nobel Peace Prize in 1997. He has 159 publications in the Web of Science (WoS) and a h-index of 43. He is member of the editorial board of several international scientific journals. He got the gold medal of the French Academy of Agriculture (2014) and was awarded several "best papers" in scientific journals. He is Chairman of the "GlobalSoilMap" Working Group (WG) of the International Union of Soil Sciences (IUSS), which is working on the "bottom-up" approach for generating fine grids of soil properties.

GLADSOILMAP (GLOBAL DIGITAL SOIL MAP)

Soils have critical relevance to global issues, such as food and water security, climate regulation, sustainable energy, desertification and biodiversity protection. All these examples require accurate national soil property information and there is a need to scientific support to develop reliable baseline soil information and pathways for measuring and monitoring soils. Soil sustainable management is a global issue, but effective actions require high-resolution data about soil properties.

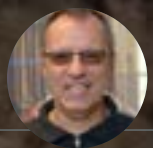


Two projects, GlobalSoilMap and SoilGrids, aim at delivering the first generation of high-resolution soil property grids for the globe, the first one by a bottom-up approach (from country to globe), the latter by top-down (global). The GLobAl Digital SOIL MAP (GLADSOILMAP) consortium brings together world scientific leaders involved in both projects. The consortium aims at developing and transferring methods to improve the prediction accuracy of soil properties and their associated uncertainty, by using legacy soil data and ancillary spatial information. This approach brings together new technologies and methods, existing soil databases and expert knowledge.

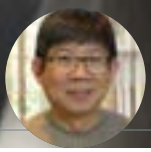
The consortium aims at transferring methods to achieve convergence between top-down and bottom-up approaches, and to generate methods for delivering maps of soil properties. These maps are essential for communities from climate and environmental modeling to decision-making and sustainable resources management at a scale that is relevant to soil management. The consortium will ensure links with the numerous actors in geosciences of the world, and will contribute to improving their skills in digital mapping and their national and international legibility. The consortium involves very experienced soil scientists and younger ones well aware of up to date technologies and methods in DSM. It covers the entire world, which is a guarantee that the results will be largely disseminated and used.

Achievements to date include the first kick-off meeting held in Orléans in November 2019, and a related detailed plan of actions. The website is operational and the first report has been delivered. Three members of the consortium are presently co-editing a special issue of a scientific journal. Many papers have already been submitted to this special issue.

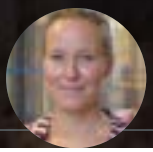
PARTNERS



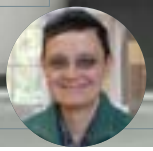
Dr Zamir Libohova
United States Department of Agriculture - Natural Resources Conservation Service - US



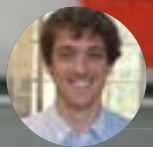
Prof. Budiman Minasny
University of Sydney - AU



Dr Vera Leatitia Mulder
Wageningen University - NL



Dr Laura Poggio
International Soil Reference and Information Centre - World Soil Information - NL



Dr Pierre Roudier
Landcare Research - NZ

AROUND THE PROJECT

Articles in peer-reviewed journals

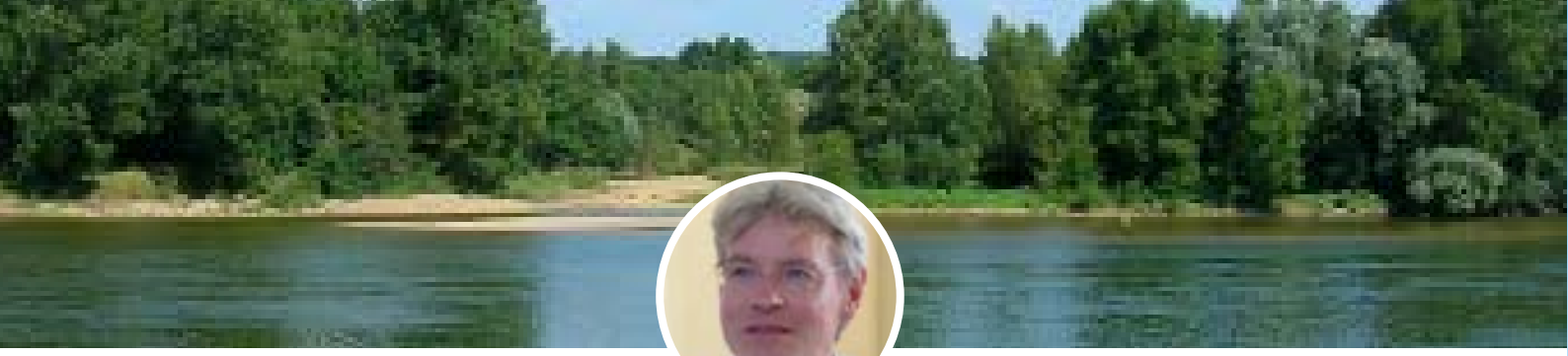
- Dharumarajan S., Kalaiselvi B., Suputhra A., Lalitha M., Hegde R., Singh S.K., Lagacherie P. (2019). Digital soil mapping of key GlobalSoilMap properties in Northern Karnataka Plateau. Geoderma Regional. 20.

- Loiseau, T., Chen, S., Mulder, V.L., Román Dobarco, M., Richer-de-Forges A.C., Lehmann, S., Bourenanne, H., Saby N.P.A., Martin, M.P., Vaudour, E., Gomez, C., Lagacherie, P., **Arrouays D.** (2019). Satellite data integration for soil clay content modelling at a national scale. International Journal of Applied Earth Observation and Geoinformation. Vol. 82.

- Vaudour E., Gomez C., Loiseau T., Baghdadi N., Loubet B., **Arrouays D.**, Ali L., Lagacherie P. (2019). The Impact of Acquisition Date on the Prediction Performance of Topsoil Organic Carbon from Sentinel-2 for Croplands. Remote Sensing. 11 (18), 2143.

Articles in books and international newsletters

- **Arrouays**, D., Libohova, Z., Minasny, B., Mulder, V.L., Poggio, L., Roudier, P. 2020. The consortium GLobAl Digital SOIL MAP (GLADSOILMAP). International Union of Soil Sciences Bulletin. 135, 88-90. https://www.iuss.org/media/iuss-bulletin135_def.pdf



Dr Wolfram Kloppmann

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Dr Wolfram Kloppmann (HDR), task officer at the Laboratory Division of BRGM, head of the Isotope Unit from 2011 to 2017, works in a broad field of environmental issues. His specialties include chemistry and isotope characteristics of deep natural fluids including energy-relevant gases, groundwater, non-conventional water resources, water-rock interactions in aquifers, isotope fingerprinting of water contaminants, but also the identification of the provenance of cultural materials and the degradation of building stones. Most of his research work involved the use of environmental isotopes. He coordinated the BRGM research program on non-conventional water resources and alternative concepts of water management (2006-2011). He was the French coordinator of the 2014-2018 ANR-NSERC Franco-Canadian G-Baseline project on impact assessment in the field of unconventional hydrocarbons.

MULTI-ISOTOPE AND CHEMICAL TRACING FOR UNDERSTANDING THE SOURCES AND FATE OF MACRONUTRIENTS AT THE BASIN SCALE (MUTUAL)

Nitrogen and phosphorous flows induce water quality degradations, which are a major obstacle for reaching the "good qualitative status" of European surface and groundwater bodies aimed by the European Water Framework Directive.

A diverse array of macronutrient sources and a complex network of transport pathways and reactive transformations are evident for both groundwater and surface water receptors, creating a key challenge for the management of natural resources. This consortium gathers experience on nutrient cycling in a variety of hydroclimatic, hydrogeological and land use settings and a large variety of complementary tools in the field of environmental geochemistry.

This will allow merging advanced tracer techniques into a diagnostic toolbox for characterising macronutrient sources and fate in aquatic ecosystems. The project aims on a critical analysis of the current approaches of source and fate identification in contaminated watersheds. The project partners produced a shared database on chemical and isotopic fingerprints of N and P sources in a diversity of catchments worldwide as basis of a common publication and common presentations.

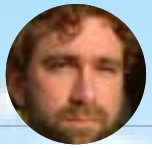
The first meeting from Jan. 16-20, 2017 was dedicated to a critical evaluation of the potential of multi-tracer approaches to identify and quantify nutrient sources and transfer times in groundwater.

The second meeting from Dec. 4-8, 2017 was dedicated to the work on a common conceptual paper on catchments affected by N and P excess: Structure breakdown, contents to be included, in the light of the current literature and the ongoing studies of all project partners.

The third meeting, from June 11-14, 2018 allowed us to advance on a common publication on the effect nitrogen fixation in soil and subsequent re-nitrification on the isotope fingerprints of nitrate.

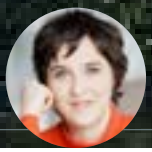
A final workshop organised on June 18, 2019 in Orléans (France) brought together international experts in the field of nutrient cycling and -tracing with regional stakeholders on the theme "N and P cycling in catchments: How can isotopes guide water resources management?".

PARTNERS



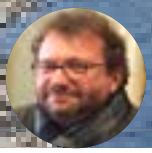
Dr Daren Gooddy
British Geological Survey - UK

Prof. Bernhard Mayer
University of Calgary - CA



Dr Neus Otero
University of Barcelona - ES

Dr Ben Surridge
University of Lancaster - UK



Dr Mathieu Sebilo
Sorbonne University - FR

Dr Dan Lapworth
British Geological Survey - UK

AROUND THE PROJECT

Articles in peer-reviewed journals

- **Kloppmann W.**, Otero N., Mayer B., Sebilo M., Gooddy D. C., Lapworth D., Surridge B., Petelet E., Flehoc C., Baran N. Limitations of the isotopic composition of nitrates as a tracer of their origin. European Geosciences Union General Assembly 2018, Vienna (Austria), 8-13 April, 2018.

- **Kloppmann W**. (2020) Origine et devenir des nitrates : atouts et limites de l'approche isotopique. Séminaire DEPA, 14 February 2020, BRGM, Orléans, France.

Prof. Karl Matthias Wantzen

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

After studying on the Rhine (German Federal Institute of Aquatic Sciences), Karl M. Wantzen worked as fellow at the Max Planck- Society to undertake his PhD on stream ecology, and to coordinate a BMBF-funded project on the Ecology of the largest wetland of the World. 2007 habilitation on biodiversity, functioning and structural dynamics of river- flood plaincorridors. > 100 publications. Since 2010 he has been professor (1st class) at the University of Tours, where he lectures river ecology and management, sustainable development and tropical ecology across different faculties, and researches in the DATE team (Landscape and urban ecology, and management) of CITERES. In 2014 he was awarded the UNESCO Chair on River Culture (Fleuve et Patrimoine, renewed in 2018), and in 2015, "Talent de la Région Centre" acknowledging his scientific and conceptual achievements. Prof. Karl Matthias Wantzen shares the coordination of the project with Prof. Stéphane Rodrigues, sediment geologist at CITERES.

ECOHYDRAULICS AND DAM REMOVAL

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. Under the auspices of the UNESCO Chair "River Culture - Fleuve et Patrimoine" directed by the PI, the consortium gathers scientists from Europe (France, Spain, Italy), Latin and North America (Argentina, USA) to review the state of the art and to develop new scientific approaches for evidence-based policies for the future (facing a current massive trend of dam construction worldwide).

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.

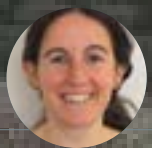
The Spanish-Italian team has monitored a large number (>20) dam removals in the past ten years and that of the USA is well-known for their work on geomorphology, endangered fish habitats and algae biomass in the Upper Colorado River. The Argentinian team has recently provided excellent studies on invertebrate-flow relationships and microplastics. Gathering this expertise from different disciplines and the comparison of a one-site-long-term study with a many-sites-short term study will create an excellent setting to improve our knowledge about physical habitat management in rivers.

So far, three thematic workshops have been completed, focusing on (i) general dam removal trends and sedimentology, (ii) biotic and (iii) toxicological effects (including plastic pollution), a fourth workshop on societal aspects of dam removal is planned for 2020. At the end of each workshop a public events helps to spread the findings and to give value to the results.

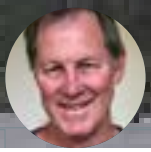
PARTNERS

Dr Simone Bizzi
PolyTech Milano - IT

Dr Martin Blettler
National Council for Scientific and Technical Research - AR



Prof. Askoa Ibisate González de Matauco
University of the Basque Country - ES



Prof. John Pitlick
Colorado State University - US

AROUND THE PROJECT

Oral communications

During the 2019 Consortium workshop, the participants delivered the following talks:

- Beletti, B.: "The Flow Obstacle Atlas of Europe"
- Blettler, M: ": Plastic remobilisation by dam removal and chemical effects".
- Garcia de Leaniz, C. (guest): "The EU-AMBER project"
- Wantzen, K: M.: "Chemical effects of dam sediments – a summary"
- Pitlick, J.: "Chemical effects of dam sediments – USA"
- Ibisate, A.: "Chemical effects of dam sediments in Spain"

Public lectures in the CITERES/LeStudium/RTR MiDi workshop (in french):

- Barbara Belletti: "Effets de pollution des sédiments dans le Rhône"
- Martin Blettler: "Environmental problems due to plastic pollution" (avec traduction en français)
- Karl M. Wantzen: "Compte-Rendu des résultats de l'atélier Dam Removal and toxic memories of sediments"

International Conference contributions (selection):

- Wantzen, Karl M. Global trends in dam construction and dam removal: Annual meetings of the AMBER project 2018 (Le Puy, France), 2019 (Malaga, Spain).
- Pitlick, J.; Bizzi, S.; Schmitt, R. J. P. Modeling the Effects of Reservoir Releases on the Bed Material Sediment Flux of the Colorado River in western Colorado and eastern Utah (AGU Fall Meeting Abstracts)
- Ibisate, Askoa; Ollero, Alfredo; Ballarín, Daniel; Horacio, Jesús; Mora, Daniel; Mesanza, Amaia; Ferrer-Boix, Carles; Acín, Vanesa; Granado, David; Martín-Vide, Juan Pedro Geomorphic monitoring of two dam removals in northern Iberian Peninsula: methodology, results and lessons learned (19th EGU General Assembly, Vienna, Austria)

Scientific publications

- Tangi, M., R. Schmitt, S. Bizzi, and A. Castelletti. 2019. The CASCADE toolbox for analyzing river sediment connectivity and management. Environmental Modelling & Software 119:400-406.

- **Wantzen, K. M.**; Alves, C.B.; Badiane, S.D.; Bala, R. M.; Blettler M. C. M.; Callisto, M.; Cao, Y.; Kolb, M.; Leite, M.F.; Macedo, D.R.; Mahdi, O.; Neves, M.; Peralta, E. M.; Rotgé, V.; Rueda-Delgado, G.; Scharager, A.; Serra-Llobet, A.; Yengué, J. L.; Zingraff-Hamed, A.; Kondolf, G. M. (2019) Urban stream and wetland restoration in the Global South – a DPSIR analysis. Sustainability 2019, 11, 4975 (48pp); doi:10.3390/su11184975, https://www.mdpi.com/2071-1050/11/18/4975

- Blettler, M.C.M., Garello, N., Ginon, L., Abrial, E., Espinola, L.A. & **Wantzen, K.M**. (2019) Massive plastic pollution in a mega-river of a developing country: sediment deposition and ingestion by fish (Prochilodus lineatus). Environmental Pollution, 10.1016/j.envpol.2019.113348

- Blettler, M.C.M. & **Wantzen, K.M**. (2019) Threats Underestimated in Freshwater Plastic Pollution: Mini-Review Water Air Soil Pollut 230: 174. https://doi.org/10.1007/s11270-019-4220-z

- Soler, J., Boisneau, C., Jugé, P., Richard, N., Guerez. Y., Morisseau, L., **Wantzen, K.M**., & Araujo, R. (2019) An unexpected host for the endangered Giant Freshwater Pearl Mussel Margaritifera auricularia (Spengler, 1793) as a tool against the "native species meltdown" effect. Aquatic Conservation: Marine and Freshwater Ecosystems 2019: 1– 13. https://doi.org/10.1002/aqc.3164

Dr Mohamed Azaroual

ARD 2020 PIVOTS PROGRAMME

Earth Sciences Institute of Orléans (ISTO) / University of Orléans, CNRS, French Geological Survey (BRGM) - FR

Prof. Lionel Mercury

ARD 2020 PIVOTS PROGRAMME

Earth Sciences Institute of Orléans (ISTO) / University of Orléans, CNRS, French Geological Survey (BRGM) - FR

KNOWLEDGE'S FRONTIERS IN WATER UNSATURATED HYDROGEOSYSTEMS: INTERFACE DYNAMICS, HETEROGENEITIES & COUPLINGS

LE STUDIUM WORKSHOP

The understanding of the behavior of the Critical Zone (CZ) in response to the global changes requires the integration of geological, geochemical and biological cycles and their couplings at different and relevant time-space scales. The O-ZNS platform (Observatory of the Vadoze Zone (VZ) of the Beauce carbonate aquifer) is a part of the PIVOTS regional program (Innovation Platforms for the valorisation and optimization of environmental technologies: https://plateformes-pivots.eu/) with a main objective directed to the understanding of mass and heat transfer mechanisms and the fate of pollutants in the CZ compartments. The O-ZNS observatory consists of a well prospecting the entire thickness of the VZ up to the water table, with a finite diameter of ~ 4 m and a depth of ~ 20 m. The site is located in the Beauce region, in a heterogeneous carbonaceous formation, with a typical sequence (from top to bottom): ground/cryoturbated limestone / limestone marl / fractured micritic limestone. The well will be equipped with environmental monitoring, soil, and subsoil imaging tools in order to understand reactive transport phenomena and exchanges of mass and heat between phases (water - rock – gas) throughout the continuum «Soil - Unsaturated Zone - Capillary Fringe - Aquifer.

The field acquisitions of long-term environmental data target are crucial to identify the fingerprints of complex and coupled physical, physicochemical and microbiological processes as well as their role in fixation, degradation and / or transfer of pollutants in the VZ. This obviously requires multidisciplinary skills, complementary methods and result joint interpretations as well as renewed theoretical approaches. The development of O-ZNS platform aims to build a large and sustainable partnerships (academic, industrial, state agencies, etc.), at national and international scales, in a collaborative way that guarantees the continuity between the academic research, industrial needs and the academic training of young engineers and researchers.

Beyond the equipment itself, O-ZNS aims also at becoming a place to discuss the scientific issues related to unsaturated geological media. This can be either naturally developed within the CZ compartments, or created by industrial purposes at various depths in the underground for CO_2 and energy vectors storage and extraction of non-wetting energy substances where the active interfaces between phases play a key role in mass and energy exchanges inducing important petrophysical evolutions of targeted reservoirs and geological structures.

4

COMPUTER SCIENCE, MATHEMATICS & MATHEMATICAL PHYSICS

HOST LABORATORIES IN COMPUTER SCIENCE, MATHEMATICS & MATHEMATICAL PHYSICS

INSTITUT DENIS POISSON (IDP)
UNIVERSITÉ D'ORLEANS, UNIVERSITÉ DE TOURS, CNRS

The Institut Denis Poisson (UMR CNRS 7013) includes one hundred permanent professors, assistant professors and CNRS researchers, as well as thirty PhD students and postdoctoral researchers. As the result of a merger in 2018 of two laboratories, the MAPMO in Orléans and the LMPT in Tours, the Institute is bi-localized in the two cities. The activities of Orléans' branch of the Institute (former MAPMO – Mathematics Laboratory, for Mathematics, Analysis, Probability, Modeling, Orléans, created in 1994), are devoted to mathematical analysis, probabilities and mathematical physics with the focus on interactions with other branches of science, both internal and external to mathematics.

PLURIDISCIPLINAIRE DE RECHERCHE EN INGÉNIERIE DES SYSTÈMES, MÉCANIQUE ET ÉNERGÉTIQUE (PRISME)
EA 4229 - UNIVERSITÉ D'ORLÉANS, INSA CENTRE VAL DE LOIRE

PRISME 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 the 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 organised into thematic axes.

Prof. Guoxian Chen

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Wuhan University - CN

In residence at: Institut Denis Poisson (IDP) - Orléans

Nationality: Chinese

Dates: **January 2018 to January 2019**

Prof. Chen is an associate professor in the school of mathematic and statistics in Wuhan University, and a Le Studium/Marie Skłodowska-Curie Research Fellow in the University of Orleans.

He received his bachelor degree from Jishou University in 2001, master degree from Capital Normal University in 2004, and PhD from Peking University in 2008 under the supervision of Prof. Pingwen Zhang and Prof. Huazhong Tang. Then he worked as a Postdoctoral Researcher at Hongkong University of Science and Technology, assistant professor at Wuhan University, Postdoctoral Researcher at RWTH Aachen University.

He works in the area of numerical analysis and scientific computing and computational fluid dynamics. He focus on the numerical simulations of singular conservation laws and related applications, such as shallow water equations with bottom topography, Euler equations with gravitational potential, and the multicomponent flows, etc..

Prof. Magali Ribot

Magali Ribot defended her PhD Thesis on numerical analysis for PDEs in Lyon in 2003.

She became an assistant professor in Nice in 2004 and professor in Orléans in 2015. She is working mainly in the field of numerical analysis for PDEs, modeling for biology and fluid dynamics.

More precisely, she is interested in well-balanced and asymptotic preserving schemes, in mixture models coupled with fluid dynamics equations and in the comparison of models of different types.

She is the co-head of the PDE group in Orléans and she is organizing regularly some workshops and seminars related to mathematics for biology.

NUMERICAL SIMULATION OF SINGULAR CONSERVATION LAWS AND RELATED APPLICATIONS

Our project focused on the following goals:

1. Apply the subcell reconstruction to discretize the new shallow water model;
2. Extend the new model on networks with application to irrigation;
3. Apply the new framework to design some new well-balanced methods to chemotaxis systems or systems with more general potentials;
4. Insert our new algorithm to softwares FullSWOF and SWASHES developed within the MAPMO. This project gives the opportunity to invite colleagues from France and abroad, in particular enhancing the contacts between Orléans and RWTH Aachen University in a first step.

The work carried out in 2019 at IDP resulted in the following achievements:

1. Insertion of the subcell hydrostatic reconstruction method to softwares FullSWOF and SWASHES;
2. Application of the subcell hydrostatic reconstruction method to one-dimensional parabolic-hyperbolic chemotaxis systems. The 1D code was obtained;
3. We designed a scheme for the Euler equations under gravitational fields based on our subcell hydrostatic reconstruction framework. To give a proper definition of the nonconservative product terms due to the gravitational potential, we first separate the singularity to be an infinitely thin layer, on where the potential is smoothed by defining an intermediate potential without disturbing its monotonicity ; and then the physical variables are extended and controlled to be consistent with the Rayleigh-Taylor stability, which contribute the positivity-preserving property to keep the nonnegativity of both gas density and pressure even with vacuum states. By using the hydrostatic equilibrium state variables the well-balanced property is obtained to maintain the steady state even with vacuum fronts. In addition, we proved the full discrete entropy inequality, which preserve the convergence of the solution to the physical solution, with an error term which tends to zero as the mesh size approaches to zero if the potential is Lipschitz continuous. The new scheme is very natural to understand and easy to implement. The numerical experiments demonstrate the scheme's robustness to resolve the nonlinear waves and vacuum fronts;
4. Submission of one paper to SIAM journal on numerical analysis, another paper is preparing and publication of one paper in Nature Materials 2020.

Figure 1. *The generation of lattice deformation in the 2D crystals. Illustration of the generation of lattice deformation in the 2D crystals and the sphere diameter effect in the SDE process*

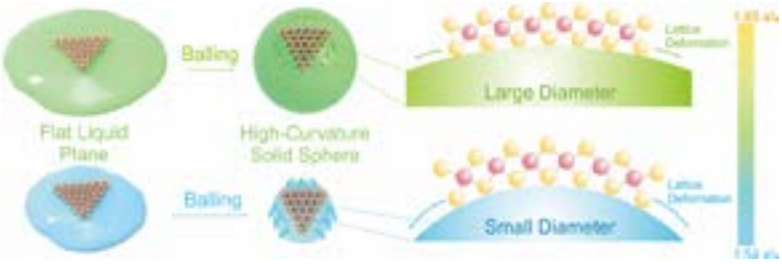
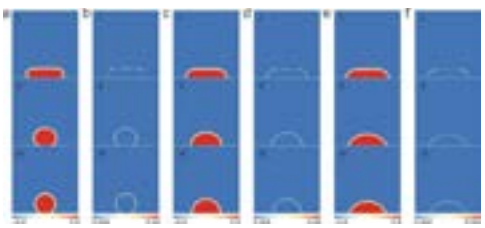


Figure 2*. The simulated reshaping process of liquid phases on a solid surface with (a) poor wettability, (c) normal wettability, and (e) good wettability. (b, d, f) The correspond force field distributions at the liquid-gas interface, respectively.*



Prof. Yiming Chen

LE STUDIUM Research Professor
Smart Loire Valley General Programme

From: Yanshan University - CN

In residence at: PRISME - Bourges

Nationality: Chinese

Dates: **April 2016 to July 2016**
April 2017 to July 2017
April 2018 to July 2018
March 2019 to June 2019

Yiming Chen is 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, Prof. Chen has published more than 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. Prof. Chen has organized two international conferences in 2010 and 2011, respectively.

Prof. 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.

Prof. Driss Boutat

Host scientist

Driss Boutat has been a Full Professor in ENSIB since 2008, which developed into the INSA Centre Val de Loire in 2014. Until now, Prof. Boutat has published more than 110 international journal and international conference articles. Moreover, he is supervisor of 12 PhD students. Prof. 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. From 2017 to 2021, Prof. Boutat is appointed as a foreign expert of high level by the Chinese government. In 2019, Prof. Boutat nominated as Guest Professor by Shenyang Jianzhu University (from 2019 to 2022).

OBSERVER DESIGN FOR DISTRIBUTED-PARAMETER SYSTEMS AND FRACTIONAL ORDER SYSTEMS

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 are 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 Prof. Chen, Prof. 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 Prof. Chen, Prof. Boutat and Dr Liu);
3. Development of efficient numerical algorithm for considered equations, and new robust differentiators using wavelets, etc. (cooperation of Prof. Chen, Prof. 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 Prof. 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 Prof. Chen and Dr Serra).

2019 INTERNATIONAL CONFERENCE ON FRACTIONAL CALCULUS THEORY AND APPLICATIONS (ICFCTA 2019)

LE STUDIUM CONFERENCES

The 2019 International Conference on Fractional Calculus Theory and Applications (ICFCTA 2019) was held in Bourges, France, from April 25 to April 30 at INSA Centre Val de Loire premises. It was cosponsored by the National Institute of Applied Sciences of Centre Val de Loire (France), Yanshan University (China) the Technical Committee on Fractional Order Systems and Control of Chinese Association of Automation. It belonged to the series of workshops called «Fractional Calculus Day» organised by Professor Igor Podlubny together with Professor YangQuan Chen from 2007 in different universities around the world. This conference aimed to provide a platform for researchers in fractional calculus theory and applications to exchange results and advanced technology. During the conference, experts and scholars in related fields and chief editors of well-known magazines will made special reports. More than 40 participants from 11 countries attended the conference (Australia, China, France, Germany, Oman, Poland, Portugal, Saudi Arabia, Slovakia, Ukraine, USA).

5 HUMAN AND SOCIAL SCIENCES

HOST LABORATORIES IN HUMAN AND SOCIAL SCIENCES

CENTRE D'ÉTUDES SUPÉRIEURES DE LA RENAISSANCE (CESR) UMR 7323 - UNIVERSITÉ DE TOURS, 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 of Tours in 1970. Successive agreements in 1983 and 1992 enhanced the institutional links between the CESR and the CNRS. In 1996 the CESR reaffirmed 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 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, SOCIÉTÉS (CITERES) UMR 7324 - UNIVERSITÉ DE TOURS, CNRS

The interdisciplinary research unit (CNRS UMR) CITERES was created in 2004 to strengthen and structure the research capabilities of the University of Tours on the broad topic of "Cities, Territories, Environment and Society", performed by a team of specialists from sociology, geography, anthropology, history, economics, urban planning, and political sciences. Four research teams work on archeology and paleontology of the Loire Basin (LAT), on social-political analysis (COST), on the Arab World and North African Mediterranean (EMAM, and on Environmental and Urban Management (DATE).

INTERACTIONS, TRANSFERTS, RUPTURES ARTISTIQUES ET CULTURELLES (InTRu) - EA 6401 - UNIVERSITE DE TOURS

The InTRu research unit was created in 2008 by the art historians Eric de Chassey, Jean-Baptiste Minnaert, France Nerlich and Pascal Rousseau (Université de 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.

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'Antiquite 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 centers - on late medieval culture, early modern culture, and modern and contemporary culture - each of which is dedicated to 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.

QUALITÉ DE VIE ET SANTÉ PSYCHOLOGIQUE (QUALIPSY)
EE 1901 - UNIVERSITÉ DE TOURS

It is a new research team (an emergent team) led by Prof. Evelyne Fouquereau and Prof. Christian Réveillère and hosted in the faculty of the "Arts and Human Sciences " (Department of Psychology). QualiPsy is a research team focused on quality of life and psychological health at adulthood. It is focused on the analysis of (i) psychological determinants (individual, group, organizational and environmental) and (ii) mechanisms and consequences (individual, group and organizational) of the alteration vs. optimization of the quality of life and psychological health in the adult population, both in general and in specific life contexts (e.g., work, illness, vulnerable situations). Research is carried under occupational psychology, clinical and pathological psychology. It is characterized by the plurality of theoretical and methodological approaches (quantitative, qualitative or quasi-experimental). The goals of most of the studies realized by Qualipsy researchers are to innovate or improve the current intervention systems on human health.

RÉCEPTIONS ET MÉDIATIONS DE LITTÉRATURES ET DE CULTURES ÉTRANGÈRES ET COMPARÉES (RÉMÉLICE)
EA 4709 - UNIVERSITÉ D'ORLÉANS

The RÉMÉLICE laboratory was born as a member of the Federation for the Study of Contemporary Civilizations (FE2C, with the universities of Poitiers, Limoges, La Rochelle, Clermont-Ferrand), as well as of the ALMOREAL Network (universities of Anger, Le Mans and Orléans), which works on cultural exchanges and intersecting views between the Spanish and Spanish-American worlds.
The aim of the RÉMÉLICE laboratory is to bring together teacher-researchers and doctoral students working in the fields of the arts, literature, languages and the human and social sciences in an international perspective, with a particular interest in the study of language-cultures and the notion of cultural transfer. Its members study the English-speaking world, Spain, Latin American countries, Japan, as well as the French-speaking world, often with comparative aims. The laboratory also seeks to overcome disciplinary barriers, national or linguistic, to study the different forms of cultural transfer that exist.

Dr Patrizia Carmassi

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Herzog August Bibliothek - DE

In residence at: POuvoirs, LEttres, Normes (POLEN) - Orléans

Nationality: Italian

Dates: **April 2018 to April 2019**

Dr Patrizia Carmassi studied at the University of Pisa and received a PhD in Medieval History from the University of Münster. In recent years she worked as a researcher at the Herzog August Bibliothek, Wolfenbüttel, and at the Research Center for Medieval and Early modern period of the University of Göttingen. Her research approach is characterized by interdisciplinary methodology, study of original manuscript sources and international networking. She has been curator of manuscript exhibitions in German cultural institutions and has organized lecture series and many international conferences of which she has edited or coedited the volumes of the proceedings. Her main research interests are history of medieval culture, medieval liturgy, Latin philology, text and image relationships, palaeography, codicology, history of libraries and book collection in the medieval and the early modern period.

Prof. Jean-Patrice Boudet

Host scientist

Jean-Patrice Boudet is professor of Medieval History (University of Orléans) since 2004. He heads the "Centre d'Etudes Supérieures sur la Fin du Moyen Âge", the Medievist team at the POLEN laboratory. He is also responsible for the «Sciences of quadrivium» division of the Institut de Recherches et d'Histoire des Textes, UPR 841 of the CNRS. He is an expert on the cultural and political history of the late Middle Ages, especially in astronomy, astrology, divination and magic. He was awarded by the CNRS bronze medal in 1997. His book, Entre science et nigromance. Astrologie, divination et magie dans l'Occident médiéval (XIIe-XVe siècle), Paris, Publications de la Sorbonne, 2006, was awarded by the premier prix Gobert of the Académie des Inscriptions et Belles-Lettres. He is currently pursuing research on Alfonsine astronomy and the relationship between astrology and politics in the Middle Ages and the Renaissance.

QUESTIONS ABOUT TIME IN EARLY MEDIEVAL CULTURE: LITERATURE, THEOLOGY AND SCIENCE

The project further develops recent research about time in the Middle Ages and deals with the different concepts and representations of time in early medieval sources. The research corpus is based on manuscripts preserved mostly in Orléans.

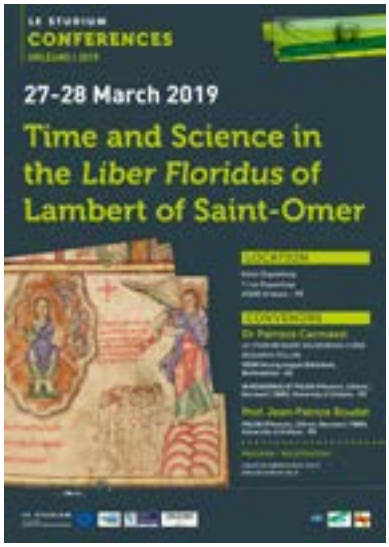
The aim is to investigate this corpus in order to understand which ideas of time were transmitted and how they could probably coexist, function or interact in a specific period (IX-XI c.) in the Benedictine monastery of Fleury. This monastery was famous for keeping the relics of Benedict. Due to the early medieval translation of the relics to Fleury one important aspect of consideration of time was the understanding of the past events in relation with the present and the role of actualization for the constitution of a legitimate identity for the monastic community.

The research during the first period of the fellowship has already shown that not only the historiographic and hagiographic production in the monastery are important for the comprehension of the ideas of time in Fleury, including eternity and the eschatological dimension of time, but also the codicological strategies which were consciously adopted during the medieval book production. Moreover, we observe the coexistence of further traditional systems of theological, natural and liturgical definition and interpretation of time, which were transmitted in the monastery through patristic and liturgical literature, later on also through philosophical texts, already before the time of the well-known computistic studies by Abbo of Fleury. At the level of the personal and common perception of time, the strong normative character exerted by the liturgical practices and the monastic rule, and customary are also to be considered with regard to their impact on the religious community. The observation of the chosen topic (time) across heterogeneous sources can contribute to the reconstruction of the intellectual background of a specific community and to outline challenges, innovations and dynamics in medieval thought. Furthermore, up to now there has been no sufficient attention to the manuscript transmission of contents and their material aspects concerning time in the manuscripts of Fleury; this kind of analysis will enhance the understanding of the techniques of acquisition, discussion and development of knowledge during the Middle Ages.

A second field of investigation about time in the Middle Ages is represented by the analysis of the encyclopedic work produced by a canon of Saint-Omer in the 12th century, the so-called Liber Floridus. In this case the different aspects of time, theories and sources which converged in one work, and the changes in the traditional views about time and cosmology through the reception of new scientific texts are examined through a transdisciplinary and international conference in March 2019. This conference aims to enrich the methodical debate and to produce new scientific results on an important medieval text which has not yet been critically edited.

TIME AND SCIENCE IN THE LIBER FLORIDUS OF LAMBERT OF SAINT-OMER

LE STUDIUM CONFERENCES



The Liber Floridus is an encyclopedic compilation written in the first quarter of the 12th century by a canon of Saint Omer named Lambert. In his attempt at synthesis and innovation he collected earlier sources but also contemporary literature.

The work was conceived as an illustrated edition which combines texts on different topics with images and diagrams. In this medieval project time plays an important role, manifested in the liturgical calendar and theological ideas about time, in the movements of planets and the signs of the zodiac, the division of time in years, months and days, the local and universal history.

The conference investigated from different points of view and disciplines the reception of new scientific ideas and the many concepts of time which are transmitted in the Liber Floridus in images and texts, considering also the theological, exegetical and philosophical backgrounds.

Moreover, the manuscript tradition of the Liber Floridus was taken into account comparing the autograph codex preserved in Ghent with other later manuscript copies.

The conference hosted scholars from six different countries and offered a public lecture about "Temps, le Liber Floridus et la science des astres au XIIe siècle" (Prof. Charles Burnett, The Warburg Institute, Londres). The proceedings will be edited by Brepols Publisher Turnhout.

TEMPS, LE *LIBER FLORIDUS* ET LA SCIENCE DES ASTRES AU XIIE SIÈCLE

LE STUDIUM LECTURES

Interest in the past, awareness of the present or anticipation of the future, time plays a significant role in the Liber Floridus by Lambert de St Omer.

This presentation proposed comparisons and contrasting insights between the ideas of time present in the Liber Floridus with those found in scientific works circulating in 12th century Europe, particularly in the fields of astronomy and astrology.

Prof. Charles Burnett, from The Warburg Institute, London, engaged the public into a stimulating reflection.

AROUND THE PROJECT:

Article

- **P. Carmassi**, Testimonianze manoscritte di tradizioni liturgiche aquileiesi, in Gabriele Archetti (ed.), Teodolinda. I longobardi all'alba dell'Europa. Atti del 2° Convegno internazionale, Centro studi longobardi. Convegni 2, volume I, Milano 2019, pp. 361-381.

Book

- **P. Carmassi** - C. Heitzmann (edd.), Marginalien im Bild und Text: Essays zu mittelalterlichen Handschriften, Wiesbaden 2019 (Wolfenbütteler Forschungen 156).

Dr Carmen Díaz Orozco

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University of the Andes - VE

In residence at: RÉceptions et MÉdiations de LIttératures et de Cultures Étrangères et comparées (RÉMÉLICE) - Orléans

Nationality: Venezuelan

Dates: **July 2018 to July 2019**

Carmen Diaz is a senior researcher at the Los Andes University, in Mérida, Venezuela Coordinator of the Master's Degree in IberoAmerican Literature. Gonzalo Picón Febres» Literary Research Institute. 2011 - 2013. Director of the Literary Research Institute «Gonzalo Picón Febres». 2004 - 2007. Founder of the Collection «Cuadernos de Crítica y Ensayo». She has also co-published 11 books with university departments (Vicerrectorado Académico, ULA) and private publishers Winner of the Latin American and Caribbean Social Thought Anthologies Contest. CLACSO. Buenos Aires, 2016. ISBN 978-987-722-256-2 Program to Stimulate Innovation and Research (PEII). Researcher Level A-2. Board of Directors of the National Observatory of Science, Technology and Innovation. Caracas - Venezuela. 2013 - 2015. Researcher Stimulus Program. University of Los Andes. ULA, Merida - Venezuela. 2005 - 2012.

Dr Brigitte Natanson

Host scientist

Dr Brigitte Natanson is Deputy Director of the REMÉLICE Laboratory and Research Project Coordinator: «Participation Feminine and Nations in Construction in Latin America of the Nineteenth Century». Lecturer in the Spanish Department of the Faculty of Arts and Human Sciences since September 2010 (HDR supported in November 2009). Lecturer between 1992 and 2009 at the University of Nancy 2. She teaches lectures, tutorials and seminars in Bachelor's degree and Master's Research and Master's Teaching in LLCE and LEA. Latin American civilization, literature and theatre courses. Elected member of the CEVU since 2012. Treasurer of the ALMOREAL Association. «De la inmigración al exilio, cómo se nombra al extranjero: del "ruso", "tano", "turco", "gallego" al "sudaca" o al "che", del Río de la Plata a España», in La part de l'Étranger, HispanismeS, n°1, January 2013, pp. 26-51.

PARTICIPATION OF WOMEN AND NATIONS UNDER CONSTRUCTION IN LATIN AMERICA IN THE NINETEENTH CENTURY: THE COMMITMENT OF MARIQUITA SÁNCHEZ AND JUANA MANSO IN EDUCATION IN ARGENTINA

The purpose of this project is to select, compile and translate the writings of these two intellectuals, in two separate volumes, the establishment of a critical edition of their complete works, as well as the creation of a bilingual website, able to offer French-speaking public access to first-hand and valuable materials, inaccessible to this day in the French academic world.

On a first fact-finding mission, the periodical El Correo de Ultramar was entirely revised after a search for information on Juana Manso's educational, literary and publishing activities. Description: Contains news from all over Europe.

The longest section is the one that reviews the Spanish press. In the first three months of 1850 there is a section about books published in Spain, in March, this section disappears. In the rest of the year literary news is non-existent.

From January 1851, the fortnightly edition of the newspaper indicates the existence of a «magnificent volume», destined to the collection, of the supplement «The Illustrated Museum». Something similar happens with another supplement: «The Illustrated Overseas Courier» whose copies are published although under the title «Illustrated Literary Part of The Overseas Courier». With regard to the latter, it should be noted that many of the descriptions of costumes in the articles in the «Revue de l'industrie et de la mode» section refer to images that do not appear in the copies of the «Literary Part...» consulted in the BNF.

The section Revue de l'Industrie et de la mode (in Spanish and French), signed by the Viscountess of Renneville, contains an interesting summary of the latest Paris fashion.

The Ultramar Courier, revised from 1853 to 1858, is a magazine illustrated with rich engravings distributed in sections among which stand out the travel section and the representation of the national types of the visited regions.

The «Scientific Bulletin» section also stands out, with curiosities about science and a few articles about regional customs. The section dedicated to news about regional customs in America is just as important as the same section dedicated to the presentation of European types and customs. Volume I (January - June 1853) does not contain any news about the work and/or Labor of Juana Manso or Mariquia Sánchez in Argentina.

In fact, it does not present any news about customs, civil works, scientific, educational, cultural advances or writers of the Río de la Plata.

FORGING GLANCES, IMAGES AND VISUAL CULTURES IN XIXTH CENTURY LATIN AMERICA

LE STUDIUM CONFERENCES

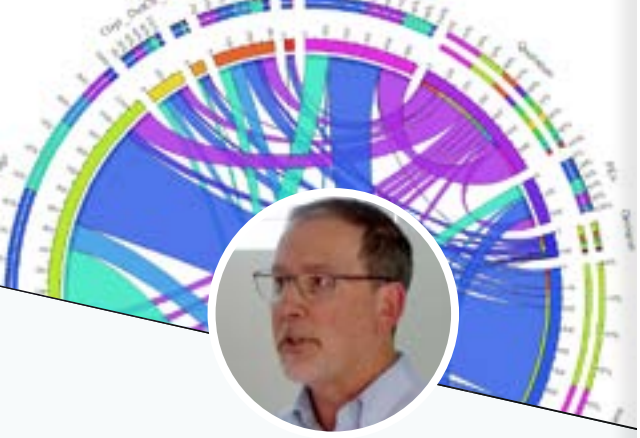
In an unprecedented essay on the pose and societies of scopic filiation, Sylvia Molloy reflects on the power of the exhibition and the underlying visual culture in 19th century Latin America. "Todo apela a la vista y todo se especulariza", Molloy will say and she will return to a semiotics of the image of an irreversible nature, at least concerning the representation of the real and the construction of a view of the nation, and of the subjectivities, corporalities and sensitivities that articulate in its framed, singularly tied to the emerging Latin American republics of the 19th century. This colloquium proposed to reflect that transition moment during which the old literate city (Rama, 1984) seemed to deal with visual culture in order to create new contents. Forging glances will be the key to this moment, as demonstrated not only by the photography of subjects and cities, but also by the universal exhibitions that, serving the nascent republics of the continent, served as showcases for national progress and stimulated the urgent foreign investment in countries as Chile (1875), Argentina (1882) and Venezuela (1883), among others. In this eagerness, literary panoramas, costumbrian watercolors, galleries of illustrious men, the albums of young ladies, panoramas, slide shows and photographs stood out and behaved as new visibility devices.

LA CONSTRUCTION DE LA FEMME MODERNE DANS LA PRESSE ILLUSTRÉE PARISIENNE DU XIXE SIÈCLE

LE STUDIUM LECTURES

Mónica Cárdenas Moreno is a Doctor of Iberian and Ibero-American studies at the University of Bordeaux-Montaigne and lecturer in Latin American literature at the University of La Reunion, her research focuses mainly on writing women from 19th century.

During the last three decades of the 19th century, the French press lived its golden age. The success of weekly magazines like L'Illustration, L'Univers Illustré, La Mode Illustrée, etc. encouraged similar cultural enterprises in other linguistic universes. In this context, it's interesting looking at the Correo de Ultramar and the Correo de París, two Parisian publications written entirely in Spanish, edited by Spanish emigrants, who in a few years became the flagships of the illustrated press in the young Hispano-American republics where they were assiduously read and served as an inspiration for local publications. An more particularly to the place reserved for women in these fortnightly publications, for example, inside the sections dedicated to fashion or in advertisements. It is from this Dr Mónica Cárdenas Moreno described in what ways these periodicals built a model of a modern woman: urban, illustrated and cosmopolitan.



Prof. Richard Freedman

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Haverford College - US

In residence at: Centre for Advanced Studies in the Renaissance (CESR) - Tours

Nationality: American

Dates: **January 2019 to January 2020**

Freedman's scholarly research focuses on the music of the Renaissance: its cultural context and its contrapuntal workings. His writings have appeared in leading scholarly journals, and in two books, *The Chansons of Orlando di Lasso and their Protestant Listeners: Music, Piety, and Print in Sixteenth-Century France* (Rochester, 2001) and *Music in the Renaissance* (W.W. Norton, 2012).

Freedman has also taken on leadership roles in digital work for the leading academic societies devoted to musicology. He was chair of the Technology Committee of the American Musicological Society (the leading organization of the field), and board member and chair of the Digital and Multimedia Committee of the Renaissance Society of America, another leading academic society. In 2019 he began a term as a member of the Board of Directors of the Répertoire International de Littérature Musicale (RILM), the leading bibliographical resource for musicology.

Prof. Philippe Vendrix

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 of Tours.

CITATIONS: THE RENAISSANCE IMITATION MASS (CRIM)

CRIM poses a simple but provocative question: What is similarity in music? The allusiveness of musical discourse is so fundamental to the Western tradition that it is hard to imagine a work that does not in some way make reference to some other composition, type or topic. Indeed, over the last 1000 years music has continued to reference earlier pieces, from rampant borrowing of George Frideric Handel to the looped sampling heard in hip-hop. Citations: The Renaissance Imitation Mass (CRIM) focuses on an important but neglected part of this allusive tradition: the so-called "Imitation" or "Parody" Mass of the sixteenth century, in which short sacred or secular pieces were transformed into long five-movement cyclic settings of the Ordinary of the Catholic Mass: Kyrie, Gloria, Credo, Sanctus, and Agnus Dei. The resulting works are far more than collections of quotations. The sheer scope of the transformation required the composer to re-think the model: shifting, extending, or compressing ideas in new musical contexts and to meet new expressive purposes. If counterpoint is a craft of combinations, then the Imitation Mass involves the art of recombination on a massive scale. These works offer an unparalleled way to learn how composers heard (and understood) each other's music.

Freedman's fellowship with Le Studium gave him the time to:

1. evaluate the results of the first phase of work on CRIM
2. select works for the next phase of CRIM
3. work with IT specialists to elaborate the CRIM web site
4. explore machine-assisted systems for analysis and discovery of musical patterns
5. craft interpretive essays and commentaries based on data gathered to date

The pace of collaborative work, and especially the collaborative development of digital tools, often proceeds both more slowly and more quickly than originally anticipated. The year in Tours was no exception in this respect. Curation the archive of CRIM analyses was painstaking. Some aspects of our technical development of software were also slow, mainly on account of the limited availability of some of our part-time consultants. But on other fronts we made much progress. Thanks to the presence in Tours (and at the CESR) of Le Studium Fellow Emilio Sanfilippo, we advanced the conceptual and computational standing of our analytic categories, in particular via the notion of «ontologies» by which machines can identify and locate related digital objects. Work with Daniel Russo-Batterham, an Australian musicologist and data-scientist and long-time CESR collaborator, produced meaningful visualization and pattern-finding engines that will help scholars understand «similarity» in new ways. Meanwhile Freedman's interactions with other Le Studium scholars showed how tools from other fields might be used to explore musical data, too. But by far the most important progress was made at the human level, as Freedman traveled to give conference presentations, teach graduate seminars, and finally in convening the workshop-conference (see below) that helped us refine our methods, identify new repertories, and outlined a series of modular units in which research and pedagogy would mutually inform each other in the years ahead.

COUNTERPOINTS: RENAISSANCE MUSIC AND SCHOLARLY DEBATE IN THE DIGITAL DOMAIN

LE STUDIUM CONFERENCES

«Counterpoints» was planned as a conference-workshop, space where specialists and students from musicology and the digital humanities could learn from each other, and where they could build an international and intergenerational community.

We were interested to see how the Imitation Mass could help us tell the story of how changing compositional practice in the sixteenth century.

And we were interested to see how the digital domain might inaugurate new modes of collaborative research and scholarly communication.

Some forty scholars and students from around the world assembled at the CESR for three days of energizing presentation, discussion and collaboration.

We were especially proud that so many students took their turn in presenting the insights they gathered during the course of the various workshops.

AROUND THE PROJECT:

Publications

- **Freedman**, Richard. «Citations: The Renaissance Imitation Mass (CRIM) and The Quotable Musical Text in a Digital Age.» Paper presented at the Digital Humanities conference, Utrecht University, Utrecht, The Netherlands, July 9-12 July, 2019.

- **Freedman**, Richard. «Citations: The Renaissance Imitation Mass (CRIM) and The Quotable Musical Text in a Digital Age." Workshop conducted at 47th Conference on Medieval and Renaissance Music, Basel University, Basel, Switzerland, July 3-6, 2019.

Dr Ki-Won Hong

LE STUDIUM / Marie Sklodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Seoul National University - KR

In residence at: Centre for Advanced Studies in the Renaissance (CESR) - Tours

Nationality: South Korean

Dates: **September 2019 to September 2020**

After Bachelor's Degree of Law and Master's Degree of Law at Seoul National University, I earned my PhD in Law at University of Paul Cézanne - Aix-Marseille 3 (France) in 2008 with a dissertation on "*La pensée politique de François Hotman articulée sur une perspective nationale*" (Very Honourable Mention with unanimous congratulations from the Jury; Proposal of a thesis prize; Proposal for publication by the Jury.). Afterwards, I continued my research in the area of early modern European legal scholarship. It is in this direction that most part of my publications have been dedicated to different topics of this research area, including *Free Will and Responsibility in Law: History and Theory*. Including priceless honors in academic world, I count a Fellowship at Nantes Institute for Advanced Study, France, in 2014-2015 and a Grant for the research proposal on "Dialectics in the Sixteenth-Century Legal Humanism" by Korea Research Foundation in 2010.

Prof. Stephan Geonget

Host scientist

Professor Stéphan Geonget, graduated from ENS Fontenay/Saint-Cloud, teaches at the CESR. He is a junior member of the Institut universitaire de France since 2009. He makes his research in Renaissance Literature in the perspectives of ethical and legal questions. Major historical figures in his research include Rabelais, Montaigne and Marguerite de Navarre, not to speak of Louis Le Caron, to whom most of his recent interests are dedicated, particularly *La Claire. Ou De la prudence de droit* (1524). Professor Geonget's activities cover many other areas including the site Epistemon (University of Poitiers) and the Bibliothèques virtuelles humanistes (university of Tours). He published 15 books and 50 articles: For instance, *La notion de perplexité à la Renaissance* (Genève: Droz, 2006) and *Littérature et Droit, du Moyen Âge à la période baroque: le procès exemplaire* (collaboration with B. Méniel, Paris: Champion, 2008).

THEORY OF JUSTICE BY GUILLAUME BUDÉ (1468-1540): ARGUMENTS, METHOD, AND INFLUENCE ON THE SIXTEENTH-CENTURY LAWYERS

As a part of my long-term research project on the corpus of early modern humanist lawyers, my research on the theory of justice by Guillaume Budé (1468-1540) aims to contribute to a richer historical account of the legal humanism and, thus, to excavate Budé's theory of justice from the textual sources which legal historians have not exhaustively searched yet.

During the first four months since my arrival at Tours, I concentrated my research in exploring the world or, more precisely, political philosophy of Guillaume Budé (1468-1540) to see how and to what extent he participated in the contemporary humanists' common project. For this purpose, I started from drawing the intellectual intercourses among the sixteenth-century humanists in Europe. The drawing is based, first, on analysis of their correspondence and, secondly, along with close reading of relevant texts from their works. For instance, a close reading of the prefatory letters to Thomas More's *Utopia* (ed. 1518) allowed me to encounter many authors who were willing to provide and express in one's own manner of each a sort of support for the political ideas explicitly and implicitly articulated in the two books. They are Erasmus, Budé, Giles, Beatus Rhenanus, and Jérôme de Busleyden (c. 1470-1517), authors who read *Utopia* as a work representing "the basic humanist values and principles." Among those preface contributors, I paid a particular attention to Budé. In doing so, I hoped that a glance at his philosophy of law would allow me to pick up the threads of the history of political philosophy of the sixteenth-century France.

I would like to make somewhat detailed account of this intellectual connection in order to make clearer where the first steps of my research were made: The first intellectual encounter between Budé and More was made in the spring of 1517, when Erasmus urged Budé to read More's *Utopia*. Budé addressed his prefatory letter for the 1517 edition to Thomas Lupset (c. 1498-1530), an English humanist who supervised the printing of Thomas Linacre's translations from Galen and the second edition of *Utopia* while he stayed in Paris from 1517 to 1519. Anyway, Budé's prefatory letter contains more than compliments. It was in fact composed in a form of critique, in which Budé targeted the legalism, which had been pervasively witnessed throughout the whole Europe for centuries. He condemned the dark side of scholasticism in legal education and practice, because of which the "trumpery" had become the "object of legal and civil arts and sciences" (*legitimarum & civilium artium ac disciplinarum scopus*). The whole human race was so much stung, thought Budé, by the covetous concerns — all anxiety for increasing one's revenue — that if one does not behave "with spiteful and watchful cunning" toward others, or even toward his or her family members and neighbors, he or she would have to run the risk of being taken something or other away from him- or herself. "This condition prevails all the more, continues Budé, in those countries where the so-called civil law and canonical law have greater authority in both forums." The first steps of my research were thus made in this direction to contextualize Budé's theory of justice.

Dr Margriet Hoogvliet

LE STUDIUM / Marie Sklodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University of Groningen - NL

In residence at: Centre for Advanced Studies in the Renaissance (CESR) - Tours

Nationality: Dutch

Dates: **June 2019 to June 2020**

Dr Margriet Hoogvliet earned her PhD "cum laude" (the highest honour in the Netherlands) in 1999 with the thesis Pictura et Scriptura: a study of text-image relations in maps of the world from the twelfth to the early seventeenth century (published in 2007 in the Brepols series Terrarum Orbis). Alternating with teaching and researching, positions with the universities of Groningen, Utrecht, Amsterdam, Paris Sorbonne/EPHE, and Leeds, she has worked since 2009 as a postdoctoral researcher, first for the project Holy Writ and Lay Readers: A Social History of Vernacular Bible Translations in the Fifteenth Century. She is a successful co-applicant of COST Action IS1301 "New Communities of Interpretation (2013-2017) and of the project Cities of Readers: Religious Literacies in the Long Fifteenth Century (Dutch Research Council (NWO), 2015-2020). Margriet Hoogvliet has published frequently and widely on the biblical and religious reading cultures of lay people living and working in the towns of late medieval France and the advanced religious participation of middle-class and poor laypeople.

Prof. Chiara Lastriaoli

Host scientist

Prof. Chiara Lastraioli is the vice-director of the Maison des Sciences de l'Homme Val de Loire. Professor of Italian Studies at the CESR 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, grillate, pelate e altro Cinquecento librario minore. She is 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'Ecriture, ses supports, ses archives) financed by Region Centre-Val de Loire.

RELIGIOUS LIEUX DE SAVOIR IN PREMODERN TOURS AND ORLÉANS: A SOCIAL AND SPATIAL APPROACH TO RELIGIOUS READING IN FRENCH (C. 1450-C. 1550)

This project intends to show that up to ca. 1550 many of the inhabitants of "average" French towns as Tours and Orléans were literate and that they did have access to religious texts in French. Centuries-old documents from the historical archives and library collections, such as surviving administrative records, handwritten books, and early prints will provide information about the wide range of social backgrounds of the readers, from a stocking maker in Orléans to well-off merchants and lawyers. The research also aims to retrace how religious texts were disseminated through social networks connecting these readers. Furthermore, the religious reading activities by lay people in Tours and Orléans are analysed from a spatial perspective. Where could late-medieval city-dwellers go to learn to read, to purchase books, or to consult religious texts in open access? What happened to a private home or workshop when it was also a space of religious reading? Reading activities, books, libraries, and book collections are also studied as places of knowledge (lieux de savoir), where knowledge was created, stored, accessed, or disseminated.

The historical data often allow plotting these places of knowledge on historical maps of premodern Tours and Orléans. Further analysis of these places of religious knowledge by making use of computerised Geographical Information Systems will allow for even more refined conclusions about spreading, concentrations, and accessibility. The research plans to explore the possibilities of a smartphone app (ArcGIS) for a touristic route and other outreach activities.

Since June 2019, the wonderful library of the CESR delivered a detailed knowledge of the existing research publications concerning the urban history of Tours and Orléans, most notably about book production, book ownership, libraries, schools and other places of knowledge. Next to this ongoing study of the scientific literature, I have researched the following historical sources i) in the inventory of a book seller in Tours, Chereau in 1868), ii) in Tours public library archives showing enormous document-based bureaucracy of the town and the socially widespread use of written documents in the urban culture, iii) in Books from the collections of the public libraries of Tours and Orléans, Bibliothèque Nationale de France,

Arsenal showing considerable number of manuscripts and early prints that can be related to Tours and Orléans. I have furthermore identified five manuscripts with religious texts accompanied by a family diary (livre de raison) noted by the lay book owners themselves. Another witness of the writing activities by lay people is Tours, BM, Ms 231, a Book of Hours copied by Nicolas Rolet in the early years of the sixteenth century.

There are several indications that this book originated from the Loire Valley (references to Vendôme and to Saint-Martin in Tours). Sources as these will be the basis of an additional publication about lay people as writers and authors in late medieval Tours and Orléans

Dr Marion Lamé

LE STUDIUM Research Fellow
ARD 2020 INTELLIGENCE DES PATRIMOINES Programme

From: Networked Multimedia Information Systems (NeMIS), ISTI-CNR - IT

In residence at: Centre for Advanced Studies in the Renaissance (CESR) - Tours

Nationality: French

Dates: **July 2019 to June 2020**

Marion Lamé is an Associate Researcher at the Nemis group (ISTI-CNR). Her research focuses on digital epigraphy as primary sources for cultural heritage, research for which the Franco-Italian University previously awarded her both its doctoral grants (Vinci II and III) for her double PhD at the universities of Bologne and Aix-Marseille. She also graduated in Digital Humanities (University of Venice, Italian Government Research Grant) and she now teaches Digital Humanities at the CESR. She won several grants for high quality research in international conferences and has published in History, Computer Science and Digital Humanities journals and proceedings. She also coordinated the team hosted by the IMERA Institute of advanced studies for the project Outil numérique: pédagogie scientifique et médiation du patrimoine culturel #INPM, manages the Tesserarum Sisciae Sylloge digital edition of the AMZ, and co-coordinates the Inscriptions work package of the H2020 ARIADNEplus project.

Prof. Benoist Pierre

Host scientist

Benoist Pierre is a full Professor (First Class) at the University of Tours. In 2016, he has been elected Director of the CESR (UFR and UMR 7323) and of I-Pat (Intelligence des Patrimoines Programme) for five year, led by the CESR which involves several hundred researchers and more than 40 laboratories in the Centre-Val de Loire Region. His research work, which was initially on the relations between religion and politics in modern-era Europe, is currently being developed within the CESR according to three axes (i) the analysis of court societies and their relation to the State in modern Europe; (ii) the study of heritage and more particularly châteaux heritage in the Val de Loire; (iii) the notion of mediatisation and promotion of sciences principally on culture, heritage and humanities. Prof. B. Pierre has published 12 books, 60 papers in international peer review journals and presented 70 public talks.

SCHOLARLY DIGITAL EDITING PRIMARY SOURCES OF INFORMATION FOR CULTURAL HERITAGE

Scholarly Digital Editing (SDE) of our primary sources of information for cultural heritage constitutes one of the core components of Digital Humanities.

The roots of this new research lie in the results of our first experimental attempt that consisted in applying digital methods to the edition of the so-called Res Gestae Divi Augusti. More than fifty traditional editions of this triumphal and highly complex display have been published since the end of the XIXth century. Each generation of philologists, historians, archaeologists and classicists renews and deepens our understanding of both the contextualized archaeological monuments, i.e. the temple of Augustus and Rome in Ancyra and the other artifacts discovered in the XXth century, as well as the Augustean text they carry. Thus, they appear as a complex, complementary as well as lacunary set of inscriptions in both Latin and ancient Greek languages. This study brought out that working on scholarly editing from a digital point of view requires an additional digital model, the editing one, to bridge the gap between traditional modus operandi and computational methods. The new goals consist in transferring the method on other types of primary sources in order to test, to adapt as well as to improve it. During this fellowship, this SDE methodological framework is being improved through collaboration with the following projects of the University of Tours: Arviva (#ROSER), CoReMa, RENUMAR, Ricercar, as well as the MASA consortium. It has been progressively built up for the last seventeen years in contact with specialized projects such as Perseus Project, Les inscriptions grecques du Louvre, Musisque Deoque as well as within institutional collaboration, among which the Archaeological Museum in Zagreb, the Istituto di Linguistica Computazionale, the Visual Computing Laboratory (CNR) and the Laboratorio di Cultura Digitale (University of Pisa). In this context, digital editions have the potential to register explicitly some editorial choices between the primary source and its interpretations, for instance, when the relations between the scholarly process and the primary source require some visual investigations or result in some audio performance. The research focuses on a twofold aspect: the evidence-based editorial practice combined with the scholarly level of modelling that is required as an additional layer to the traditional stacks of any computer system. This study does this by following a first selection of two lines of inquiries: the visual representation and the expert's expression, focusing on the processing possibilities (machine learning) of the export and following the FAIR principles. Firstly, Digital Autoptic Processes (DAP), based on Visual Computing and annotation technologies, are used to register the decision made by an editor and doing so associates observable features in a machine readable format (e.g.: some written signs on a manuscript to the corresponding transcription). Secondly, the expert's expression is edited so it can become machine readable (i.e. controlled vocabularies, ontologies). Heterotoki 2.0, online service for scholarly digital editing the working expression, will manage a dual structural heterogeneity of the datasets. Recent highlights include publications about Digital Autoptic Processes (5TH IEEE CIST'18), Digital Working Terminologies (ODOCH19 and DH19) as well as temporal relationships to our cultural past and concept drift (1ST WODHSA19). This position as a Le Studium Research Fellow is funded by the ARD 2020 Intelligence des Patrimoines programme.

Dr Emilio Maria Sanfilippo

LE STUDIUM Research Fellow
ARD 2020 INTELLIGENCE DES PATRIMOINES Programme

From: University of Nantes - FR

In residence at: Centre for Advanced Studies in the Renaissance (CESR) - Tours

Nationality: Italian

Dates: **April 2019 to March 2020**

He got a bachelor and master degree in Philosophy at the University of Catania (Italy) with an emphasis on analytic philosophy. The interest for research brought me at Saarland University (Germany), where I had a research position at the Institute for Formal Ontology and Medical Information Science (IFOMIS). I then moved to the Laboratory for Applied Ontology at the Italian CNR, and I got a PhD in Information and Communication Technologies from the University of Trento with a thesis on ontologies for design and manufacturing. I moved to France with a postdoctoral position at the Laboratory of Digital Sciences of Nantes (at the *École Centrale de Nantes* and CNRS), where I continued the research line of my PhD thesis. Thanks to the Le Studium fellowship at the CESR, I am now investigating methodological and applications concerns relative to the use of ontologies for cultural heritage data management.

Prof. Benoist Pierre

Host scientist

Benoist Pierre is a full Professor (First Class) at the University of Tours. In 2016, he has been elected Director of the CESR (UFR and UMR 7323) and of I-Pat (Intelligence des Patrimoines Programme) for five year, led by the CESR which involves several hundred researchers and more than 40 laboratories in the Centre-Val de Loire Region. His research work, which was initially on the relations between religion and politics in modern-era Europe, is currently being developed within the CESR according to three axes (i) the analysis of court societies and their relation to the State in modern Europe; (ii) the study of heritage and more particularly châteaux heritage in the Val de Loire; (iii) the notion of mediatisation and promotion of sciences principally on culture, heritage and humanities. Prof. B. Pierre has published 12 books, 60 papers in international peer review journals and presented 70 public talks.

ONTOLOGY-BASED DATA INTEGRATION FOR THE DIGITAL HUMANITIES

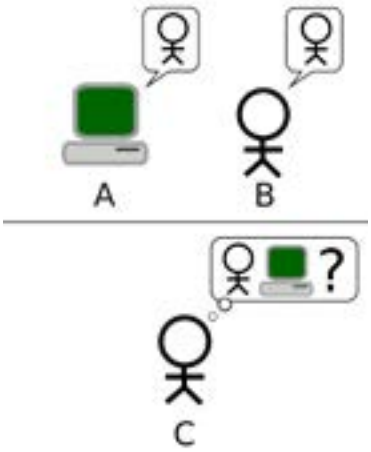
This project addresses fundamental and application research in the context of the Digital Humanities at the intersection between Computer Science, Artificial Intelligence, Logics, and Philosophy. The driving idea is about the development of computational models, called *ontologies*, by which multiple and *heterogeneous* datasets can be published in a Web environment and possibly integrated.

Why are these efforts requiring research support? Let us assume that your data are about musical scores published in multiple editions. The way in which you model and describe the data depends on both your understanding of the musical domain and the terminology adopted in your working context. Here the research challenge starts to emerge.

Indeed, when you share data with other fellows, you must be sure that they understand *what you mean*, namely, that the *intended semantics* of the data is preserved in the data sharing process. For example, what you call 'musical piece' may be called 'musical composition' by others for whom 'piece' may be used only for compositions' parts. As simple as this example can be, it depicts a source of traps, because there is no guarantee that third-parties fully understand your data when the latter are shared. Nor computer systems can fix this situation, since they can not access data meanings if the latter are not explicitly provided.

Ontologies represent the intended meaning of a vocabulary of terms used, e.g., for data modelling in such a way to make it processable by both humans and computers. The main purpose is to enhance *communication* between humans, machines, or humans and machines.

In the context of my LE STUDIUM fellowship at the CESR, I contribute to design an ontology covering data spanning across multiple domains, including musicology and the study of ancient documents, as well as biology and natural heritage. The challenge is to define a conceptual framework that is general enough to encompass such a variety of data while being useful for concrete application settings. Also, despite the state of the art is quite rich, there are several notions which lack a robust conceptual treatment, e.g., that of (musical or literary) *work*.



For instance, when two people read Shakespeare's *Hamlet*, one in English and the other in French, we commonly claim that they read the *same novel*, even though the texts are different. Are there any principles behind this common-sense intuition? Is it possible to make a cut-off distinction between a novel and its various texts? These and other questions are fundamental when data on *works* have to be managed.

The development of the ontology -- in the shape of a Semantic Web model -- is currently an ongoing effort, and tests on its quality and usability are regularly performed to ensure its trustability and applicability in research projects at the *ARD 2020 Intelligence des Patrimoines*.

Dr Rebecca Tharme

LE STUDIUM / Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: Riverfutures Limited - UK

In residence at: CItés, TERritoires, Environnement et Sociétés (CITERES) - Tours

Nationality: British

Dates: **November 2019 to November 2020**

Rebecca Tharme is an international specialist in river conservation and environmental water management, with 28 years of experience in multicultural, interdisciplinary partnerships and research-for-development projects across Africa, Asia and Latin America. She holds a PhD in Aquatic Ecology, University of Cape Town, South Africa, for which she was awarded the Purcell Prize, as well as a First Class B.Sc. Honours in Zoology and B.Sc. cum laude (Zoology and Botany). Rebecca has been an independent consultant with her company, Riverfutures, for several years, and an Adjunct Principal Research Fellow of the Australian Rivers Institute, Griffith University. She serves on the International Union for Conservation of Nature Species Survival Commission's Freshwater Conservation Committee. She has also served as an invited jury member for Swiss Re Foundation's international ReSource Award and on the Ramsar Convention on Wetlands' Scientific and Technical Review Panel. Rebecca has co-authored numerous publications, including a 2017 book on Water for the Environment, and is a Freshwater Science Associate Editor for Frontiers in Environmental Science.

Prof. Karl Matthias Wantzen

Host scientist

After studying on the Rhine (German Federal Institute of Aquatic Sciences), Karl M. Wantzen worked as fellow at the Max Planck- Society to undertake his PhD on stream ecology, and to coordinate a BMBF-funded project on the Ecology of the largest wetland of the World. 2007 habilitation on biodiversity, functioning and structural dynamics of river- flood plaincorridors. > 100 publications. Since 2010 he has been professor (1st class) at the University of Tours, where he lectures river ecology and management, sustainable development and tropical ecology across different faculties, and researches in the DATE team (Landscape and urban ecology, and management) of CITERES. In 2014 he was awarded the UNESCO Chair on River Culture (Fleuve et Patrimoine, renewed in 2018), and in 2015, "Talent de la Région Centre" acknowledging his scientific and conceptual achievements. Prof. Karl Matthias Wantzen shares the coordination of the project with Prof. Stéphane Rodrigues, sediment geologist at CITERES.

BIOLOGICAL AND CULTURAL DIVERSITY, AND FLOW REGIMES - A UNIFYING APPROACH FOR MANAGING RIVERSCAPES

The project aims to highlight and explore the complex and diverse interlinkages existing between the biological diversity and the cultural diversity of large river systems, with a particular focus on the potential implications for environmental water management. It aims to help synthesise the diversity of case study evidence globally that demonstrates how biodiversity and cultural diversity are intimately coupled in riverscapes, both directly and indirectly, including through the flow regime as a driving and dynamic connector.

Currently, freshwater biodiversity is in precipitous decline worldwide, with flow alteration a major driver. A similarly critical situation exists for cultural diversity. A central premise being investigated is that together with declining biodiversity, cultural diversity (as that part of culture that is derived from human-river relationships, or river culture) will also be impaired as a result of the various disruptive flow regulation and fragmentation impacts of large water infrastructure and water uses.

The project aspires to show that transdisciplinary, joined-up conservation and management of rivers, including through the implementation of environmental flows, has greater potential to synergistically address the detrimental impacts of flow alteration on biological and cultural diversity than their independent treatment. More broadly, it is hoped that the project will provide a source of information for the elaboration of new approaches to aid future implementation of environmental flow and freshwater conservation policies, and thus more generally support the achievement of the water and environment related Sustainable Development Goals (SDGs).

As the first stage of the project, a review is underway of the knowledge base on river cultural and biological heritage, diversity and flow regimes, based on scientific literature, case studies (including chapters of a new river culture book in preparation), and projects. It is evident that there are a number of frameworks, concepts, and theories that are pertinent to address, and these are being consolidated, as are the wide range of biocultural indicators with high potential for application in relation to basin flow management.

Contacts have been made with various experts, institutions, and programmes actively engaged in different aspects of river biodiversity conservation and culture, including the IUCN nature-culture journey and Ramsar Culture Network (of which Rebecca Tharme and K. M. Wantzen have become members).

Rebecca has joined the doctoral advisory committee for a student researching river culture in the Congo Basin, and will be part of a small group (Mission Val de Loire, Biosphere Reserve Bassin de la Dordogne, and CITERES) guiding an internship on the management application of different conservation tools for inland water socio-ecosystems.

At the policy level, Rebecca has contributed to strategies, targets and indicators for potential inclusion in the Post-2020 Global Biodiversity Framework, which is currently in draft form.

Rebecca is collaborating with the United Nations Food and Agriculture Organization, International Water Management Institute, IHE Delft Institute for Water Education and partners to advance guidance for SDG "water stress" indicator 6.4.2, with a co-designed environmental flow workshop planned for April 2020, Rome, Italy.

Prof. Temenuga Trifonova

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: York University - CA

In residence at: Interactions, Transferts, Ruptures artistiques et culturelles (InTRu) - Tours

Nationality: Bulgarian

Dates: **June 2018 to May 2019**

Temenuga Trifonova is an Associate Professor of Cinema and Media Studies at York University in Toronto. She is the author of the monographs Warped Minds: Cinema and Psychopathology (Amsterdam UP, 2014) and The Image in French Philosophy (Rodopi, 2007), and editor and contributor of the collections Contemporary Visual Culture and the Sublime (Routledge, 2017) and European Film Theory (Routledge, 2008). She has been a visiting fellow and/or artist at the Waseda Institute for Advanced Studies in Tokyo (2019), the New York University Center for European and Mediterranean Studies (2017), the American Academy in Rome (2015), the Brown Foundation at the Dora Maar House (2013), Fondation des Treilles (2013) and Pushkinskaya 10 Art Centre, St. Petersburg (2013). She is also a published novelist (Tourist, 2018 and Rewrite, 2014) and award-winning filmmaker.

Dr Raphaële Bertho

Host scientist

Raphaële Bertho is Assistant professor of Arts and History of photography at Tours University and director of Intru laboratory. Her research focuses on the institutional, artistic, professional and vernacular uses of photography and visual representations of the territory since 1945 in resonance with political philosophy. She collaborate since 2012 with the French group of photographers France(s) Liquid Territory, which questions the possibility of representing a national territory at the time of the European construction and in an international context. She was the curator in 2017 of two exhibitions with the Bibliothèque Nationale de France. Her work focuses on public commission of artistic photography in Western societies from the 1970s on, in particular in the United States, East Germany and Italy. Her analyses consider as much the images as the conditions of creation and reception.

ON THE RUINS AND MARGINS OF EUROPEAN IDENTITY IN CINEMA: EUROPEAN IDENTITY IN THE ERA OF THE GLOBAL

The history of the idea of 'European identity' can be described as a constant oscillation between two poles, one instrumental or pragmatic, the other affective and, on the other hand, as a continuous and unresolved conflict between the belief in some ineffable European 'ethos' and the outright rejection of the very idea of 'European identity'. Over the last several decades the increased mobility of large groups of people has influenced the socio-geographical fixity of a continent of nation-states, putting in question both the concepts of 'national identity' and 'European identity'.

Europe has seen a trend of populist right-wing parties, riding on the wave of multicultural backlash across Europe, gaining widespread support with slogans purporting to save ethno-nationalist culture from the threat of immigrants. The Brexit referendum, following a prolonged political campaign of heightened anxiety over border control and anti-immigrant hostility, was simply the most dramatic expression of the crisis of European identity.

The degree to which the migrant crisis represents a significant challenge to European identity and its core Enlightenment values, including liberty, justice, citizenship and hospitality, can be gauged by considering the ongoing debates around national identity and nationalism, the failure of multiculturalism, European integration, borders and bordering, the Other, and cosmopolitanism as a potential way of rethinking of European identity. The film scholarship exploring the increasingly prominent place of migration in European cinema, and the ways in which the figure of the migrant (and that of the refugee) has challenged established notions of 'European identity', is rapidly growing.

In my research project I aim to demonstrate two things. First, in contemporary European cinema it is becoming increasingly difficult to separate stories about migration from stories exploring life under the conditions of neoliberalism in general. Second, the fact that recent films frame the refugee crisis as a primarily

1. socioeconomic,
2. racial, or
3. ethical issue suggests the continued relevance of Europe's core

Enlightenment legacy embodied in the values of liberty, equality, hospitality, fraternity etc. and, further, and at the same time points to migration as an "ever-deferred confrontation with the European Question as a problem of race and "postcoloniality" (Nicolas de Genova).

ON THE RUINS AND MARGINS OF EUROPEAN IDENTITY IN CINEMA: EUROPEAN IDENTITY IN THE ERA OF MASS MIGRATION

LE STUDIUM CONFERENCES

The purpose of this conference was to engage with contemporary debates around the concepts of 'Europe' and 'European identity' through an examination of European films from 2000 to the present dealing with various aspects of globalization (the refugee crisis, labor migration, the resurgence of nationalism and ethnic violence, international tourism, neoliberalism, transnational commodification, post-colonialism, transnational capital etc.) in order to reflect on the ambiguities and contradictory aspects of the figure of the migrant and the ways in which this figure challenges us to rethink core concepts such as European identity, European citizenship, justice, ethics, liberty, tolerance, and hospitality in the post-national context of ephemerality, volatility, and contingency that finds people looking for firmer markers of identity.

INCARNER LES MIGRANTS: UN QUESTIONNEMENT ARTISTIQUE, ÉTHIQUE ET POLITIQUE

LE STUDIUM LECTURES

Since his first work on a Roma family in Arles in 1997, Mathieu Pernot has been working for more than twenty years to question the representation of these men and women from elsewhere, these migrants whose evocation is often disembodied, made of numbers and lines on the map. Mathieu Pernot conducted a plastic and political research addressing the ethical dimension involved and shedding light on the invisibles of our contemporary history.

AROUND THE PROJECT:

Oral communication

- "The Figure of the Migrant in Contemporary European Cinema," PAMLA annual conference, San Diego, November 14-17, 2019

Book

- The Figure of the Migrant in Contemporary European Cinema - Editor Bloomsbury Academic

Dr Tijen Tunali

LE STUDIUM Marie Skłodowska-Curie Research Fellow
Smart Loire Valley General Programme

From: University of New Mexico - US

In residence at: CItés, TERritoires, Environnement et Sociétés (CITERES) - Tours

Nationality: Turkish

Dates: **September 2018 to August 2019**

I received my PhD in art history and criticism from the University of New Mexico in 2015. I have a MA degree in art history and visual studies from the University at Buffalo, a BA degree in fine arts (painting) from the Binghamton University and a BS degree in Economics from the Istanbul University. My work is published in peer-reviewed journals of various, and in volumes by Routledge, Palgrave Macmillan, and the Liverpool University Press. I have also published extensively in high-impact peer-reviewed journals in English, Spanish and Turkish (French on the way). I have presented my work at over 20 international conferences around the world. I have received competitive fellowship and scholarships such as AIAS/ Marie Curie COFUND Postdoctoral Research Fellowship, Phyllis Muth Scholarship for Fine Arts, and Terra Foundation's Curatorial Grant, Dissertation Fellowship of Latin American and Iberian Institute of the University of New Mexico.

Dr Gülçin Erdi Lelandais

Host scientist

I received my PhD in Sociology in 2006 from the Institute of Advanced Studies on Social Sciences in Paris. I have served as lecturer and researcher at different universities in France and spent time as a Marie Curie Research Fellow in the Framework FP7 of European Commission at the Department of Politics and International Studies at the University of Warwick. I'm currently a permanent CNRS Researcher at the Center for Research on Cities, Territories, Environment and Societies (CITERES) at the University of Tours and scientific secretary of CNRS's research cluster «Spaces, Territories and Society». My research focuses on the analysis of contentious politics, spatial configurations, everyday resistance practices inside the city and urban transformation. I've published several articles in journals, such as International Journal of Urban and Regional Research and Citizenship Studies.

ART AND THE CITY: URBAN SPACE, ART AND SOCIAL MOVEMENTS

The research project pursued the following scientific goals:

1. To examine how the spatial and aesthetic urgencies of the Western capitalist city produced exclusionary planning processes, through the fragmentation of urban space and how that have influenced contemporary art's production.
2. To test the hypothesis that the shared and active interactions between the urban dwellers and art can subvert the authoritative and conservative logic and pattern - a possible aid for democratic politics. For this, it analyzes how the artistic interventions shape our perceptual and sensual encounters with the city.
3. To capture the aesthetic struggles in the urban social movements from the point of antagonistic aesthetics that creates the basis for envisaging participatory democracy. With researcher's conceptualization of "carnival aesthetics," the aim is to construct a compelling ground for the intersection of aesthetics and politics through and beyond the existing approaches to "protest art," and "political art."
4. To introduce humanities perspective of the aesthetic contestations in the research of urban space, which addresses art as a specified and privileged aesthetic practice that sits in the intersections between cultural practices and social terrain of conflict. This research combines humanities and social science methods to close the gap and as such uses empirical data to extend the aesthetic enquiry rather than superseding or supplanting it.
5. To untangle the methodological problem: How can the inherent value of aesthetic practice be acknowledged in social science research that attempts to wrench an effective response into a reflective space where it can be 'made sense of'?

After one year of active research and activities in Tours, achievements to date are:

1. Critiqued conventional approaches on art's relationship to urban space.
2. Reconsidered the interrelationships between theories of art's political function and politics of aesthetics, on equal terms.
3. Provided a useful resource to provoke discussion on art, city and the urban environment.
4. Encouraged an interdisciplinary approach to the discussion of hegemonic and counter-hegemonic urban aesthetics in the changing neoliberal urban landscape.
5. Theorized on the emancipatory potential of art.
6. Answered the main research question: What kind of political and aesthetic possibilities could emerge in the intersection of the spatial, aesthetical and dialogical premises of art and the ideological and economic premise of neoliberal urbanism?
7. Published and presented extensively on aesthetic struggles in the urban social movements.

REBEL STREETS: URBAN SPACE, ART, AND SOCIAL MOVEMENTS

LE STUDIUM CONFERENCES

Art's presence in the urban space is dynamic and interactive that communicates the complex forms of globalization, cultural hybridity, and plurality in contemporary daily life—where we experience politics. The new forms of agencies and strategies of urban creativity in the form of graffiti, wall paintings, yarn bombing, stickers, urban gardening, street performances, tactical art, creative campaigns and theatrical actions—among others—demand an active spectatorship (Whybrow, 2011) and have a growing power to renegotiate space for new forms of political participation.

Social mobilizations in the neoliberal cities constitute a common theme in texts inspired by Henri Lefebvre's colossal work on production and reproduction of urban space (Lefebvre, 1968) and David Harvey's book Rebel Cities (Harvey, 2012). Urban creativity has a broad scope of interests from a clear "right to the city" perspective with its ecological, spatial, and ideological agenda to the struggles of civil rights, and individual and collective freedoms.

While, this aspect has opened the research into recognizing street art as a genre for "political democratization" (Bengtsen & Arvidson, 2014), the growing significance of art in social and spatial justice movements has been neglected by both social movement theory and art theory.

Thus, the analysis of art and urban social movements is still academically insufficient, although art is well-recognized to have had an essential part during the Egyptian and Tunisian revolution (Abaza 2016), Spanish Indignados (Ramírez Blanco 2018), Greek Aganaktismenoi movement (Tsilimpoudini 2016) and the Gezi Uprising (Tunali 2018).

Rebel Streets conference will engage in the questions that scrutinize the complex relationships between urban space, social resistance, and art, such as:

1. How can art in the public space be used as a weapon of resistance and a means of reconstruction?
2. Are street artists obliged to be a part of the urban resistance against neoliberalism?
3. How does art respond uniquely to gentrification?
4. How do public artistic expressions reveal, delimit or question the complexity of neoliberal urbanization?
5. How can we interpret the poetics of urban art from the perspective of subcultures, freedom of expression, and the limits of criminality?
6. How is street art activism perceived by the authorities, politicians, businesses, and the wider public?
7. What prompts urban artists to communicate with urban dwellers with their marks on the city's surface?
8. What kind of public should critical urban art try to constitute and what kind of public spaces are needed to that effect?
9. What can we learn from urban art about visual resistance in the interplay with political power structures?
10. Under what conditions could art become effective in reclaiming the cities as sites of resistance and change?

AROUND THE PROJECT:

Oral communications

- "Art and Gentrification in the Changing Neoliberal Urban Landscape." AAH,Art History Association's Annual Congress. Brighton, UK (4-9 April 2019).
- "Urban Aesthetics and the Right to the City." City and Nation Symposium. University of Bristol, Bristol, UK (12-13 June 2019).
- "Urban Aesthetics and the Right to the City." City and Nation Symposium. "Art of the Rebel Streets and the Case of Gezi Uprising in Turkey." Rebel Streets: Urban Space, Art and Social Movements, University of Tours, Tours, France (24-25 May 2019).

Dr Robert Courtois

CONSORTIUM COORDINATOR

LE STUDIUM CONSORTIUM | SMART LOIRE VALLEY Programme

Robert Courtois (MD, PhD) (psychiatrist, associate professor of psychology / senior lecturer), project leader, head of CRIAVS, Psychiatry-Addictology department, Tours University Hospital.

His research areas are psychopathological processes, individual vulnerabilities, risk and protective factors of the behavior of adults reflecting difficulty adapting to change.

- Becoming an adult: risk behaviors, addictions, risky sexual behavior
- Interpersonal relationships: violence, sexual violence, domestic violence, harassment
- Life history, adverse environment, coping with illness: personality, resilience, psychological health and quality of life

ASSESSMENT OF RISK OF SEXUAL ASSAULT (ARSA): PSYCHOLOGICAL ADJUSTMENT, NEUROPSYCHOLOGICAL AND PSYCHIATRIC DETERMINANTS

The creation of this Le Studium Consortium ARSA ("Assessment of Risk of Sexual Assault: Psychological adjustment, neuropsychological and psychiatric determinants") aims to establish a multidisciplinary international research team of psychologists, neuropsychologists, psychiatrists and criminologists.

We decided to explore a new way to better understand and explain sexual violence that consists of describing risk factors for coercive sexual relations (including all inappropriate or unwanted relationships) by using a dimensional approach based on the Research Domain Criteria (RDoc) created by the American 'National Institute of Mental Health' (NIMH).

This is a research framework for new approaches to investigating mental disorders. It aims to integrate many levels of information (from genomics and circuits to behavior and self-reports) in order to explore basic dimensions of functioning that span the full range of human behavior (from normal to pathological).

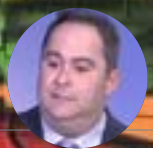
Improving the prevention of sex offending requires multidisciplinary and comprehensive studies (from the general population to sexual offenders). To meet this aim, we are planning to respond to both national and European (or international) calls for proposals next year.

We believe that these researches could provide the basis for awareness raising and training of professionals, for disseminating information to the general public, and for improving risk assessment and prevention of sexual violence.

We responded to the French National Research Agency (ANR) request for proposal (AAPG 2020). After succeeding in the first step, we are now competing for the final selection. Our project is titled "From fantasies to problematic sexual behavior and sexual violence in youth aged 18 to 25" (acronym FRIDA). The FRIDA project team includes all members of the Studium consortium ARSA and two medical research units of Tours University Hospital: INSERM U 1253 iBrain (Imagery and Brain) and INSERM CIC-P 1415 (clinical investigation center).

PARTNERS

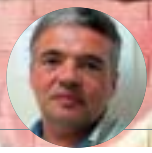
Prof. Thierry Pham
University of Mons - BE



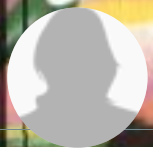
Prof. Jean-Pierre Guay
University of Montreal - CA

Prof. Christian Joyal
University of Montreal - CA

Prof. Stéphane De Brito
University of Birmingham - UK



Prof. Philippe Allain
University of Angers - FR



Dr Catherine Potard
University of Angers - FR

AROUND THE PROJECT

Oral communication

- February 7, 2019 Conference on the sexual offenders "Towards a new way of exploring coercive sexual relations» Organized by The Studium Loire Valley Institute for Advanced Studies for foreign researchers hosted by the University of Tours (Fellows in residence).

TRANSDISCIPLINARY APPROACH

Emblematic of the transdisciplinary approach developed 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 and Professors in residence, their laboratory hosts and guests from the scientific, industrial and institutional sectors. Each month, two of them are invited to present their research project and scientific objectives. Visits of laboratories, experiments, museum, remarkable places are organised to enlarge everyone's experience in the region.

All international researchers visiting the Centre-Val de Loire region are invited to attend these meetings. Regional PhD students of Doctoral Schools have the possibility to register and attend these seminars to enlarge their scientific field and discover new disciplines. A regular attendance enables them to validate credits.

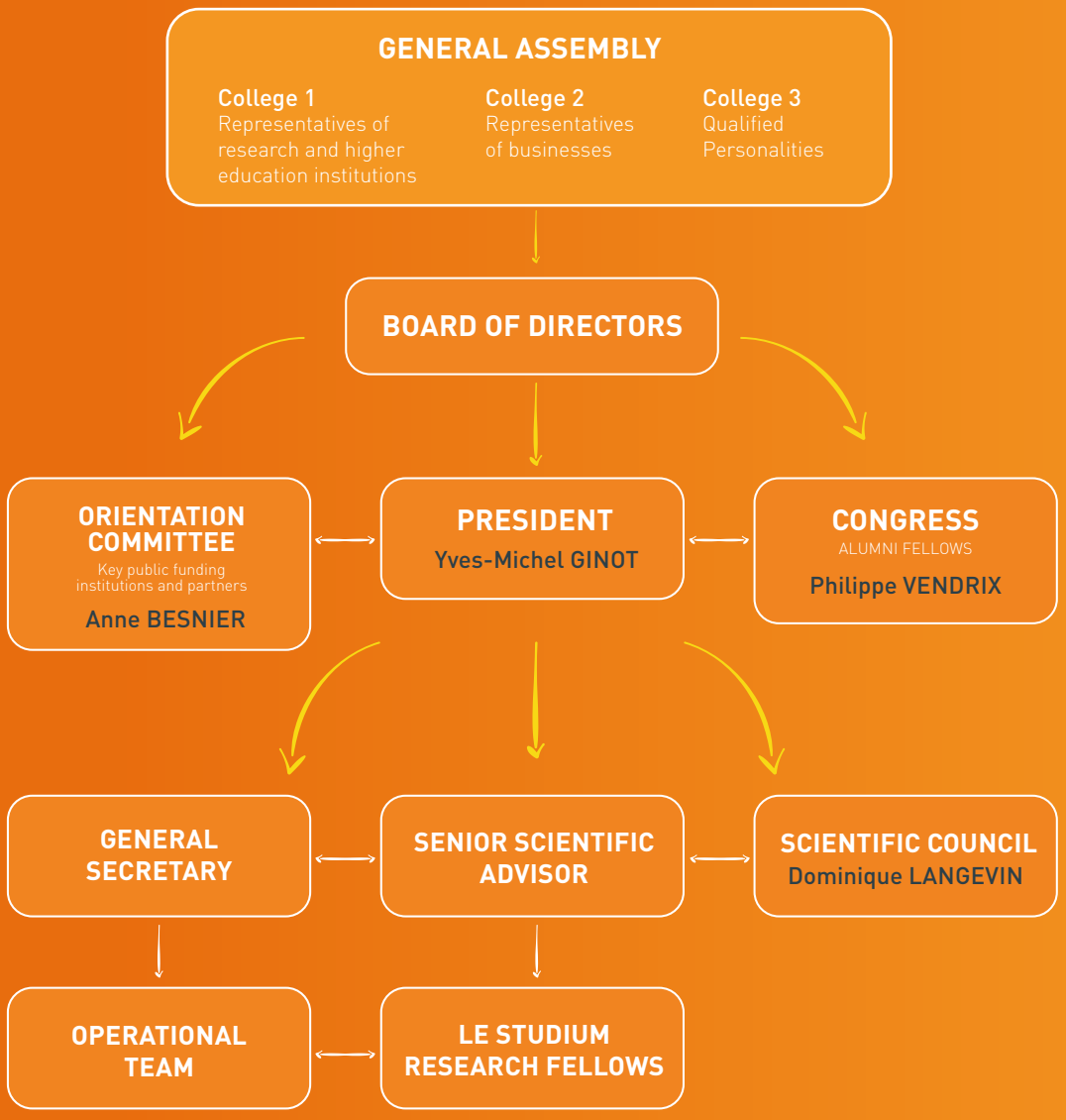

THURSDAY
5th September 2019 - 14H00
Music and Digital Scholarship: Lessons from the Renaissance
2nd May 2019 - 14H00
Macromolecular crowding: a physicist's perspective on understanding molecular motors in the complex environment of a living cell
4th April 2019 - 14H00
7th November 2019 - 14H00
Reproductive challenges of the 21st century
4th July 2019 - 14H00
Chiral matter: from quarks to quantum computers
10th January 2019 - 14H00
On a neglected insect-borne disease, its vectors and the rational control of parasite transmission
5th December 2019 - 14H00
Microorganisms and climate change: a critical piece in the global environmental puzzle
Oxydative stress: from molecular structure to health
7th November 2019 - 14H00
7th February 2019 - 14H00
Towards a new way of exploring coercive sexual relations?
2nd May 2019 - 14H00
5th September 2019 - 14H00
Ontology for cultural heritage
10th January 2019 - 14H00
European Identity in Cinema in the Era of Mass Migration

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, Professors and Visiting Researchers benefit from exceptional living and working conditions. Well established research institutions and laboratories offer their office and equipment facilities and LE STUDIUM offers fully furnished residences and high-quality integration support and assistance. During their residency time in the region, each of them has the opportunity to attend many international events and to organise at least a major one.

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 international visiting scientists in a newly renovated castle of the 18th century, Le Chateau 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. In the dynamic city of Tours, LE STUDIUM maintains a few private residencies in the city centre. Tours is a university town with a highly developed touristic and cultural offer. Every year social and networking events are organised giving international LE STUDIUM international scientists a chance to discover more of the regional scientific and cultural environment and deepen their interdisciplinary skills and exchanges.

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 past year's activities. Every four years, this General Assembly reviews the composition and elects a new Board of Directors. Local and regional institutions are represented at LE STUDIUM Orientation Committee. The Board of Directors and the Orientation Committee meet two to three times a year to review the activities according to an agreed strategic plan. The Board of Directors prepares reports and decisions to be submitted to the General Assembly. The President of LE STUDIUM is appointed for four 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

LE STUDIUM Scientific Council establishes the final ranking of applications and recommends fellowship, professorship and consortium awards. It is composed of independent external senior scientists who gather once a year in June to analyse 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 2018-2019, LE STUDIUM Scientific Council members were:

PRESIDENT

Dominique LANGEVIN
Research Director at CNRS, Physics and Engineering Sciences, Laboratory of Solid State Physics at the University of Paris-Sud-Orsay- FR

MEMBERS

Dominique ALLART
Professor, Director of Service d'Histoire et Technologie des Arts plastiques (Temps modernes), University of Liège - BE

Laura BACIOU
Professor, Biophysicist, Laboratory of Physical Chemistry at the University of Paris-Sud - FR

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

James A. DIAS
Professor, Biomedical Sciences, University of the State of New York - USA

Mark GOERBIG
Professor Theoretical Physiscs, CNRS Research Director, Laboratoire de Physique des Solides, Université Paris-Sud, Saclay - FR

Marc GOUJON
Social and Human Sciences, French National Scientific Research Centre - FR

Aylin Carla HANYALOGLU
Doctor in Molecular Biology, Imperial College London, Faculty of Medicine - UK

David HULMES
Research Director in biology, Centre National de Recherche Scientifique, Ecole Normale Supérieure of Lyon - FR

Piotr LAIDLER
Professor, Head Chair of Medical Biochemistry, Jagiellonian University Medical College, Krakow - PL

Jean-Claude LECRON
Professor in biochemistry and Immunology, University of Poitiers, Hospital practitioner at the University Hospital of Poitiers - FR

Federica MIGLIARDO
Professor in Biophysicist, Universita' degli Studi di Messina, Italy / Institut de Biologie Intégrative de la Cellule, CNRS, Saclay - FR

John O'BRIEN
Professor, Director of Studies in the School of Modern Languages and Cultures, Durham University - UK

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

Alain PRIOU
Professor, Physics, Université Paris Ouest Nanterre La Défense - FR

Sébastien ROSE
R&D Director of Axyntis Group, Fine chemistry and engineering, Pithiviers, FR

Jean-Pierre SAMAMA
Research Director in biophysics, Centre National de Recherche Scientifique, Synchrotron Soleil - FR

Alain THOREL
Doctor in physico-chemistry, MINES ParisTech - FR

Emmanuel TRELAT
Professor, Mathematics, La Sorbonne University, Laboratoire Jacques-Louis Lions, CNRS - FR

Laurent TISSOT
Professor in Contemporary history, University of Neuchâtel - CH

Ralph WATZEL
Professor, Geology and geophysics, President of the Federal Institute for Geosciences and Natural Resources (BGR), Hannover - DE

Friedrich-W WELLMER
Professor, Geology and geophysics, Former President of the Federal Institute for Geosciences and Natural Resources - DE

THE FOLLOWING PERMANENT GUESTS ATTENDED THE COUNCIL MEETINGS: REPRESENTATIVES OF HIGHER EDUCATION INSTITUTIONS, RESEARCH ORGANIZATIONS AND REGIONAL INSTITUTIONS

Christian ANDRES
Inserm Scientific Correspondent

Christelle BARTHET
Scientific Assistant, CEA Le Ripault, Tours

Catherine BEAUMONT
President Centre INRAE Val-de-Loire

Ary BRUAND
President University of Orleans, represented by Ioan TODINCA, Vice-President Research

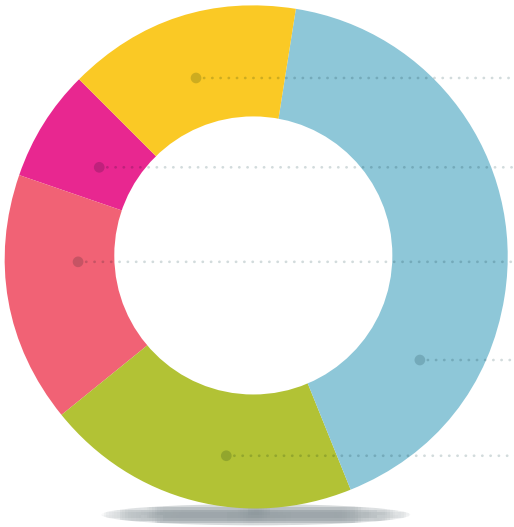
Yves-Michel GINOT
Director of Pharmaceuticals Innovation, Servier Group, Orléans, LE STUDIUM President

Hélène PAUWELS
Research Branch, BRGM, Orléans

Philippe VENDRIX
President University of Tours, represented by Daniel ALQUIER, Vice-President Research

ORIGIN OF LE STUDIUM RESEARCH FELLOW

THEMATICS REPARTITION SINCE 1996



EARTH, ECOLOGY AND ENVIRONMENTAL SCIENCES	14%
COMPUTER SCIENCE, MATHEMATICS AND MATHEMATICAL PHYSICS	7%
HUMAN AND SOCIAL SCIENCES	18%
LIFE AND HEALTH SCIENCES	40%
MATERIALS AND ENERGY SCIENCES	21%

IN REGION CENTRE VAL DE LOIRE SINCE 1996

2019 FINANCIAL DATA

2019 EXPENDITURES REPARTITION

1 239 801 €

SMART LOIRE VALLEY GENERAL PROGRAMME

1 256 755 €

AR2020 REGIONAL PROGAMMES

163 361 €

GENERAL ADM. & HUMAN RESOURCES COSTS

2019 FINANCIAL RESOURCES

REGION CENTRE VAL DE LOIRE	62%
EUROPEAN FUNDS	27%
UNIVERSITY OF TOURS	4%
ORLEANS METROPOLE	3%
PRIVATE COUNTRIBUTIONS	2%
VARIOUS	2%

2019 EVENTS PANORAMA

2019

JANUARY

10 Jan — **On a neglected insect-borne disease, its vectors and the rational control of parasite transmission**
Dr Marcelo Lorenzo
Villa Rabelais, Tours

10 Jan — **European Identity in Cinema in the Era of Mass Migration**
Prof. Temenuga Trifonova
Villa Rabelais, Tours

14-18 — **Assessment of Risk of Sexual Assault: Psychological adjustment, neuropsychological and psychiatric determinants - 1st meeting**
Dr Robert Courtois
Les Tanneurs, University of Tours, Tours

28-30 — **Induced Pluripotent Stem Cells (iPSCs): From Disease Models to Mini-Organs**
Dr Denis Reis de Assis & Prof. Hélène Blasco
CCI Touraine, Tours

29 Jan — **Les cellules souches : panacée ou boîte de Pandore ?**
Prof. Christian Andres
Faculty of Medicine, Tours

FEBRUARY

5-6 Feb — ***Refactoring Monoterpenoid Indole Alkaloid Biosynthesis in Microbial Cell Factories (MIAMi)***
Dr Vincent Courdavault & Prof. Nathalie Guivarc'h - La Villa Rabelais, Tours

7 Feb — **Towards a new way of exploring coercive sexual relations?**
Dr Robert Courtois
Villa Rabelais, Tours

7 Feb — **Art and the city: urban aesthetics in the changing neoliberal landscape**
Dr Tijen Tunali
Villa Rabelais, Tours

14 Feb — **Lipidomics, an effective molecular tool for food and cosmetic innovations in the new field of nutricosmetic**
Dr Itziar Tueros
University of Orléans, Orléans

MARCH

7 Mar — ***Weeds and their control in the sustainable agriculture***
Dr Agnieszka Synowiec
University Pole of Chartres, Chartres

11 Mar — **PGBD-Day - The domesticated PGBD5 transposase from its molecular characterization to its physiological roles**
Yves Bigot
Hôtel Oceania l'Univers, Tours

12-15 — **Adapting forest ecosystems and wood products to biotic and abiotic stress**
Dr Guillermina Dalla-Salda & Dr Philippe Rozenberg - Bariloche, Argentina

19 Mar — **Epilepsie - Recherche et aspects cliniques**
Prof. Viviane Bouilleret & Dr Emmanuel Barbeau - Hôtel Dupanloup, Orléans

27-28 — ***Time and Science in the Liber Floridus of Lambert of Saint-Omer***
Dr Patrizia Carmassi & Prof. Jean-Patrice Boudet
Hôtel Dupanloup, Orléans

27 Mar — **Temps, le Liber Floridus et la science des astres au XIIe siècle**
Prof. Charles Burnett
Hôtel Dupanloup, Orléans

APRIL

2-3 Apr — ***On the Ruins and Margins of European Identity in Cinema: European Identity in the Era of Mass Migration***
Prof. Temenuga Trifonova & Dr Raphaële Bertho (InTRu)
University Library of Les Tanneurs, Tours

2 Apr — **Incarner les migrants: un questionnement artistique, éthique et politique**
Dr Raphaële Bertho & Mathieu Pernot
Arcades Institute, Tours

4 Apr — **Putting some skin in the spectroscopy game : probing the integrity of laboratory-grown models of human skin for testing cosmetics using Raman spectroscopy**
Dr Yuri Dancik
Amphi Beaumont, Tours

4 Apr — **Critical features of innate immunity at biomineralized barriers**
Prof. Maxwell Hincke (BOA)
Amphi Beaumont, Tours

25-26 — **2019 International Conference on Fractional Calculus Theory and Applications (ICFCTA 2019)**
Prof. Yiming Chen & Prof. Driss Boutat
INSA Centre Val de Loire, Bourges

29 Apr — **Orient Latin et région Centre-Val-de-Loire. Les importations de monnaies « régionales » dans le royaume latin de Jérusalem, 1099-1291**
Dr Robert Kool - Hôtel Dupanloup, Orléans

MAY

2 May — **Macromolecular crowding: a physicist's perspective on understanding molecular motions in the complex environment of a living cell**
Prof. Anand Yethiraj
Hôtel Dupanloup, Orléans

2 May — **Revisiting the reaction of OH + SO2: a crucial reaction in the chemistry of our atmosphere**
Dr Max McGillen
Hôtel Dupanloup, Orléans

6-10 — **Ecohydraulics and dam removal 3rd meeting**
Prof. Karl Matthias Wantzen
MSH Val de Loire, Tours

13-15 — **Biological Activities of Essential Oils**
Dr Agnieszka Synowiec & Dr Christophe Hano
Hôtel Dupanloup, Orléans

13 May — **Le parfum des roses, une petite histoire en 5 actes**
Dr Jean-Claude Caissard
Hôtel Dupanloup, Orléans

13-17 — **Plasma Cosmetic Consortium - 1st meeting**
Dr Eric Robert
Hôtel Dupanloup, Orléans

Themes in color

- CONFERENCE
- PUBLIC LECTURE
- THURSDAY
- SUMMER SCHOOL
- RENCONTRE LEONARDO
- CONSORTIUM
- AFFILIATED EVENT
- EXPERTS DAYS
- WORKSHOP

20-24 — **Lanthanide-Based Agents for Sensitive and Selective Near-Infrared Imaging of Living Biologicals Systems - 3rd meeting**
Dr Svetlana Eliseeva
Hôtel Dupanloup, Orléans

20 May — **DNA sensing and STING activation in lung inflammation**
Dr Valérie Quesniaux & Dr Dieudonnée Togbe
Hôtel Dupanloup, Orléans

21-23 — **New avenues for the behavioral manipulation of disease vectors**
Dr Marcelo Lorenzo & Prof. Claudio Lazzari
MSH Val de Loire, Tours

21 May — **Biologie d'un envahisseur : le moustique tigre Aedes albopictus**
Dr Guillaume Lacour - HQ, Tours

28-29 — **Forging glances. Images and visual cultures in XIXth century Latin America**
Dr Carmen Díaz Orozco & Dr Brigitte Natanson
Hôtel Dupanloup, Orléans

28 May — ***La construction de la femme moderne dans la presse illustrée parisienne du XIXe siècle***
Dr Mónica Cárdenas - Hôtel Dupanloup, Orléans

JUNE

11-14 — **Knee Osteoarthritis Predictive Imaging Consortium - 1st meeting**
Dr Eric Lespessailles
Hôtel Dupanloup, Orléans

14 Jun — **Vine & Wine**
Prof. Nathalie Guivarc'h & Dr Arnaud Lanoue
Sancerre Town Hall, Sancerre

17-21 — **Multi-isotope and chemical tracing for understanding the sources and fate of macronutrients at the basin scale (MUTUAL) 4th meeting**
Dr Wolfram Kloppmann
Hôtel Dupanloup, Orléans

18 Jun — **N and P cycling in catchments: How can isotopes guide water resources management?**
Dr Wolfram Kloppmann
Hôtel Dupanloup, Orléans

27-28 — **Knowledge's frontiers in water unsaturated hydrogeosystems: interface dynamics, heterogeneities & couplings**
Dr Mohamed Azaroual & Prof. Lionel Mercury
OSUC, Orléans

28 Jun — **Climate, air quality, and health: long-term goals and near-term actions**
Prof. Akkihebbal Ravishankara, Dr Abdelwahid Mellouki & Prof. Mario J. Molina - Chemistry Nobel Prize (1995)
Auditorium Jean Zay, Orléans

JULY

4 Jul — **Chiral matter: from quarks to quantum computers**
Prof. Dmitri Kharzeev
Matra Museum, Romorantin-Lanthenay

15-19 — **CosmeNovIC: Plant Natural Products production by novel in vitro culture approaches for improved cosmeceuticals efficiency and security - 1st meeting**
Dr Christophe Hano & Prof. Nathalie Guivarch
Tours

SEPTEMBER

5 Sep — **Ontology for cultural heritage**
Dr Emilio M. Sanfilippo
CESR, Tours

5 Sep — **Music and Digital Scholarship: Lessons from the Renaissance**
Prof. Richard Freedman
CESR, Tours

23-27 — **Assessment of Risk of Sexual Assault: Psychological adjustment, neuropsychological and psychiatric determinants - 2nd meeting**
Dr Robert Courtois
Villa Rabelais, Tours

OCTOBER

2 Oct — **Les secrets de la couleur des verres et des céramiques**
Jacques Livage
Hôtel Dupanloup, Orléans

3 Oct — **Inventing new reactions for chemical proteins synthesis**
Dr Thimmalapura Marulappa Vishwanatha
Hôtel Dupanloup, Orléans

14-18 — **Lanthanide-Based Agents for Sensitive and Selective Near-Infrared Imaging of Living Biologicals Systems - 4th meeting**
Dr Svetlana Eliseeva
Hôtel Dupanloup, Orléans

14 Oct — **Les Vikings en France - les monnaies racontent**
Jens Christian Moesgaard
Hôtel Dupanloup, Orléans

16-18 — **Targeting GPCR to generate life, preserve the environment and improve animal breeding: technological and pharmacological challenges**
Prof. Manuela Simoni,
Dr Frédéric Jean-Alphonse, Dr Pascale Crépieux & Dr Eric Reiter - Villa Rabelais, Tours

16 Oct — **Les perturbateurs endocriniens et la nouvelle toxicologie**
Prof. Robert Barouki
City Hall, Tours

NOVEMBER

4-8 — **Pharmacological and nutritional targeting of voltage-gated sodium channels in the treatment of epithelial cancers 4th meeting**
Dr Sébastien Roger
Villa Rabelais, Tours

7 Nov — **Investigating gonadotropin hormone actions on the cellular level: Toward a better knowledge and control of gonadal biology**
Dr Frédéric Jean-Alphonse
Centre INRAE Val de Loire, Nouzilly

7 Nov — **Reproductive challenges of the 21st century**
Prof. Manuela Simoni
Centre INRAE Val de Loire, Nouzilly

14-16 — **Counterpoints: Renaissance Music and Scholarly Debate in the Digital Domain**
Prof. Richard Freedman & Prof. Philippe Vendrix
CESR, Tours

18-22 — **Knee Osteoarthritis Predictive Imaging Consortium - 2nd meeting**
Dr Eric Lespessailles
Hôtel Dupanloup, Orléans

20 Nov — **Les principes physiques dans les projets architecturaux de Léonard de Vinci**
Prof. Salvatore Magazù
Hôtel Dupanloup, Orléans

25-26 — **Extracellular vesicules in amyotrophic lateral sclerosis - from biomarkers to therapeutic targets - 1st meeting**
Prof. Hélène Blasco
Faculty of Medicine, Tours

25-29 — **GLobAl Digital SOIL MAP (GLADSOILMAP) - 1st meeting**
Dr Dominique Arrouays
Hôtel Dupanloup, Orléans

25-27 — **International Meeting on Plasma Cosmetic Science**
Dr Eric Robert, Dr Jean-Michel Pouvesle & Dr Catherine Grillon
Hôtel Dupanloup, Orléans

25 Nov — **En 2019, faut-il avoir peur des cosmétiques ?**
Dr Céline Couteau & Dr Laurence Coiffard - Hôtel Dupanloup, Orléans

27-29 — **Raman spectroscopy in cosmetic sciences : From quality control to in vivo objectivation - 1st meeting**
Dr Franck Bonnier (NMNS)
University of Tours, Tours

DECEMBER

2-4 Dec — **Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies**
Dr Yuri Dancik & Dr Franck Bonnier - City Hall, Tours

2 Dec — **Produits cosmétiques: Parlons pénétration cutanée!**
Dr Yuri Dancik & Dr Franck Bonnier - City Hall, Tours

2-6 — **CosmeNovIC: Plant Natural Products production by novel in vitro culture approaches for improved cosmeceuticals efficiency and security 2nd meeting**
Dr Christophe Hano
BBV, Tours

5 Dec — **Microorganisms and climate change: a critical piece in the global environmental puzzle**
Dr Juanita Mora-Gómez
Hôtel Dupanloup, Orléans

5 Dec — **Oxydative stress: from molecular structure to health**
Dr Arlette Richaud-Torres
Hôtel Dupanloup, Orléans

12 Dec — **Biodiversité végétale Malagasy : Une richesse d'exception pour un développement des communautés locales ?**
Dr Mahenina Manase, University of Antsiranana - ICOA, Orléans

2020

LIST OF RESEARCHERS IN RESIDENCE IN 2019

SMART LOIRE VALLEY GENERAL PROGRAMME

Dr PATRIZIA CARMASSI
Questions about time in early medieval culture: Literature, theology and science
April 2018 - May 2019
In residence at : POuvoirs, LEttres, Normes (POLEN) - EA 4710 - Université d'Orléans
Host scientist : Prof. Jean-Patrice Boudet

Prof. GUOXIAN CHEN
Numerical simulation of singular conservation laws and related applications
January 2018 - January 2019
In residence at : Institut Denis Poisson (IDP) - UMR EA 7013 - Université d'Orléans, Université de Tours, CNRS
Host scientist : Prof. Magali Ribot

Prof. YIMING CHEN
Observer Design for Distributed-Parameter Systems and Fractional Order Systems
April 2019 - June 2019
In residence at : Laboratoire Pluridisciplinaire de Recherche en Ingénierie des Systèmes, Mécanique, Énergétique (PRISME), Université d'Orleans, INSA Centre Val De Loire
Host scientist : Prof. Driss Boutat

Dr GUILLAUME COLLET
Earlier tumor diagnostic combined with radio-preconditioning in cancer therapy : a novel near-infrared emitting nanomofs for oxygen delivery
September 2019 - August 2020
In residence at : Centre de Biophysique Moléculaire (CBM) - UPR 4301 - CNRS
Host scientist : Prof. Stéphane Petoud

Prof. IGOR DENYSENKO
Modeling of reactive plasmas for nanoparticle synthesis
May 2019 - July 2019
In residence at : Groupe de Recherches sur l'Energétique des Milieux Ionisés (GREMI) - UMR 7344 - Université d'Orléans, CNRS
Host scientist : Dr Maxim Mikikian

Dr CARMEN DIAZ OROZCO
Participation of women and nations under construction in Latin America in the nineteenth century: the commitment of Mariquita Sánchez and Juana Manso in education in Argentina
July 2018 - July 2019
In residence at : REceptions et MEdiations de Littérature et de Cultures étrangères et comparées (REMELICE) - EA 4709 - Université d'Orléans
Host scientist : Dr Brigitte Natanson

Dr MAHMUT ELBISTAN
Chiral Particles, Anomalies, and Helicity
January 2019 - January 2020
In residence at : Institut Denis Poisson (IDP) - UMR 7013 - Université d'Orléans, Université de Tours, CNRS
Host scientist : Prof. Peter Horvathy

Prof. RICHARD FREEDMAN
CRIM: the Renaissance Imitation Mass
January 2019 - January 2020
In residence at : Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS
Host scientist : Prof. Philippe Vendrix

Prof. MAXWELL HINCKE
Evolution of Innate Immunity at Biomineralized Barriers
March 2019 - May 2019
In residence at : BOA - UMR 0083 - Centre INRAE Val de Loire, Université de Tours
Host scientist : Dr Sophie Rehault-Godbert

Dr KI-WON HONG
Theory of justice by Guillaume Budé (1468-1540): arguments, method, and influence on the sixteenth-century lawyers
September 2019 - August 2020
In residence at : Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS
Host scientist : Prof. Stephan Geonget

Dr MARGRIET HOOGVLIET
Religious «lieux de savoir» in premodern Tours and Orléans: A Social and Spatial Approach to Religious Reading in French (c. 1450-c. 1550)
June 2019 - June 2020
In residence at : Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS
Host scientist : Prof. Chiara Lastraioli

Prof. DMITRI KHARZEEV
Chiral matter: theory and applications
June 2019 - August 2019
In residence at : Institut Denis Poisson (IDP) - UMR 7013 - Université d'Orléans, Université de Tours, CNRS
Host scientist : Dr Maxim Chernodub

Dr MARCELO GUSTAVO LORENZO
Genomics of learning and memory in disease vector insects
May 2018 - May 2019
In residence at : Institut de Recherche sur la Biologie de l'Insecte (IRBI) - UMR 7261 - Université de Tours, CNRS
Host scientist : Prof. Claudio Ricardo Lazzari

Prof. IGOR LIMA MALDONADO
Characterization of Limbic System Connectivity through fiber dissection and diffusion imaging techniques
January 2018 - December 2019
In residence at : Imagerie et Cerveau (IC) - UMR 1253 - Université de Tours, Inserm
Host scientist : Prof. Christophe Destrieux

Dr MAGDALENA MALINOWSKA
Grape Metabolomics & Cell Cosmetics
October 2019 - September 2020
In residence at : Biomolécules et Biotechnologies Végétales (BBV) – EA 2106 - Université de Tours
Host scientist : Dr Arnaud Lanoue

Dr MICHAEL PITCHER
New metastable oxides by rapid cooling from the melt and low temperature devitrification
September 2019 - September 2020
In residence at : Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) – UPR 3079 - CNRS
Host scientist : Dr Mathieu Allix

Dr LAURA PIVETEAU
NMR Study of Disordered Inorganic Materials Using Spin Diffusion
September 2019 - September 2020
In residence at : Conditions Extrêmes et Matériaux: Haute Température et Irradiation (CEMHTI) – UPR 3079 - CNRS
Host scientist : Dr Dominique Massiot

Dr FRANCISCO MENDEZ RUIZ
Coordination compounds as antioxidants: activity evaluation by combining first-principle calculations and solid-state NMR
December 2019 - December 2020
In residence at: Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS
Host scientist: Dr Pierre Florian

Prof. AKKIHEBBAL RAVISHANKARA
Interlinkages in the chemistries of the troposphere and stratosphere: impacts of nitrous oxide on Earth system
May 2019 - July 2019
In residence at: Institut de Combustion Aérothermique Réactivité et Environnement (ICARE) - UPR 3021 - CNRS
Host scientist: Dr Abdelwahid Mellouki

Dr ARLETTE RICHAUD TORRES
Coordination compounds as antioxidants: activity evaluation by combining first-principle calculations and solid-state NMR
June 2019 - May 2020
In residence at: Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS
Host scientist: Dr Pierre Florian

Prof. GEORG VON SAMSON-HIMMELSTJERNA
Combined effects of drug-target and non-drug-target resistance mechanism in ascarids
October 2019 - September 2020
In residence at: Infectiologie et Santé Publique (ISP) – UMR 1282 - Centre INRAE Val de Loire, Université de Tours
Host scientific: Dr Cédric Neveu

Prof. MANUELA SIMONI
Pleotropism of Gonadotropin action
April 2019 – April 2020
In residence at: Physiologie de la Reproduction et des Comportements (PRC) - UMR 7247 - Centre INRAE Val de Loire - Université de Tours, CNRS, IFCE
Host scientist: Dr Pascale Crépieux

Dr AGNIESZKA SYNOWIEC
Biological effects of essential oils
September 2018 - September 2019
In residence at: Laboratoire de Biologie des Ligneux et des Grandes Cultures (LBLGC) - UPRES EA 1207 / USC INRAE 1328, Université d'Orléans
Host scientist: Dr Christophe Hano

Dr REBECCA THARME
Biological and cultural diversity, and flow regimes – a unifying approach for managing riverscapes
November 2019 - October 2020
In residence at: CItés, TERritoires, Environnement et Sociétés (CITERES) - UMR 7324 - Université de Tours, CNRS
Host scientist: Prof. Matthias Wantzen

Prof. TEMENUGA TRIFONOVA
On the Ruins and Margins of European Identity in Cinema: European Identity in the Era of the Global
June 2018 – May 2019
In residence at: Interactions, Transferts, Ruptures artistiques et culturelles (InTRu) - EA 6301 - Université de Tours
Host scientist: Prof. Raphaële Bertho

Dr TIJEN TUNALI
Art and the city: Urban space, art and social movements
September 2018 - September 2019
In residence at: CItés, TERritoires, Environnement et Sociétés (CITERES) - UMR 7324 - Université de Tours, CNRS
Host scientist: Dr Gülçin Erdi Lelandais

Dr THIMMALAPURA MARULAPPA VISHWANATHA
Development of novel chemoselective ligation techniques for protein synthesis
July 2018 - May 2020
In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 4301 – CNRS
Host scientist: Dr Vincent Aucagne

Dr WOLFGANG WISNIEWSKI
Mechanisms of glass crystallization analyzed by electron backscatter diffraction (EBSD)
September 2019 - August 2020
In residence at: Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS
Host scientist: Dr Mathieu Allix

Prof. ANAND YETHIRAJ
Macromolecular crowding: a physicist's perspective on understanding molecular motions in the complex environment of a living cell
September 2018 - September 2019
In residence at : Centre de Biophysique Moléculaire (CBM) - UPR 4301 – CNRS
Host scientist: Prof. Francesco Piazza

ARD2020 COSMETOSCIENCES PROGRAMME

Dr BILAL HAIDER ABBASI
Strategies to enhance cosmeceuticals in in vitro cultures of herbal plants
January 2018 - September 2019
In residence at: Biomolécules et Biotechnologies Végétales (BBV) – EA 2106 - Université de Tours / Laboratoire de Biologie des Ligneux et des Grandes Cultures (LBLGC) EA1207 – Université d'Orléans
Host scientists: Prof. Nathalie Guivarch (BBV) and Dr Christophe Hano (LBLGC)

Dr YURI DANCIK
Molecular imaging using Raman spectroscopy: from fundamental research to industrial applications
October 2018 – June 2020
In residence at: NanoMédicaments et NanoSondes (NMNS) - EA6295 - Université de Tours
Host scientist: Dr Frank Bonnier

ARD2020 BIOPHARMACEUTICALS PROGRAMME

Dr GREGORY GUIRIMAND
Bio-production of vindoline and catharanthine by recombinant yeast cell factories Bio-production of vindoline and catharanthine by recombinant yeast cell factories
June 2019 - July 2020
In residence at: Biomolécules et Biotechnologies Végétales (BBV) – EA 2106 - Université de Tours
Host scientist: Dr Vincent Courdavault

Prof. PIETER HIEMSTRA
Development and application of well-differentiated culture models of primary airway epithelium from various sources
September 2019 - October 2019
In residence at: Centre d'Etude des Pathologies Respiratoires (CEPR) – UMR 1100 - Université de Tours, Inserm
Host scientist: Dr Mustapha Si-Tahar

Dr FREDERIC JEAN-ALPHONSE
Targeting CGPR with antibodies
November 2018 - May 2020
In residence at: Physiologie de la Reproduction et des Comportements (PRC) - UMR 7247 - Centre INRAE Val de Loire - Université de Tours, CNRS, IFCE
Host Scientist: Dr Eric Reiter

Dr MAGDIEL PEREZ CRUZ
Therapeutic use of Periostin antibody and CAR Treg in papain and HDM induced severe asthma in mice
October 2019 - September 2020
In residence at : Immunologie et Neurogénétique Expérimentales et Moléculaires (INEM) - UMR 7355 – Université d'Orléans, CNRS
Host scientist: Dr Bernhard Ryffel

Dr DENIS REIS DE ASSIS
Recombinant Intrabodies as Molecular Tools and Potential Therapeutics for Amyotrophic Lateral Sclerosis
March 2018 - April 2019
In residence at: Imagerie et Cerveau (IC) - UMR 1253 - Université de Tours, Inserm
Host sicentist: Prof. Hélène Blasco

ARD2020 PIVOTS PROGRAMME

Dr MAX McGILLEN
Experimental measurements of atmospheric chemical reactions
April 2019 - September 2019
In residence at: Institut de Combustion Aérothermique Réactivité et Environnement (ICARE) - UPR 3021 - CNRS
Host scientists: Prof. Abdelwahid Mellouki & Dr Véronique Daële

Dr JUANITA MORA-GOMEZ
Role of microorganisms in the Carbon Cycling of Peatlands
April 2019 - September 2020
In residence at: Institut des Sciences de la Terre d'Orléans (ISTO) - UMR 7327 - Université d'Orléans, BRGM
Host scientists: Dr Fatima Laggoun Défarge & Dr Sébastien Gogo

ARD2020 LAVOISIER PROGRAMME

Dr ARUNABH GHOSH
Design, formulation and characterisation of new safer electrolytes for electrochemical storage of energy
February 2019 - December 2020
In residence at: Physicochimie des Matériaux et des Electrolytes pour l'Energie (PCM2E) - EA 6299 - Université de Tours
Host scientist: Prof. Fouad Ghamouss

Dr SATYAJIT PHADKE
Energy storage systems
January 2016 - June 2019
In residence at: Physicochimie des Matériaux et des Electrolytes pour l'Energie (PCM2E) - EA 6299 - Université de Tours
Host scientist: Prof. Meriem Anouti

Dr EDURNE SERRANO-LARREA
Electrochemical energy conversion based on metal-free nanoporous electrocatalysts
October 2019 - October 2020
In residence at: Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS
Host scientists: Dr Conchi Ania & Dr Encarnacion Raymundo-Piñero

ARD2020 INTELLIGENCE DES PATRIMOINES PROGRAMME

Dr EMILIO SANFILIPPO
Ontology-based data integration for the digital humanities
April 2019 - August 2020
In residence at: Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS
Host scientist: Prof. Benoist Pierre

Dr MARION LAME
Scholarly Data Editing
July 2019 - June 2020
In residence at: Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS
Host scientist: Prof. Benoist Pierre

SMART LOIRE VALLEY GENERAL PROGRAMME AWARDS SELECTION OF CAMPAIGN 2019

LE STUDIUM RESEARCH FELLOWSHIP

Dr GUILLAUME COLLET
Earlier tumor diagnostic combined with radio-preconditioning in cancer therapy : a novel near-infrared emitting nanomofs for oxygen delivery
September 2019- August 2020
In residence at: Centre de Biophysique Moléculaire (CBM) - UPR 430 – CNRS
Host scientist: Prof. Stéphane Petoud

Prof. RAPHAEL CAHEN
Sociological and Cultural History of International Law (1815-1871)
From: Ghent University, Belgium
Host scientist: Prof Pierre Allorant
POuvoirs, LEttres, Normes (POLEN) - EA 4710 - Université d'Orléans, CNRS

Dr JEAN-FRANÇOIS DELUCHEY
At the margins of neoliberal governmentality: the extermination of peripheral youth in the Brazilian Amazon region
From: Federal University of Pará, Brazil
Host scientist: Dr Nathalie Champroux
Interactions Culturelles et Discursives (ICD) - EA 6297- Université de Tours

Prof. VALERIE HAYAERT
Justitiart. Images of Justice: a European survey of Legal Symbolism
From: Bonn University, Germany
Host scientist: Prof. Stephan Geonget
Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS

Dr KI-WON HONG
Theory of justice by Guillaume Budé (1468-1540): arguments, method, and influence on the sixteenth-century lawyers
September 2019 – August 2020
Host scientist: Dr Stephan Geonget
Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS

Dr DANIELE CARVALHO BERNARDO NASCIMENTO
Role of amphiregulin in the pathophysiology of experimental polymicrobial sepsis
From: University of São Paulo, Brazil
Host scientist: Dr Valérie Quesniaux
Immunologie et Neurogénétique Expérimentales et Moléculaires (INEM) - UMR 7355 – Université d'Orléans, CNRS

Dr MICHAEL PITCHER
New metastable oxides by rapid cooling from the melt and low temperature devitrification
September 2019 - September 2020
Host scientist: Dr Mathieu Allix
Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) – UPR 3079 - CNRS

Dr MARIA CRISTINA DEL RINCON-CASTRO
Genomic characterisation of six Mexican baculovirus strains with activity against spodoptera frugiperda (lepidoptera: noctuidae)
From: University of Guanajuato, Mexico
Host scientist: Dr Elisabeth Herniou
Institut de Recherche sur la Biologie de l'Insecte (IRBI) - UMR 7261 - Université de Tours, CNRS

Prof. EUGEEN SCHREURS
Music in the collegiate church of Our Lady in Antwerp (c.1370 - c.1530): an European hub?
From: University College Antwerp, Belgium
Host scientist: Prof. Philippe Vendrix
Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS

Dr REBECCA THARME
Biological and cultural diversity, and flow regimes – a unifying approach for managing riverscapes
Host scientist: Prof. Matthias Wantzen
CItés, TERritoires, Environnement et Sociétés (CITERES) - UMR 7324 - Université de Tours, CNRS

Dr KATHERINE SMITH
Targeting fatty acid metabolism to control lung inflammation
From: Cardiff University United Kingdom
Host scientist: Dr Bernhard Ryffel
Immunologie et Neurogénétique Expérimentales et Moléculaires (INEM) - UMR 7355 – Université d'Orléans, CNRS

Dr ALEXANDRE VANAUTGAERDEN
Museion. From Space to Place: Rebuilding Memory Institutions
From: Royal Academy of Science, Letters and Fine Arts of Belgium, Belgium
Host scientist: Prof. Benoist Pierre
Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS

Dr PRIYANKA VERMA
Development of Catharanthus roseus transgenic plants with engineered catharanthine pathway via CRISPR/cas9 gene invalidation
From: National Chemical Laboratory, India
Host scientist: Dr Vincent Courdavault
Biomolécules et Biotechnologies Végétales (BBV) – EA 2106 - Université de Tours

Dr WOLFGANG WISNIEWSKI
Mechanisms of glass crystallization analyzed by electron backscatter diffraction (EBSD)
September 2019 - August 2020
Host scientist: Dr Mathieu Allix
Conditions Extrêmes et Matériaux : Haute Température et Irradiation (CEMHTI) - UPR 3079 - CNRS

Prof. ADRIAN WOLSTENHOLME
Further development of Caenorhabditis elegans as a tool for studying drug targets in parasitic nematodes
From: University of Georgia, USA
Host scientist: Dr Cédric Neveu
Infectiologie et Santé Publique (ISP) – UMR 1282 - Centre INRAE Val de Loire, Université de Tours, CNRS

Dr KATHIA ZALETA
Protein translation enhancement therapy for the treatment of Neurodegenerative diseases
From: University of California San Diego, USA
Host scientist: Prof. Patrick Vourc'h
Imagerie et Cerveau (IC) - UMR 1253 - Université de Tours, Inserm

Dr ILLIA ZYMAK
CosmOrbitrap - high resolution mass spectrometer for space application
From: Academy of Sciences of the Czech Republic
Host scientist: Dr Christelle Briois
Laboratoire de Physique et de Chimie de l'Environnement et de l'Espace (LPC2E) - UMR 7328 - Université d'Orléans, CNES, CNRS

LE STUDIUM VISITING RESEARCHER

Prof. RHEA PAUL
Integrating Linguistic and Clinical Perspectives in Developing a Tool for Identification of Child Language Disorders
From: Sacred Heart University, USA
Host scientist: Dr Sandrine Ferré
Imagerie et Cerveau (IC) - UMR 1253 - Université de Tours, Inserm

LE STUDIUM RESEARCH PROFESSORSHIP

Prof. SALVATORE MAGAZU
Interdisciplinary analysis of the Leonardo da Vinci's studies on dynamics
From: University of Messina, Italy
Host scientist: Prof. Pascal Brioist
Centre d'Etudes Supérieures de la Renaissance (CESR) - UMR 7323 - Université de Tours, CNRS

LE STUDIUM RESEARCH CONSORTIUM

Dr DOMINIQUE ARROUAYS
GLobAl Digital SOIL MAP (GLADSOILMAP)
Infosol Unit - US 1106 - Centre INRAE Val de Loire

Prof. SERGEY SOLODUKHIN
Exploration of Duality, Geometry, and Entanglement
Institut Denis Poisson (IDP) - UMR 7013 - Université d'Orléans, Université de Tours, CNRS

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