



THE PRESIDENT EDITORIAL



2022 marked the 25th anniversary of the Le Studium Loire Valley Institute for Advanced Studies (IAS). The organisation of a memorable 3-day conference programme gathered more than 200 participants around presentations and discussions offering a large panel of sciences, exquisite animations, keynote talks, international guests and distinguished speakers. Part of the recently adopted new strategic plan 2021 – 2027 engaged to better fulfil our mission of internationalisation of research in the Centre-Val de Loire region, the event “Understanding, Preserving and Improving the World around us” demonstrated the diversity the institute has been able to catalyse and mingle over the past two decades. The three qualities pertain: curiosity, imagination and intuition.

Conceived and developed over the last 25 years, this wild flower, to use the expression of its creator and founder, Professor Paul Vigny, has taken root and found its place in this territory of balance and elegance, having been very well cultivated by several successive teams. The actors of this territory and their guest researchers already tell us that Le Studium has confirmed to be a real added value to the

regional ecosystem as well as beneficial for the careers of the hosted and hosting researchers. The current activity is therefore already a win-win situation.

With the mandate to continue the work that has been achieved so far, the current team, passionately committed to the quality of its actions, consolidates this foundation and permanently thinks of other fertile seeds to propose.

Le Studium, in its format as institute for advanced studies, stands out for its broad spectrum of sciences, reflecting the diversity of the region's research institutes, and helps to irrigate them by welcoming motivated talents, rich in culture and different practices. All Le Studium partners offer a remarkable environment to all scientists joining Le Studium Loire Valley IAS. Le Studium contribution to international scientific exchanges gives an international signature recognised by visiting scientists and this largely benefits the regional research ecosystem. In parallel to its programmes and services, it has definitively become the energising place of knowledge sharing and internationalisation.

This year 2022 also marked the establishment of two new programmes. In addition to its traditional Smart Loire Valley Programme open to all scientific disciplines and experienced researchers, Le Studium was invited to join the European University ATHENA, as an associate partner of the University of Orleans and launched the ATHENA Visiting Researchers Programme. A second invitation enabled Le Studium to join a new mobility programme funded by the European Union Marie-Curie Sklodowska Actions, the French Institutes Advanced Study programme (FIAS) alongside 6 other institutes. In the framework of the new Ambition Research and Development CVL programmes, potential international partners were visited, interviewed and welcome in the region and new partnerships are under development. Le Studium team worked as well on the integration of Le Studium in other ambitious regional and international programmes. We want to thank the outstanding and faithful collaboration of our independent Scientific Council members who bring the necessary credit to our activities.

Thanks to the financial support of our regional partners (Centre-Val de Loire Regional Council, Orleans Metropole, the Orleans and Tours Universities), not forgetting the European financing brought by certain projects and the European Regional Economic Development Fund, and scientific partners (BRGM, INRAE, CEA, INSERM, INSA, CNRS), Le Studium interacted with 28 laboratories in 2022. They have welcomed our selected international researchers and together we have organised international scientific events. This brochure presents our programmes and offers a discovery path of the different profiles and projects supported through them. For us, science has human faces, smiles and personalities, and discovery nurtures itself by this multidisciplinary landscape. Respect of differences and friendship also belong to the “Le Studium experience”. It is part of an awe attitude.

Mr Yves-Michel Ginot,
President

L'ÉDITO DU PRÉSIDENT

L'année 2022 a marqué le 25ème anniversaire de l'Institut d'études avancées (IAS) Le Studium Loire Valley. L'organisation d'une conférence mémorable sur 3 jours a rassemblé plus de 200 participants autour de présentations et de discussions offrant un large panel de sciences, d'animations exquises, de conférences majeures, d'invités internationaux et d'orateurs distingués. S'inscrivant dans le cadre de notre nouveau plan stratégique 2021 - 2027 récemment adopté pour mieux remplir notre mission d'internationalisation de la recherche en région Centre-Val de Loire, l'événement «Comprendre, Préserver et Améliorer le monde qui nous entoure» a démontré la diversité des profils que l'institut a su catalyser et mélanger au cours des deux dernières décennies. Les trois qualités demeurent : la curiosité, l'imagination et l'intuition.

Conçue et cultivée depuis 25 ans, cette fleur sauvage, pour reprendre l'expression de son créateur et fondateur, le Professeur Paul Vigny, a pris racine et trouvé sa place dans ce territoire d'équilibre et d'élégance, après avoir été très bien développée par plusieurs équipes successives. Les acteurs de ce territoire et leurs chercheurs invités nous disent déjà que Le Studium a confirmé être une réelle valeur ajoutée à l'écosystème régional et bénéfique pour les carrières des chercheurs hébergés et accueillants. L'activité actuelle est donc déjà dans une situation où tout le monde est gagnant.

Mandatée pour poursuivre le travail accompli, l'équipe actuelle, passionnément attachée à la qualité de ses actions, consolide ce socle et réfléchit en permanence à d'autres idées fécondes à proposer.

Le Studium, dans son format d'institut de recherche avancée, se distingue par son large spectre de sciences, reflétant la diversité des instituts de recherche de la région, et contribue à les irriguer en accueillant des talents motivés, riches de culture et de pratiques différentes. L'ensemble des partenaires du Studium offre un environnement remarquable à tous les scientifiques qui rejoignent Le Studium Loire Valley IEA. La contribution du Studium aux échanges scientifiques internationaux donne une signature internationale reconnue par les scientifiques invités, ce qui bénéficie largement à l'écosystème régional de la recherche. Parallèlement à ses programmes et services, il est définitivement devenu le lieu dynamisant du partage des connaissances et de l'internationalisation.

Cette année 2022 a également été marquée par la mise en place de deux nouveaux programmes. En plus de son traditionnel Smart Loire Valley Programme ouvert à toutes les disciplines scientifiques et aux chercheurs expérimentés, Le Studium a été invité à rejoindre l'Université européenne ATHENA, en tant que partenaire associé de l'Université d'Orléans et a lancé le programme ATHENA Visiting Researchers. Une seconde invitation a permis au Studium de rejoindre un nouveau programme de mobilité financé par les actions Marie-Curie Sklodowska de l'Union européenne, le programme FIAS (French Institutes Advanced Study) aux côtés de 6 autres instituts. Dans le cadre des nouveaux programmes Ambition Recherche et Développement CVL, des partenaires internationaux potentiels ont été visités, interviewés et accueillis dans la région et de nouveaux partenariats sont en cours de développement. L'équipe du Studium a également travaillé sur l'intégration du Studium dans d'autres programmes régionaux et internationaux ambitieux. Nous tenons à remercier la collaboration exceptionnelle et fidèle des membres de notre Conseil scientifique indépendant qui apportent le crédit nécessaire à nos activités.

Grâce au soutien financier de nos partenaires régionaux (Conseil Régional Centre-Val de Loire, Orléans Métropole, Universités d'Orléans et de Tours), sans oublier les financements européens apportés par certains projets et le Fonds Européen de Développement Economique Régional, et des partenaires scientifiques (BRGM, INRAE, CEA, INSERM, INSA, CNRS), Le Studium a interagi avec 28 laboratoires en 2022. Ils ont accueilli les chercheurs internationaux que nous avons sélectionnés et nous avons organisé ensemble des événements scientifiques internationaux. Cette brochure présente nos programmes et propose un parcours de découverte des différents profils et projets soutenus. Pour nous, la science a des visages, des sourires et des personnalités humaines, et la découverte se nourrit de ce paysage pluridisciplinaire. Le respect des différences et l'amitié font aussi partie de l'expérience Le Studium.

Mr Yves-Michel Ginot,
President

IDENTITY & MISSIONS

LE STUDIUM Loire Valley Institute for Advanced Studies (IAS): a unique transdisciplinary approach to support research and innovation in the Centre-Val de Loire region and a multidisciplinary intellectual and human space favouring international scientific exchanges.

Established in 1996 by Prof. Paul Vigny and inspired by the historical, geographical and human cultures of the Loire Valley, LE STUDIUM Loire Valley Institute for Advanced Studies (IAS) covers all research fields in one global initiative aiming at boosting international and multidisciplinary scientific exchanges in the region and creating a dynamic scientific community that fosters knowledge, research and innovation.

Strengthening fundamental research, sharing knowledge, contributing to innovation developments and addressing global challenges are the many goals pursued by the institute.

Having welcome hundreds of highly qualified scientists, the institute contributes to the strengthening of human capital for research, development and innovation and participates in the valorisation of regional scientific research and economic influence.

LE STUDIUM Loire Valley IAS offers international invited research fellows and visitors an intellectual and human space favouring interdisciplinary exchanges and debates, offering science a human dimension and creating a path for inspired research. It is guided by the three necessary conditions required for a creative activity, namely Curiosity, Imagination and Intuition.

LE STUDIUM's programmes enable the institute to welcome the residency of experienced international researchers across all scientific disciplines and to support international collaborative research projects. The selections and recruitments happen through calls for applications and call upon high standards applying to LE STUDIUM Scientific Council and human resources management. The institute develops in parallel a rich scientific events programme including international conferences, workshops, transdisciplinary seminars, webinars, summer schools and lectures for the promotion of the scientific culture and knowledge. A dedicated contact person brings support and assistance to each selected researcher to facilitate her/his smooth and efficient installation and integration in the region from visa preparation, fully furnished housing arrangements, clearing of all administrative and technical burdens for banking, schooling, insurance...

The Smart Loire Valley Programme operated with a co-financing from the European Union in the framework of the

Marie Skłodowska-Curie Actions (COFUND) for the mobility of experienced researchers for the period 2015-2021. The programme still opens every year and offers various residency awards.

Starting in 2022, LE STUDIUM is a partner of the French Institute for Advanced Study Programme (FIAS) - cofunded by the Marie Skłodowska-Curie Actions – alongside with six other French institutes for advanced studies.

LE STUDIUM Loire Valley IAS is also a key partner of the regional council for its Ambition, Research and Development programmes initiative to support the smart specialisation strategy (S3) efforts. Thus, the projects hosted by the institute cover a wide array of key strategic scientific topics for the region.

Since 2021, LE STUDIUM is an associated partner of the ATHENA European University Consortium through a partnership with the University of Orleans with a Visiting Researchers Programme and the organisation of international events.

Based in the city center of Orleans at the Hotel Dupanloup, the International University Centre for Research, the IAS maintains deep interactions with all regional cities, research structures and stakeholders, offering its high-quality services and attractiveness to welcome talents in the Centre-Val de Loire region. It enjoys prestigious premises and exceptional facilities offering international visiting and regional researchers a memorable experience.

At the interconnection between fundamental research and innovation, LE STUDIUM works in close collaboration with all regional research partners, stakeholders and intermediaries:

- University of Orleans, University of Tours, INSA Centre-Val de Loire, ESAD Orleans
- BRGM, CNRS Centre Limousin Poitou-Charente, CEA Le Ripault, Centre INRAE Val de Loire, Inserm
- Cosmetic Valley, Polymeris, Dream, S2E2, Polepharma, Vegepolys
- Maison des Sciences de l'Homme Val de Loire, Da Vinci Labs, CHRU of Tours, CHRU Orléans, Euclide, Dev'Up, Centre-Sciences, CCI, etc...

LE STUDIUM Loire Valley Institute for Advanced Studies' awards are selected thanks to the support and expertise of the LE STUDIUM Scientific Council. The latter is composed of twenty-five renowned scientists who regularly dedicate some of their precious time to evaluate research projects and candidacies in total independency.

SCIENTIFIC VISION & SURROUNDINGS

From fundamental research to innovation and socio-economic development

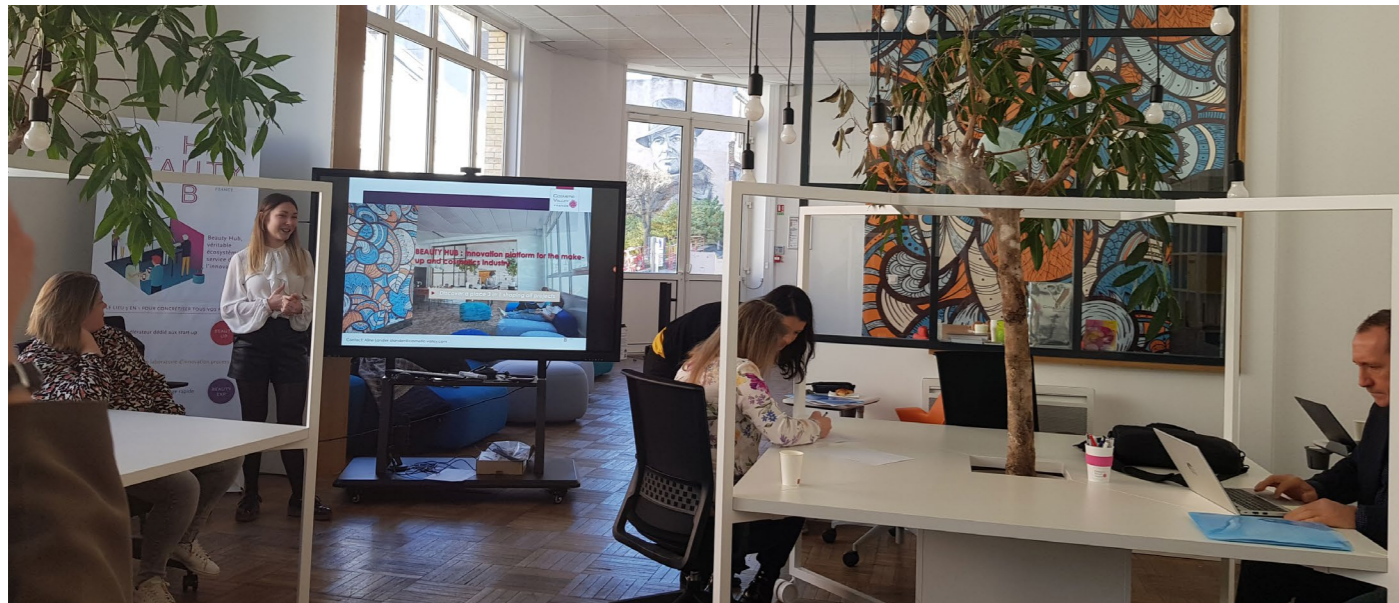
LE STUDIUM Loire Valley Institute for Advanced Studies is strongly imbedded in the Centre-Val de Loire region's research landscape. With 25 years of experience and holding a prestigious portfolio of regional and international research programmes, LE STUDIUM's activities contribute to spreading light on its regional 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. LE STUDIUM's expertise lies in attracting and managing a growing flow of global research exchanges, boosting international scientific 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.

Through its Smart Loire Valley Programme (SLV), LE STUDIUM has attracted and selected a larger number of experienced scientists who came to spend a one-year full time residency in the Centre-Val de Loire region. A first European Union Horizon

2020 COFUND award (Marie Skłodowska-Curie Actions) for the mobility of scientists was granted in 2015. This award brought a six-year co-financing to the initial support provided by the Centre-Val de Loire Regional Council for five hundred and sixty-six months of research. It brought substantial benefits and visibility to hosting laboratories and to the entire regional research ecosystem. Beyond this grant, the SLV programme continues to offer various types of award every year: Fellowship, Professorship, Visiting Researcher, Visiting Artist and Consortium awards. In 2022, LE STUDIUM joined the French Institutes Advanced Study Programme (FIAS) in the framework of another COFUND MSCA grant.

LE STUDIUM's Scientific Council reviews eligible filed applications calling upon a wide network of international scientists to carry out a fair, independent and transparent evaluation process. Other recruitments and awards happen in the framework of the Ambition, Research and Development CVL smart specialisation programmes initiated by the Centre-Val de Loire Regional Council and the European University ATHENA Visiting Researchers Programme in





which LE STUDIUM contributes as a key partner for the implementation of international actions and scientific exchanges.

As the recent sanitary crisis slowly vanishes, 2022 applications and residences came back to their normal average. LE STUDIUM has attracted and welcomed twenty-five international researchers for one hundred and eighty-six months of research. These awards were across diverse disciplines from the social sciences, natural sciences, environmental sciences and material and energy sciences.

The monthly transdisciplinary seminars, LE STUDIUM Thursdays, praised by all participants have become over time a not-to-miss intellectual space for exchanges. They enable Research Fellows to advance their presentation skills, to gain a deeper understanding of all regional research activities, to experiment concrete transdisciplinary exchanges and to enhance visibility of host laboratories. PhD students are invited to attend, an opportunity that allows them to validate transversal credits and increase their scientific culture and knowledge. Events organised in 2022 have again demonstrated the diversity of research projects represented in the faculty of fellows and the creative interactions that emerged in all discussions. Their virtual digital format engaged a larger community to connect and take part. Thankfully, all seminars took place in-person this year and social events could be organised.

Awards of selected candidates include the opportunity to have LE STUDIUM finance the organisation of Conferences and Workshops; these multidisciplinary events organised 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-size format and peculiarity offer the ideal scenery for the creation of close and fruitful discussions, which often result in new ideas for research and international collaborations. The digital format of certain events creates as well a new dynamic, as it has enabled worldwide connections. The online storage and accessibility of presentations beyond the conference time contributes even more to the public's awareness of research and facilitates the transfer of scientific knowledge to a wider audience. Partnerships with universities and other local actors have been essential to guarantee visibility and participation to all events.

Following its new path and strategic plan for the period 2021-27 with set objectives, 2022 has seen the organisation of a large interdisciplinary conference to celebrate the 25th anniversary of the institute. More than 200 participants shared presentations and discussions around a memorable 3-day gathering offering a large panel of sciences, keynote talks and distinguished speakers.

LE STUDIUM remains an international, outwardlooking partner offering opportunities to access and develop fundamental research projects across all scientific fields. These opportunities are essential to lead to new knowledge and create the foundations from which the practical application of knowledge must be drawn. Together with its members and partners, LE STUDIUM's mission nurtures this process closely linked to innovation.

LE STUDIUM 25TH ANNIVERSARY

*Understanding, Preserving and Improving the World around us
A 3-day multidisciplinary scientific conference*

LE STUDIUM has celebrated its 25th anniversary by a major interdisciplinary and transdisciplinary conference that took place at the Hôtel Dupanloup in Orléans on June 28-30, 2022. The conference gathered a large number of present and past guests, professors, fellows and visitors, who have performed their research in regional laboratories. Alongside other regional prominent scientific expertises and special guests, their presence has definitively illustrated the multidisciplinary activities and exchanges the institute has been able to catalyse over the past 25 years. This conference gave the opportunity to acknowledge these 25 years of accomplishments together with the successful implementation of the European COFUND Smart Loire Valley Fellowships Programme and other programmes supported by the Centre-Val de Loire Regional Council, Orléans Metropole and regional partners.

LE STUDIUM Loire Valley Institute for Advanced Studies is one of the oldest institutes in France and unique for offering a full panel of research possibilities from mathematics to humanities, including hard and soft matter studies from material sciences to chemistry and biology. This features the diversity and potential of the Centre-Val de Loire region's research landscape.

Sciences and societal concerns are moving along forward and LE STUDIUM, keeping track of these trends, has defined a strategic vision for the future to embrace scientific and societal challenges and support its regional research partners' strategies. A series of Keynote speakers brought their vision and of these future challenges as well.



LE STUDIUM Presidents (from left to right): Dr Yves-Michel Ginot (2017-present), Prof. Paul Vigny (1996-2014) and Prof. Ary Bruand (2015-2016)

LE STUDIUM 25 YEARS
 25 ANS DE RECHERCHES ET D'INNOVATIONS
 POUR LE MEILLEUR VAL DE LOIRE

International Multidisciplinary Conference – LE STUDIUM 25 Years
 Understanding, preserving and improving the world around us
 28th to 30th June 2022

PROGRAMME

Tuesday 28th June

- 10:30 Keynote Speaker **Jean-François Clervoy**, French Astronaut
 – Ensemble, avec audace, vers l'inconnu (Together, boldly, into the unknown)
- 11:30 Keynote Speaker **Jean-Pierre Bourguignon**, Mathematician
 – La recherche, une aventure internationale (Research, an international adventure)
- 14:30 Le Studium Scientific Council (Dr Yves-Michel Ginot, Dr Dominique Langevin, President)
- 15:00 Prof. Akkibhabal Ravishankara (Colorado State University - USA) – Our world can mitigate environmental changes: Montreal Protocol as a case study
- 15:30 Dr David Giron (Insect Biology Research Institute, University of Tours – CNRS - FR) - Insects as solutions for a sustainable future
- 16:00 Prof. Jens Moesgaard (Stockholm University - SE) & Dr Guillaume Sarah (IRAMAT, CNRS - FR) - A successful collaboration between humanities and hard sciences: the study of Viking coins in Normandy
- 17:00 Dr Frances Westall (CBM, CNRS – FR) - When only microbes inhabited the Earth 3500 million years ago
- 17:30 Prof. Paul Vigny - Le STUDIUM, a wild flower in Loire Valley gardens
- 18:15 Round table: "Cross-fertilisation: Interdisciplinarity in sciences and internationalisation of research" with Prof. Eric Blond, President University of Orléans, Prof. Arnaud Giacometti, President University of Tours / Prof. Federica Migliardo, University of Messina, Italy, Le Studium Scientific Council Member / Prof. Wiesław I. Gruszecki, Vice-President for Research & International relations of the Marie Curie-Skłodowska University of Lublin, Poland



LE STUDIUM 25 YEARS
 25 ANS DE RECHERCHES ET D'INNOVATIONS
 POUR LE MEILLEUR VAL DE LOIRE

Wednesday 29th June

- 9:15 Keynote Speaker - Prof. Jean-Pierre Sauvage – Nobel Prize - From solar energy research to molecular machines
- 10:15 Anne Besnier, Vice President for Higher Education, Research & Innovation, Regional Council – The Centre-Val de Loire RRI ecosystem
- 11:15 Dr Erida Gjini (University of Lisbon - PT) - Coexistence near neutrality.
- 11:45 Dr Dominique Arrouays (Centre INRAE Val de Loire - FR) - InfoSol Digital soil mapping from territories to globe. Progress and challenges
- 14:00 Prof. Pascal Briot (CESR, University of Tours/CNRS - FR) – Can Leonardo da Vinci be considered a scientist.
- 14:30 Prof. Kristina Djanashvili (Delft University of Technology - NL) - Pushing the Boundaries for Nanotechnology to Meet Oncology
- 15:00 Dr Conchi Ania (CEMHTI, CNRS - FR) - Porous Carbons for Water Treatment: facing current pollution threats with advanced methods
- 15:30 Dr Yuri Dancik (Senior Research Scientist, Certara Simcyp – UK) - Emerging complementary trends in cosmetic sciences: in vitro and in silico methods to evaluate the skin penetration of topically applied active cosmetic ingredients
- 16:30 Dr Anne Delouis (POLEN, University of Orleans - FR) - Ethnography in the office and the science lab: anthropology's contribution to the understanding of the modern world
- 17:00 Dr Alfredo Ulloa-Aguirre (National Autonomous University of Mexico) – Chaperoning essential proteins: The quality control system of the cell in health and disease
- 17:30 - Dr Valérie Hayaert (University of Warwick - UK) - Pictures of martyrs painted for those condemned to death in Bologna around 1350: icons of true compassion or images staging a sacrificial mechanism?



LE STUDIUM 25 YEARS
 25 ANS DE RECHERCHES ET D'INNOVATIONS
 POUR LE MEILLEUR VAL DE LOIRE

Thursday 30th June

- 9:00 Keynote Speaker Prof. Vincent L. Pecoraro – University of Michigan, USA -Metallacrowns: An illustration of Non-Linear Scientific Progress
- 10:00 Prof. Isabelle Dimier-Poisson (ISP Infectiology and Public Health, University of Tours / INRAE – FR) - A French nasal vaccine project against COVID-19 blocks all transmission of the virus
- 11:00 Sophie Gabillet, Le Studium General Secretary - Strategy and ambitions for the coming years
- 11:30 Dr David Graves (Princeton University - USA) - Low Temperature Plasma with Applications from Nanofabrication to Biomedicine
- 12:00 Dr Vincent Courdavault (Plant Biomolecules and Biotechnology, University of Tours – FR) - Beauty and the Yeast: Elucidating and bioengineering the synthesis of periwinkle anticancer drugs.
- 14:00 Prof. Richard Freedman (Haverford College - USA) - Decoding Music: What Musicology and Data Science Can Learn from Each Other
- 14:30 Prof. Christophe Sinturel (ICMN, CNRS, Université d'Orléans - FR) - Block copolymer self-assembly in thin films
- 15:00 Prof. Stéphane Petoud (CBM, CNRS – FR) - Luminescent Lanthanide-based Compounds for Biological Imaging in the Centre-Val de Loire région: A Success Story with Le Studium
- 15:30 Dr Emilio Sanfilippo (National Research Council (CNR), Institute of Cognitive Sciences and Technologies (ISTC, IT) - Formal Ontology in Information Systems - When Philosophy meets Computer Science
- 16:30 Launch of LE STUDIUM Congress and Alumni Club (Prof. Philippe Vendrix, University of Tours - FR)



THE SMART LOIRE VALLEY PROGRAMMES

Across its different programmes, LE STUDIUM offers different types of awards and actions that stimulate and facilitate international scientific collaborations and interdisciplinary exchanges.

Independent external peer reviewers and international independent Scientific Council members assess and select the best candidates and innovative research projects. To be eligible, applicant researchers must be nationals or long-term residents of a country other than France and comply with the European mobility rules.

LE STUDIUM RESEARCH

FELLOWSHIP

This award enables experienced international researchers to work in a host laboratory for ten to twelve consecutive months. The award targets internationally competitive researchers and offer them the opportunity to discover and work in nationally accredited laboratories with international renown in the Centre-Val de Loire region. Salary, fully furnished housing, logistic and administrative support, specific training opportunities, and funding to organise one international event are associated with the award.

LE STUDIUM RESEARCH

PROFESSORSHIP

This award enables an experienced international Professor to work in a host laboratory, to participate in research, research team building and postgraduate teaching and mentoring. The Professorship residency consists in four periods of three months in the Centre-Val de Loire region (twelve months in total in four consecutive years). Salary, fully furnished housing, logistic and administrative support, specific skills acquisition, and funding to organise one international event are associated with the award.

LE STUDIUM

VISITING RESEARCHER

This award enables experienced international researchers wishing to visit and work with a laboratory in the Centre-Val de Loire region with personal resources, to enter the LE STUDIUM scientific community. The award offers fully furnished housing, full logistic and administrative support, specific training opportunities, funding to organise an international event and integration in the region for a three to twelve-month residency.

LE STUDIUM

VISITING ARTIST

This award enables experienced international artists wishing to visit and work with one or more laboratories in the Centre-Val de Loire region with personal resources, to enter the LE STUDIUM scientific community. The award offers fully furnished housing, full logistic and administrative support, specific training opportunities, funding to organise an international event and integration in the region for a three to twelve-months residency.

LE STUDIUM RESEARCH

CONSORTIUM

This award enables the creation of a team of five researchers (under the leadership of 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 (four meetings in total over two years). The consortium projects have well-defined research objectives, a work-plan to implement and milestone goals to achieve between meetings. They can serve different objectives and consist in a solid basis to build a sustainable collaboration among a small group of international partners.

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. They contribute to the valorisation of the research work carried out in the region in partnership with international scientists and the extension of their networks.

The Smart Loire Valley General Programme*

The Smart Loire Valley Programme call for applications is open from November each year to February the next year. It offers different formats of awards (residency, visit, networking). The Smart Loire Valley Programme aims 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 to create or extend international collaborations.

For the period 2015 to 2021, the programme operated 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 Fellowships award.

Since 2022, the programme is funded by regional partners and authorities and continues to offer attractive awards. More than 100 months of residencies are financed and supported through this programme.



* The SMART LOIRE VALLEY Fellowships Programme received European Union H2020 funding (Marie Skłodowska Curie Actions, COFUND contract #665790) for Fellowships awards between 2016 and 2021.

The French Institutes Advanced Study (FIAS) Programme*

FIAS is an international mobility programme proposing high-level scientific residencies in the seven IAS of Aix-Marseille, Loire Valley (Orléans-Tours), Lyon, Montpellier, Nantes, Paris and Rennes. Initiated in 2020, the FIAS Fellowship programme will run until the 2024-2025 academic year.

The FIAS fellowship programme supports high-quality and innovative research as fellows conduct their research with the greatest freedom and benefit from the strong scientific and extra-academic support by the institutes.

The call is open to all disciplines in the SSH and all research fields. Research projects from other sciences that features a transversal dialogue with SSH are also eligible. It offers 10-month fellowships. For this purpose, the LE STUDIUM Loire Valley IAS will welcome projects at the interface between SSH and other sciences enthusiastically.



*The FIAS programme receives funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 945408

The ATHENA European University Visiting Researcher Programme

Advanced Technology Higher Education Network Alliance – the ATHENA European University is a federation of mid-size higher education institutions in nine European countries (Portugal, France, Germany, Greece, Italy, Lithuania, Poland, Slovenia and Spain). It draws on their combined strengths to reach a common objective: deliver high-quality education with a positive impact on research, youth employability and social advancement at the national and European levels.

The launch of joint research and educational projects enhance synergies between the member universities and stakeholders, foster research quality and impact, boost the competitiveness of the submitted proposals, attract funds to support its programmes and fully leverage the infrastructure of the network and scientific potential.

The introduction of joint multidisciplinary modules and curricula, supported by blended and actual mobility schemes and workshops organisation, aim to break down any possible scientific and cultural barriers to mobility. The key objective is to deliver inclusive, innovative, high-quality international education permanently aligned with global market needs.

LE STUDIUM offers a Visiting Researcher Programme associated to the ATHENA alliance's partners including the organisation of international workshops and summer schools.

Calls for applications are open to all research themes for researchers, working in a university of the ATHENA consortium and wishing to join a research laboratory at the University of Orléans. While applications with a link to ATHENA's thematic focus (digital transformation) are particularly encouraged, all projects receive equal consideration according to their scientific merit.



ATHENA Alliance gathering in Orléans, November 2022



ATHENA
EUROPEAN UNIVERSITY



The Ambition Research & Development Programmes

The Centre-Val de Loire Regional Council has initiated a series of smart specialisation programmes, starting in 2013, to implement the European Smart Specialisation Strategy. These programmes and bids are still running to generate socio-economic impact by pooling together all regional stakeholders' efforts (research, academic and private) to create strong regional research in various fields and develop excellence centres of international scale.

Through the «Ambition Research and Development» initiative, ARD 2020 at first and now ARD CVL, the Centre-Val de Loire Region aims to strengthen research and development skills in relation to major regional socio-economic issues and to address the climate and environmental emergency. This initiative contributes to the emergence of research and development clusters of international stature with high visibility and attractiveness in close collaboration with the regional socio-economic landscape, with the double perspective of strengthening the academic and socio-economic attractiveness of the region and of fostering the development of first class poles to enhance research and innovation activity in the region.

The first wave of ARD 2020 programmes for the period 2014-2020 was targeting biopharmaceuticals, cosmetics, environmental metrology and engineering, cultural and natural heritage and natural energies.

For a new period running from 2021 to 2026, a series of new programmes emerged in the continuation or formation of new research fields:

- **ARD CVL Biomédicaments (Biopharmaceuticals),**
- **ARD CVL Cosmétosciences (Cosmetics),**
- **ARD CVL JUNON (Digital twins for environment)**
- **ARD CVL MATEX (Multimaterials under extrem conditions)**
- **ARD CVL SyComore (Precision and Connected Silviculture)**

LE STUDIUM stands as an official partner of these regional programmes. It leads on the internationalisation actions by providing expertise and services to recruit international experienced scientists and organises actions and events to boost international scientific exchanges and collaborations as well as to valorise the research work and projects carried out in the region.



ARD CVL BIOPHARMACEUTICALS



The Ambition Research & Development CVL Biomedicaments programme aims to develop a biopharmaceuticals R&D cluster in the Centre-Val de Loire region by capitalising on the multidisciplinary research teams from several research institutions. It plans the involvement of regional pharmaceutical industries and encourages the creation of new companies. In addition to the funding brought to academic research projects with high translational potential, it seeks to identify and connect public and private actors working on biopharmaceuticals at the regional, national, European and boosting international collaborations. It trains and attracts talents in biotechnologies.

The University of Tours leads the programme in partnership with the University of Orléans, the CNRS, the Centre INRAE Val de Loire, INSERM, CHRU Tours Hospital, Labex MaBImprove, MabDesign, Polepharma, IMT and LE STUDIUM IAS. It currently brings together 12 laboratories and 30 research teams with recognised expertise in the fields of recombinant proteins, monoclonal antibodies, vaccines, immune-conjugates in oncology, human plasma-derived drugs, stem cells and cell therapy, and advanced therapy drugs.

The main funded research projects focus on:

- Preclinical evaluation of an Antibody-Drug Conjugate (ADC) for Merkel Cell Carcinoma (MCC) treatment
- Synthetic biology: secure etoposide supply by bioproduction
- In silico methods development: therapeutic antibody selection and affinity maturation
- Intrabodies development for Amyotrophic Lateral Sclerosis (ALS) treatment
- Large scale sequencing and identification of patient antibodies for diagnostic test development



ARD CVL COSMÉTOSCIENCES



The Centre-Val de Loire Region has placed research and innovation in cosmetics at the heart of its regional innovation strategy. As a leader in the sector, it is home to more than 150 cosmetics companies. It has contributed to the creation of the Cosmetic Valley competitiveness cluster, the world's leading network of industries in the sector, and together with Lombardy, supports the Go4Cosmetics European platform on the digital and green transition.

The University of Orléans leads the programme, in partnership with the University of Tours, the CNRS, Cosmetic Valley and LE STUDIUM Loire Valley IAS. It brings together 12 laboratories and 23 research teams with recognised skills. Research fields covered are plant and biotechnological sourcing, the development of eco-processes for extraction, the characterisation of plant extracts, the formulation and encapsulation of active ingredients, skin biology and the use of new technologies to evaluate the activity and control the safety of cosmetic active ingredients.

The programme aims to stimulate collaborative research and innovation in cosmetics between academic and industrial laboratories in order to support the development of the cosmetics sector, with a unique positioning on a European scale across the entire value chain, from plant material to finished products.

The currently funded research projects pursue the following topics:

- New ways of obtaining phyto-actives for cosmetics
- Valorisation of poplar root exudates for cosmetics purposes
- Integrated eco-responsible processes for cosmetics ingredients
- Non-invasive method for personalisation of dermo-cosmetic care
- Selective cell extinction for the safety of cosmetics ingredients



ARD CVL JUNON



JUNON is an Ambition, Research and Development programme to develop a digital research cluster on the continental environment (agricultural, urban, forestry and river) in the Centre-Val de Loire region. It aims to design digital services to improve the monitoring and understanding of the environment, for better management of natural resources.

The French geological survey (BRGM) leads the JUNON programme, in partnership with four research institutions (Centre INRAE Val de Loire, CNRS, University of Orléans, University of Tours). It involves non-academic partners, such as the DREAM water and environment competitiveness cluster, the Agreen Tech Valley cluster, Orléans-Val de Loire Technopôle and LE STUDIUM IAS.

JUNON is a continuation of the previous ARD 2020 PIVOTS programme, which has promoted the emergence of seven experimental platforms dedicated to monitoring, environmental metrology and remediation of the various anthropised environments (subsoil/soil/water/air).

The research activities focus around five main axes:

- JANUSS (Soil/Air): Regrouping the monitoring of air quality and greenhouse gases in the region and creating a synergy of data players for the development of digital twins with an «agro/ ecosystems-atmosphere» interface. The process involves long-term observation of relevant variables, fine-scale modelling and new approaches based on artificial intelligence
- JUNEAU (Water): Elaboration of two digital twins WATER. The process involves acquisition of quantitative data, improvement of knowledge on the hydrogeological functioning and contaminants transfers' behaviours, and optimisation of the monitoring of the groundwater quantity and quality.
- DATA: Collection, storage, exploration, representation and combination of the data. The process includes collection, centralisation, security, traceability of data and use of digital tools for interrogation and automated processing.
- DIGITAL TWINS: Interoperability of data and software bricks, design of environmental digital twins as well as their implementation and evaluation.
- PREDICTION: New multi-source and explainable predictive AI models for environmental data analysis and monitoring



ARD CVL MATEX



To meet the ever-increasing demands for performance, profitability, connectivity, and durability, manufacturers in many sectors are developing solutions involving the combination of different materials that can be grouped under the term "multi-materials". This multi-material approach enables to couple the properties of the components, allowing the design of multifunctional materials, which can respond to several solicitations, or evolve according to the environment and adapt. Thus, the study of these materials under extreme conditions of pressure, temperature, irradiation or reactive gases or liquids as well as their behaviour under thermal, chemical, mechanical and electrical stress is of primary importance to improve their performance in many application sectors.

MATEX is a collaborative project financed by the Centre-Val de Loire region as part of the Ambition, Research and Development CVL initiative. Its mission is to bring together research, industry and higher education in order to create a dynamic around multi-materials in extreme conditions. The objective is to facilitate the industrial transition.

The CNRS leads the programme in partnership with the University of Orléans, the University of Tours, the INSA CVL engineering school and LE STUDIUM IAS. It currently brings together 9 regional laboratories with recognised expertise in the fields of materials and for their outstanding instrumental park.

Sixteen research projects articulate around four major axes:

- Multi-materials based on polymers and carbon: structure, properties, bio-based components and regeneration
- Multi-component coatings of metals and/or ceramics and performance under extreme conditions
- Materials under stress in extreme conditions
- Development of specific instrumentation



ARD CVL SYCOMORE



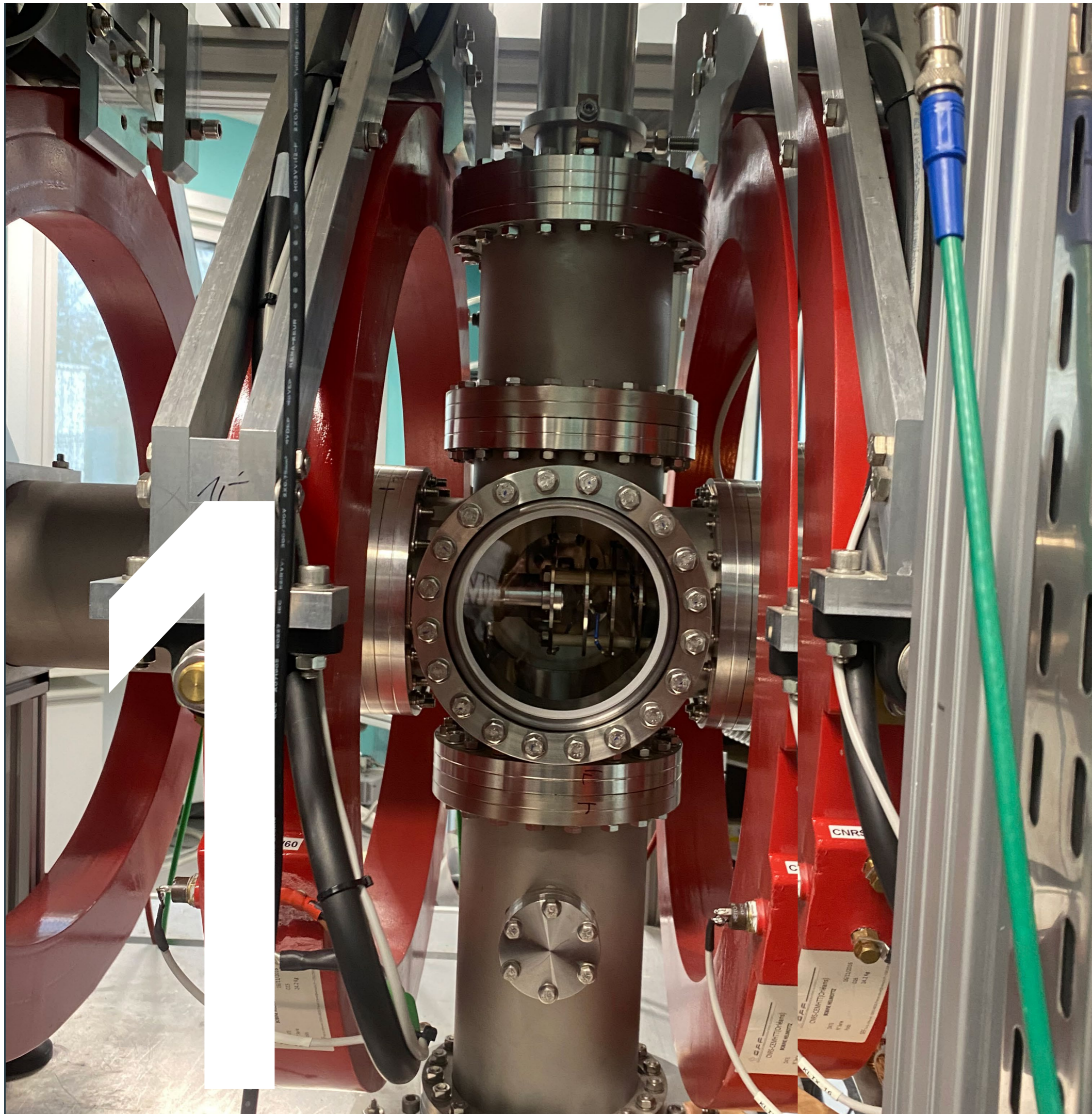
The Centre-Val de Loire region is the sixth most forested region in France. The Centre-Val de Loire forests, mostly production forests, offer many ecosystem services (production of materials and renewable energy, carbon storage, protection against flooding and soil erosion, biodiversity conservation, recreation, etc...). A regional forest-wood plan 2019-2029 between the Region and the actors of the forest-wood sector aim to harvest more wood to store CO2 sustainably in construction and limit biotic and climatic risks. The increased use of bio-based products in the context of sustainable forest management should thus amplify the role of the forest and the regional forestry-wood sector in the transition to a low-carbon economy and the fight against climate change. However, climate change requires close monitoring of the health of these forests and anticipation of the necessary adaptations to future climate conditions.

In line with this plan, the SyCoMore (Precision and Connected Forestry) ARD CVL programme aims to prevent forest dieback and adapt the regional forests to climate change, targeting the main production species of oak and pine. To achieve these ambitious objectives, the SyCoMore dynamic brings together all the players in the forestry-wood industry, both academic with laboratories and units working on the forest (INRAE, University of Orleans, University of Tours, INSA Centre Val de Loire, CNRS) and socio-economic (Fibois, CNPF-IDF, ONF, UNISYLVA, Dream, VEGEPOLYS VALLEY, AgreenTechValley, CybeleTech). With more than 250 researchers in the public domain, these forces represent the second pole of excellence on the forest in France.

The research projects articulate around four major axes:

- Develop innovative tools for phenotyping and measuring the forest ecosystem
- Understand, predict, manage and prevent forest dieback
- Manage and renew the region's forests to make them more resilient to climate change
- Forest genetic resources for the future and their resilience to climate change






MATERIALS & ENERGY SCIENCES

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HOST LABORATORIES IN MATERIALS & ENERGY SCIENCES


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

 The laboratory was originally formed in 1969 and renamed the "Centre de Recherche sur les Matériaux 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.



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

 The Institut Denis Poisson (IDP) was created in 2018 on the basis of two laboratories: the Laboratory of Theoretical Physics and Mathematics (LMPTP) based in Tours and the Laboratory of Mathematics (MAPMO) based in Orleans.

The IDP is a multidisciplinary laboratory with mathematicians and theoretical physicists working in a large variety of fields. It is well-known for its high standard works in gravitational physics, quantum field theory, Riemannian geometry and dynamical systems. Several directions of current research pursued in the Laboratory are relevant for the subject of the present project.

The IDP in Tours consists of 42 professors and lecturers and 7 CNRS researchers (4 Chargés de Recherche and 3 Directeurs de Recherche). The administrative and technical support is provided by 3 secretaries, 1 librarian and 2 technicians. It is responsible for teaching within the Master programs «Fundamental physics and applications» (M1), «Non-linear models in Physics» (M2).



GROUPE DE RECHERCHE SUR LES MATÉRIAUX, LA MICROÉLECTRONIQUE, L'ACOUSTIQUE ET LES NANOTECHNOLOGIES (GREMAN) UMR 7343 - UNIVERSITÉ DE TOURS, CNRS, INSA CVL



GREMAN is a CNRS research laboratory of the University of Tours and INSA Centre Val de Loire. GREMAN was launched in 2012 through the integration of LEMA (Laboratory of electrodynamic of advanced materials) specialized in materials science (physics and chemistry) and LMP (Laboratory of power microelectronics) specialised in systems engineering (electronics and acoustics). The mission of GREMAN is understanding, designing, synthesizing, and characterizing new electronic materials and devices and integrating them into systems for electrical energy conversion and management with a main objective of improving energy efficiency. In particular, these research activities are supported by fundamental studies using simulation tools and models developed within the laboratory and also by technological platforms of CERTeM R&D center for manufacturing and multi-physical multi-scale characterization.



GROUPE DE RECHERCHES SUR L'ÉNERGÉTIQUE 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: energy storage or conversion, materials, microelectronics, nanotechnologies, metrology, radiation sources, biomedicine, transport, and the environment. About 40 permanent position professors and researchers develop their research with the help of 10 engineers, technicians and administrative staff. The laboratory also welcomes around 30 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 and routine material analyses. Modeling, strongly linked to experimentation, is also an important aspect of the performed research.



LABORATOIRE PLURIDISCIPLINAIRE DE RECHERCHE INGÉNIERIE DES SYSTÈMES, MÉCANIQUE, ÉNERGÉTIQUE (PRISME)

**EA 4229 - UNIVERSITÉ D'ORLÉANS, INSA CENTRE VAL
DE LOIRE**



PRISME laboratory is a joint research institute between the University of Orléans and the INSA Centre Val de Loire (EA 4229). Its area of expertise and methodological approaches are part of the Science and Technology field, as well Engineering Sciences as Information and Communication Sciences and Technologies. Its main topics are in the general field of engineering sciences and technologies over a wide spectrum of disciplinary fields including: Combustion, Engines and energy systems, Explosions, Aerodynamics, fluid mechanics, signal and image processing, automation and robotics.



**Dr Alberto José Fernández
Carrión**

LE STUDIUM Visiting Researcher

From: Guilin University of
Technology - CN

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

Nationality: Spanish

Programme: SMART LOIRE VALLEY

Dates: September 2022 to March 2023

Dr Alberto J. Fernández-Carrión is an associate researcher at Guilin University of Technology (China) where he does research on the solid-state chemistry of ion conductor materials (oxide and sodium ion conductors). He was born in Seville (Spain) and obtained his B.S. in Chemistry at the University of Seville in 2009, where he also attained his PhD degree in Materials Science (2014). He later worked for 2 years as a postdoctoral fellow at the CEMHTI laboratory (CNRS-Orleans, France) and at the European Ceramic Center (Limoges, France; 1 year) where he developed several transparent materials featuring either electrical or luminescent properties. Currently, he is interested in the development of new metal-oxide ceramics for energy conversion/storage technologies.



Dr Michael Pitcher
Host Scientist

Dr Michael Pitcher holds a D.Phil. in inorganic chemistry (University of Oxford, 2011) which was followed by postdoctoral (2011-2014) and research coordination (2014-2018) experience at the University of Liverpool in the field of inorganic materials and oxide chemistry. Recruited by the CNRS in 2019, he has published more than 50 papers on the synthesis of new inorganic solids with diverse functional properties. His current research interests at the CEMHTI lab (CNRS Orléans) include the synthesis of new metastable oxides by advanced melt-quenching techniques, which is supported by an ANR Jeune Chercheur grant. He held a STUDIUM Guest Fellowship in 2019 – 2020.

GLASS CERAMIZATION PROCESSING FOR DEVELOPING SOLID-STATE TRANSPARENT SODIUM ION ELECTROLYTES (CERAMINA)

The development of materials for energy storage technologies is a key issue concerning the welfare in daily life. Among the various available energy storage technologies, batteries provide stored chemical energy with the ability to further delivery it as electrical energy. Batteries are composed of a cathode, an anode, an ion conducting electrolyte, and charge carriers, being their efficiency highly influenced by the electrolyte material. Electrolytes can be in liquid or solid state. Given the flammable character of the liquid-based electrolytes, the solid-state counterparts spawned tremendous interest as they exhibit better chemical and electrochemical stabilities while ameliorating the safety concerns, leading to solid-state batteries. Most of the solid-state electrolytes (SEs) explored so far have been based on lithium, owing to the fact that lithium batteries offer superior volumetric and gravimetric energy densities, making them very attractive for portable applications. Nevertheless, their use in large-scale energy storage systems (e.g. grid scale energy storage) is still limited because of the geographically restricted resources of Lithium. Unlike Lithium, sodium presents vaster and better resources distribution, which dramatically decreases the final material costs. The efficiency of solid-state sodium batteries highly relies on the solid-state sodium electrolyte employed, being desirable electrolytes showing total ionic conductivities larger than 10⁻³ S/cm at room temperature. Even when the bulk conductivities of some oxide-based sodium electrolytes fulfill this requirement, the total conductivities are typically dropped by the grain boundaries and pores.

CERAMINA project addresses the previous challenges and aims at preparing fully dense solid-state Na electrolytes to be integrated in solid-state sodium batteries. Its novelty relies on its fancy processing approach: full crystallization of glass precursors. The innovative technique is expected to yield optimized total conductivities thanks to the complete absence of pores, thin grain boundaries and large grains. This set of microstructure features can minimize the large grain boundaries resistance. In addition, by a careful control of the crystallization process, it could be possible to retain the initial transparency of the corresponding glasses, which may add extra value to the materials being potentially useful in optoelectronic applications (for instance, solid-state lighting systems). Thus, the proposed project would lead to the development of a new kind of multifunctional material, gathering high sodium ion conductivity (>10⁻³ S/cm) and optical transparency.

During the first three months of the project, potential Na-based compositions were identified as potential candidates for preparing the corresponding glass precursors by using both the classic melt-quenching technique or the innovative aerodynamic levitation system coupled to CO₂ lasers. In this regards, interesting results have been found in some composition withing the Na₂O-MgO-SiO₂ ternary system, in which transparent and crystalline sodium ion conductors have been identified.



CEMHTI XRD analysis



Prof. Feng Huang

LE STUDIUM Guest Research Fellow

From: China agricultural university - CN

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

Nationality: Chinese

Programme: SMART LOIRE VALLEY

Dates: December 2021 to December 2022

Feng Huang, got PhD in plasma physics in June 2005 from the Institute of Physics, Chinese Academy of Sciences. She has worked in China Agricultural University since July 2005 and been a professor of China Agricultural University since January 2018. She was a visiting scholar at Lawrence Berkeley National Laboratory in the United States from September 2011 to July 2012. From December 2021 to December 2022, she was a visiting scholar of GREMI/CNRS, University of Orleans. Feng Huang has over 20 years of experience in plasma related research including complex plasma, thin film material, plasma agriculture, and the combination of plasma science and AI. She got Wu Wenjun AI Science and Technology Award (No.0218, 10/12/2020). She presided over and participated in national projects, provincial and ministerial projects, the cooperation projects with local governments and enterprises. She was also an instructor of the field service station of the Key Laboratory of Agricultural Informatization Standardization of the Ministry of Agriculture and Rural Affairs and conducted plasma technology application in field agriculture.

PLASMA TECHNOLOGY AND APPLICATION IN AGRICULTURE

The use of fertilizers and pesticides has indeed boosted crop growth, greatly contributing to the increase of agriculture production, but it has also caused a series of problems, such as environmental degradation, soil hardening and increasingly serious food safety problems. Non-thermal plasma, as a green agricultural technology alternative to conventional chemicals, was proved to be a rapid, effective and environmentally friendly technique with the potential of boosting agriculture efficiency with improving quality and increasing yield by alleviating soil toxicity, improving seed germination and plant growth, promoting pesticide degradation, etc. Based on the broad application prospects of plasma technology in agriculture, the goals of this project are to conduct the researches on plasma science and agriculture application including AI approaches. The parameter diagnoses and simulations of different plasma discharge systems with different discharge conditions, and the intelligent control of plasma systems and agricultural application equipment were investigated. Direct micrograph image and spectral analysis and recognition will be combined in discharge diagnosis to find out the relationship between plasma discharge conditions and real-time collected data by characteristic images, characteristic spectra, etc. The interdisciplinary researches of plasma and agriculture based on plasma diagnosis, agricultural data measurement and AI strategies were also carried out in this project, such as through plasma treatment to study the effects of plasma on agriculture (including soil, water and seeds, plant growth, nutritional composition, yield, etc). For plasma application in agriculture, the two problems of how to explore the optimized plasma discharge conditions and how to explain the mechanism of plasma application are closely related to the application effect of plasma and practical agricultural industry. With the rapid development of artificial intelligence, its combination with plasma agricultural technology can effectively promote the large-scale application of plasma in agriculture, such as, artificial intelligence can quickly identify plasma discharge parameters, detect the vitality of plasma treated seeds, recognize and classify plasma crops, make the estimation on plasma crop yield, etc. Thus, in this project the identification and classification of plasma discharge spectra, images and plasma treated agricultural objects were also studied. We have conducted the researches on plasma spectra recognition, plasma discharge image recognition, plasma treatment on soil, plasma seed treatment, effect of plasma and electrostatic field on the growth and nutrients of vegetable, plasma rice growth classification, identification of harvested plasma rice, plasma rice yield prediction by AI, plasma pesticide residue degradation and the detection, plasma stress resistance, etc. Some of the research results have been published in academic journals, patents or software copyrights, and shown in international conferences.

ON-LINE MEETING ON ARTIFICIAL INTELLIGENCE FOR PLASMA SCIENCE

This first online meeting on artificial intelligence for plasma science gathered experts from the artificial intelligence and plasma communities. The objectives were to:

- Introduce some basics on AI and machine learning strategies for plasma science.
- Demonstrate the use of AI in plasma science (plasma processing, plasma medicine, plasma agriculture, plasma device control and monitoring, plasma diagnostics, etc).
- Develop an interdisciplinary international researchers' network on artificial intelligence for plasma science.

This event seduced the scientific community with 115 registered participants (70% in plasma science / 30% in AI) from 24 countries. It planned the future organisation of dedicated workshop on AI science and applications with the creation of a consortium with expert members of France, Spain, Serbia and China.

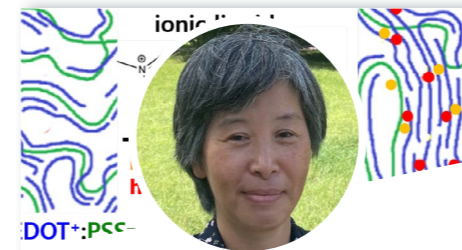


LE STUDIUM CONFERENCE



Dr Eric Robert
Host Scientist

Eric Robert received a PhD in plasma physics in 1997 on the X-ray excitation of high-pressure plasmas. He was then hired as CNRS researcher to develop mercury-free lightning, extreme ultraviolet source for microelectronics and innovative X-ray diagnostics, and later was expert in non-thermal plasma source development (3 patents), diagnostics (spectroscopy, imaging, electrical, chemical analysis). He introduced their applications for: cancerology, skin treatment, wound healing, materials functionalization and decontamination. He was elected member by the International Society on Plasma Medicine, International Plasma Chemistry Society, received Cosmetic Victory Award and gave more than 50 invited reports in international conferences.



Prof. Yun Hee Jang

LE STUDIUM Visiting Researcher

From: Daegu Gyeongbuk Institute of Science and Technology - KR

In residence at: Research Group for Materials, Microelectronics, Acoustics and Nanotechnologies (GREMAN) - Tours

Nationality: South Korean

Programme: SMART LOIRE VALLEY

Dates: September 2022 to January 2023

Yun Hee JANG received her Ph.D. (1995) in Physical Chemistry from Seoul National University, Seoul, Korea. After working at Caltech (Pasadena, USA) as Postdoctoral Researcher (1997-2005) and at GIST (Gwangju, Korea) as Assistant/Associate Professor of Materials Science & Engineering (2006-2016). She is now working at DGIST (Daegu, Korea) as Professor of Energy Science & Engineering, where she was Department Chair (2018-2019) and Associate Vice President for Academic Affairs (2019-2021). Her research group, Curious Minds' Molecular Modelling (CMMM) Laboratory, employs a multiscale computational approach, which combines small-scale quantum-mechanical density functional theory calculations with large-scale molecular dynamics and Monte Carlo simulations, for molecular-level understanding of structures, reactions, and dynamics of various functional materials at interfaces. She has been awarded the best research award from DGIST, Korea in 2017 and has received several visiting professor fellowships from Korea and France to spend a short period time at ENSCP (Paris, 2011) and University of Tours (Tours, 2006, 2022).

MOLECULAR MODELING OF STRETCHABLE (BIO/THERMO) ELECTRONICS

A transistor was invented in 1948 and we are now surrounded by all kinds of electronic devices containing silicon semiconductors. A conjugated conducting polymer with alternating single-double bonds was discovered in 1977 and organic electronics containing flexible organic semiconductors are slowly replacing or supplementing the silicon electronics, realizing dream products like foldable phone, rollable TV, and artificial skin. We expect that wearable electronic devices (e.g., Apple Watch) of today will soon become soft skin-like patch-type devices and will even go inside our body to correct irregular heartbeats or improve our brain functions, as predicted by world's leading groups of this field such as John Rogers (Northwestern, USA), George Malliaras (Cambridge, UK), Magnus Berggren (Linköping, Sweden), Zhenan Bao (Stanford, USA), and Takao Someya (Tokyo, Japan). A key player in such organic (bio)electronic devices is PEDOT:PSS. This water-processable (therefore environmentally-benign) polymer mixture of positively-charged PEDOT+ and negatively-charged PSS- is a flexible and transparent organic semiconductor and electrochemical transistor, which is ideal for (bio) electronic devices such as light emitting diode, photovoltaic cell, thermoelectric generator, self-powered implantable sensor-actuator, and ultimately artificial skin. However, so far, even such a state-of-the-art organic semiconductor show much lower electrical conductivity and charge mobility than their inorganic counterparts (indium tin oxide ITO). Vapor-deposited PEDOT crystals can be highly conductive, but in solution-processed PEDOT:PSS films, short PEDOT (6-18 EDOT units) and long PSS (< 2200 SS units) form granular domains of 10-30 nm, in which hydrophobic PEDOT-rich regions are encapsulated by hydrophilic PSS-rich regions, hindering formation of large conducting PEDOT domains and their long-range networks. It makes PEDOT:PSS water-soluble, thermally-stable, eco-friendly, but very poor in conductivity. Our goal is therefore to enhance the conductivity (and in turn thermoelectricity) of PEDOT:PSS. Interestingly, a dramatic (< 5000-fold) improvement of PEDOT:PSS conductivity has been achieved by ionic liquids (IL). Experimental evidences and our computational molecular-level observations both indicate a mechanism in which an ion exchange between PEDOT+·PSS- and IL (A+·X-) triggers PEDOT+·PSS- separation and forms PEDOT+-rich domains decorated by IL anions X-. Combining this mechanism with a classic hard-soft-acid-base theory of chemistry, we have been able to extract a molecular design principle that ILs or ionic salts with hydrophilic (hard) cations and hydrophobic (soft) anions would favor the process, as confirmed by our recent modeling-experiment collaboration. To our surprise, the PEDOT:PSS film treated with our newly-designed hard-cation-soft-anion ILs in this recent experiment demonstrates a dramatic improvement not only in the electric conductivity but also in the mechanical property (elastic modulus and damage strain). Our molecular dynamics simulations on an atomistic model of the IL-treated PEDOT:PSS films deposited from the aqueous solution provide a molecular-level origin of such improvements in elastic modulus.

Such electrostatic-interaction-based principles also help understanding structures and behaviors of another prevalent ionic polymer, DNA and RNA. Indeed, many organisms (including human) use positively-charged proteins (e.g., protamine) to control reversible assembly-disassembly cycles of negatively-charged DNA for reproduction, and protamine is also used in mRNA vaccines to control reversible assembly-disassembly of negatively-charged RNA. Therefore, another goal of our project is to improve our molecular-level understanding of such processes involving DNA and RNA.

Our project also aims at designing a red-selective polymer which can strongly absorb only the skin-penetrating visible light, i.e., the red light (625-800 nm). Such a polymer would help realizing wireless (i.e., non-invasive) power supply to a subdermal bioelectronic implant (e.g., pacemaker on heart or neuromodulator on brain) by shedding the red light toward the red-light-absorbing organic photovoltaic thin film deposited on it. We propose a narrow-wide type of copolymers with distorted backbones (i.e., minimal hybridization) for best red-selective polymers.



Prof. Yves Lansac
Host Scientist

Yves LANSAC received his Ph.D. (Physics) from University of Nice, France, in 1993. After working at University of Colorado (Boulder) and Caltech (Pasadena), USA, as Research Associate and Staff, he now works as Associate Professor (Physics) at the GREMAN CNRS laboratory (University of Tours, France), where he received his habilitation in 2007. His research involves the application of computer simulation and numerical modelling to the study of equilibrium and non-equilibrium self-organisation in soft matter systems such as liquid crystals, colloids, and biomaterials. He is a visiting professor of the LPS CNRS laboratory (University Paris-Saclay, France), and an adjunct professor and Brain Pool Fellow of DGIST (Daegu), Korea.



Prof. Dmitri Kharzeev

LE STUDIUM Research Professor

From: Stony Brook University - US

In residence at: Institut Denis Poisson - Tours

Nationality: American

Programme: SMART LOIRE VALLEY

Dates: June 2018 to September 2018
June 2019 to August 2019
June 2022 to July 2022

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 at the Italian National Institute of Nuclear Physics, three years at 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, USA 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, USA, where he directs the Center for Nuclear Theory; he also continues to hold the Senior scientist appointment at BNL. Fellow of APS, AAAS, a Foreign member of Academia Europaea; recipient of the Humboldt prize.



Dr Maxim Chernodub
Host Scientist

Maxim Chernodub received his PhD in 1999 at the Moscow Institute of Physics and Technology, Russia. In 1999-2001 and 2003-2008 he was a researcher within the Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia; 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 has been a researcher (and since 2016 – a senior researcher) of CNRS at the University of Tours, France. He has 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 the 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 the Centre- Val de Loire region 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 information processing and transmission.

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:

- The development of the idea of a novel chiral superconducting qubit based on an analog of a chiral magnetic effect. The qubit utilizes a "Chiral Magnetic Josephson Junction" (CMJJ) built from noncentrosymmetric superconductors connected by an uniaxial magnet. The resulting Chiral Magnetic Qubit is protected from noise caused by fluctuations in magnetization and does not require an external magnetic flux, allowing for a simpler and more robust architecture of a quantum processor based on it. The practical realization of our proposal requires further research into the parity-odd response of NCSs and their interfaces and opens opportunities for future cross-disciplinary research. This work was carried out in collaboration with J. Garaud, and has contributed decisively to his promotion to the Professor position at the University of Tours.
- Basing on this theoretical idea (developed by M. Chernodub, J. Garaud and D. Kharzeev in Tours), the team 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 chiral magnetic qubit for further experimental studies.
- This motivated the team's study of the response of NCSs to the magnetic field and the formation of vortices. Here, they have demonstrated, within a Ginzburg-Landau framework describing NCSs with O point group symmetry, that vortices can exhibit an inversion of the magnetic field at a certain distance from the vortex core. In stark contrast to conventional superconducting vortices, the magnetic-field reversal in the parity-broken superconductor leads to non-monotonic intervortex forces and, consequently, to the exotic properties of the vortex matter such as the formation of vortex bound states, vortex clusters, and the appearance of metastable vortex/anti-vortex bound states [2]. They have performed a detailed investigation of the dynamics of magnetic vortices also considered an alternative direction based on usual, unknotted qubit made of a so-called noncentrosymmetric superconductor material. They expect that this material should have an intrinsic stabilization of the logical states. On the theoretical side, they are advancing the investigation of the ground state of these qubits using numerical Monte-Carlo simulations of thermodynamic states.
- The team are organizing a dedicated Le Studium conference on "Chiral Matter: from quarks to quantum computers" in Tours on July 5-7, 2023 where results, as well as work by others, will be discussed.



Dr Michal Korenko

LE STUDIUM Research Fellow

From: Slovak Academy of Sciences - SK

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

Nationality: Slovak

Programme: SMART LOIRE VALLEY

Dates: September 2022 to August 2023

Michal Korenko obtained his Ph.D. in high temperature molten salt chemistry and electrochemistry in 2003 at the Slovak University of Technology in Bratislava, Slovakia. Currently, he is working as a senior research fellow at the Institute of Inorganic Chemistry, Slovak Academy of Sciences, working in the Molten Salt Group with the ultimate focus to link and understand the relationship between the structure of molten systems and their physico-chemical behaviour (thermal and electrochemical stability, density, viscosity, conductivity, etc.). His scientific career has focused on projects in the field of molten salt chemistry, high temperature electrometallurgy, and high temperature energy applications. He was involved in a number of academic projects (EU, US, Slovak, Czech), including specific projects for industrial partners (ALCOA, HYDRO, RIO TINTO, ELYSIS). In 2009 – 2011, he spent two years as a postdoc at the Nuclear Research Institute in Řež near Prague working on the pyrochemical electrochemical separation of lanthanides and actinides in molten fluorides. In 2017 he assumed his position in Slovakia after 3 years spending as visiting scholar at the Valparaiso University, Indiana, USA, participating on US Department of Energy (ARPA-E) project of solar thermal electrolysis of MgO from molten fluorides.



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 Orléans at the CEMHTI laboratory. His research covers the synthesis and characterization of inorganic materials with a special interest in new transparent ceramics. He has patented and published (i) the first transparent polycrystalline ceramics obtained by full crystallization from glass (cnrs.fr/inc/communication/direct_labos/allix.htm) and (ii) and new highly transparent glasses and glass-ceramics exhibiting controlled nanostructure. He is the author or co-author of more than 140 scientific publications (H-index = 33), he is also co-inventor of 5 international patents on transparent alkaline earth aluminate glass and nanostructures glass-ceramics. He was awarded the CNRS bronze medal in 2013.

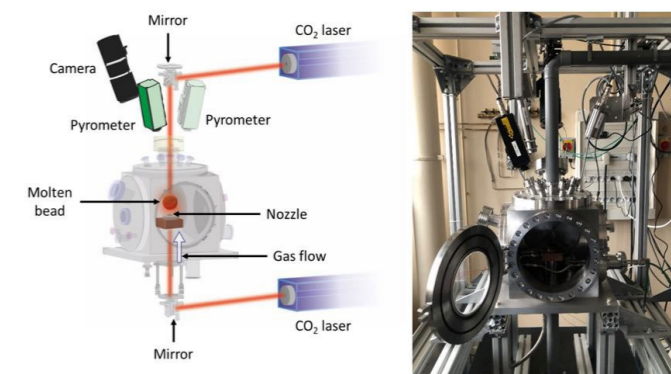
MOLTEN SALT SYNTHESIS AND CHARACTERIZATION OF (OXO)-(FLUORO)- ALUMINATES FOR ELECTROCHEMICAL AND ELECTRONIC/PHOTONIC APPLICATIONS

The primary aim of the project is a thorough and comprehensive physico-chemical analysis and the structural and phase characterization of the key phases and compounds of the high temperature interface fluoride melt/solid (glass) phase based on oxo-fluoro-aluminates of alkali metals. The gained knowledge is then being used for a targeted synthesis and preparation of previously unknown compounds and materials (including their physicochemical characterization) with interesting functional properties for electronic and photonic applications. A key innovation in this project is to apply a new, synergistic and strategic approach to the synthesis of metastable/non-stoichiometric phases and materials in order to discover new functional complex compounds, phases, and materials for electrochemical, electronic, and photonic applications. The practical intention behind this project is based on long-term cooperation between the home (IIC SAS, Bratislava) and host (CEMHTI CNRS, Orléans) institutes in the scientific field of high-temperature systems (melts, glasses, ceramics, interfaces). Up to now, the collaboration was mostly oriented to the study of the structure of oxo-fluoride melts for aluminium production. The present project is now trying to intensify the cooperation with Dr Mathieu Allix's group to focus more on the high function materials synthesized from these molten oxo-fluoride melts for specific electronic and photonic applications.

The project is based on the following chronological/logical procedure:

- Investigation and identification of interesting, unknown, or metastable/non-stoichiometric phases, compounds, and materials: Characterization of multicomponent systems and their binary subsystems, using different Thermal Analysis (TA) methods (including different STA modes like DTA/TG, DTA/DSC coupled with IR and MS).
- Targeted synthesis of the materials, identified in the previous step: Preparation of the samples using container-less aerodynamic levitation melting (ADL) and the use of quenching techniques to prepare undercooled samples.
- Thoroughgoing structural and material characterization of identified and newly prepared compounds and materials: a complete spectral and diffraction analysis of the mixtures using different diffraction, spectral and microscopic techniques (XRD, TEM, and NMR, including MAS, MQ-MAS, D-HMQC-HETCOR).
- Physico-chemical characterization of the electrochemical, electronic and photonic properties of the systems, materials, and compounds identified or synthesized in previous steps.

The use of various synthesis/analytical techniques makes it possible to find out deeper relationships between the structure of molten and solid systems and their physico-chemical properties. This knowledge can then allow on a greater scale a qualitative/quantitative prediction and modeling for specific practical electronic/photonic applications.



The aerodynamic levitation technique (ADL) developed at CEMHTI CNRS



Prof. Luke O'Dell

LE STUDIUM Visiting Researcher

From: Deakin University - AUS

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

Nationality: Australian

Programme: SMART LOIRE VALLEY

Dates: September 2022 to November 2022

Luke O'Dell is an Associate Professor in the Institute for Frontier Materials at Deakin University. His research focuses on the development and application of magnetic resonance based techniques (including liquid and solid-state NMR, dynamic nuclear polarisation, operando methods, and imaging) to study structure and dynamics in functional materials, particularly novel ion-conducting electrolytes such as ionic liquids, organic ionic plastic crystals and polymers. He has published over 130 papers in this area and in 2017 was awarded the Sir Paul Callaghan Medal by the Australian and New Zealand Magnetic Resonance Society for his contributions to the field.

UNDERSTANDING SODIUM BATTERY MATERIALS USING HIGH-FIELD SOLID-STATE NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY

The goals of this project are to use nuclear magnetic resonance (NMR) spectroscopy to (1) improve our understanding of sodium solvation, dynamics and interactions inside novel solid-state sodium battery electrolytes, and (2) understand the formation of the solid-electrolyte interphase (SEI) products on a sodium metal electrode surface of a functioning battery with an ionic liquid electrolyte. This detailed knowledge will allow us to design the next generations of sodium battery technologies through the design of improved electrolyte materials with enhanced ionic conductivity and favourable SEI formation properties.

To date, two novel solid-state sodium electrolyte materials have been studied. The first is a block co-polymer featuring a polymerised ionic liquid component to facilitate ion conduction, combined with a styrene component to add mechanical strength. High-field solid-state NMR experiments, in particular the ^{19}F - ^{23}Na HETCOR experiment, have allowed us to identify the solvation environment of the sodium cations, which are coordinated by two tetra fluoro sulfonyl imide (TFSI) anions. The sodium solvation environment is crucial in battery electrolytes as it will determine the ion transport mechanism as well as the desolvation process that occurs when the sodium reaches the electrode. Additional NMR experiments have been used to probe the different components of the polymer (^{13}C cross polarisation and direct excitation) and the increase in dynamics upon incorporation of an ionic liquid plasticiser to the polymer (^1H , ^{19}F and ^{23}Na line width measurements).

The second electrolyte system studied consists of a zwitterionic plastic crystal system doped with a sodium salt. A similar suite of NMR methods used for the polymer have been applied to this material and have shown that the sodium cations preferentially interact with the anionic BF_3 group of the zwitterion rather than the TFSI anions of the salt. Interactions between the TFSI anions and the zwitterion have also been observed by ^1H - ^{19}F HETCOR.

With regards to the second project goal, we have carried out ex situ ^{19}F and ^{23}Na NMR experiments on SEI products formed within cycled symmetric sodium metal coin cells containing two different ionic liquid electrolytes. The ^{19}F spectra show signals from the residual fluoro sulfonyl imide (FSI) anions of the electrolyte, as well as sodium fluoride. Additional signals at around -80 ppm are tentatively assigned to the SO_2F anion which provides insights into the break down mechanism of the FSI anions. The ^{23}Na spectra show multiple overlapping peaks from different sodium containing FSI phases and a preliminary ^{23}Na MQMAS spectrum shows that this method is feasible to improve the resolution and allow these peaks to be identified.

Thus, we have so far achieved new insights into sodium solvation and ion interactions in two novel solid-state electrolyte materials, as well as gaining information on the formation of SEI products in sodium metal batteries incorporating ionic liquid electrolytes.



Dr Michaël Deschamps

Host Scientist

Michael Deschamps is a Professor of Materials Chemistry (1st Class) at the University of Orléans. His research focuses on Nuclear Magnetic Resonance (NMR) techniques (high-resolution liquid and solid-state NMR, in situ and operando or imaging experiments) applied to electrochemical energy storage, including batteries and supercapacitors. He is currently the head of the NMR platform of the French network on Electrochemical Energy Storage (RS2E). He has published more than 100 papers on the subject and was awarded a Junior Fellowship at the Institut Universitaire de France between 2014 and 2019.



Dr Corneliu Sergiu Stan

LE STUDIUM Research Fellow

From: Gheorghe Asachi Technical University of Iași - RO

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

Nationality: Romanian

Programme: SMART LOIRE VALLEY

Dates: November 2021 to April 2022

Corneliu S. Stan defended his doctoral thesis "New lanthanide complexes with organic ligands" in 2012 and is currently a full-time researcher within the Natural and Synthetic Polymers Department within the Faculty of Chemistry of the Gheorghe Asachi Technical University of Iasi, Romania. During the last 10 years he has published 42 research papers (34 in peer reviewed high impact ISI Journals), mostly as main author, achieving more than 350 citations. Also, he is the main author of 6 national patents, 5 national registered patent requests, and 1 international patent request. His main research areas of interest are nanostructured carbon materials with optical and medical applications, photo/electro luminescent materials, lanthanide and transition metals complexes including polymer complexes, aerogels, polymer composites etc. He was involved as main researcher in the successful completion of more than 9 national funded, multi-annual research projects.

CARBON NANOMATERIALS AS SOLAR UV PROTECTORS TARGETING APPLICATIONS RANGING FROM PAINTS/VARNISHES TO PHARMA/COSMETIC PRODUCTS

The main goal of the project, is the development of new nanostructured carbon dots and their application as solar UV protectors in various materials, ranging from paints/varnishes for automotive/household to pharmaceutical/cosmetic products and formulations. This novel approach is supported by the hypothesis that protection can be provided by the down conversion of the harmful solar UV towards lower energy photons produced through the radiative processes within highly photoemissive Carbon Dots, thus reducing the negative effects over long-term solar exposure. Corneliu Stan's work focused on imide-derived Carbon Dots suggests that they are particularly well suited for this goal due to the wide range UV excitation of their radiative processes, along with high physico-chemical stability, inertness, non-toxicity and ease of fabrication with minimal environmental impact. Their excitation interval is located conveniently in 300–390 nm range covering both UV-B and UV-A regions, where most of the solar UV component at sea level is located while the photons produced by PL emission are located in blue-green area of the visible spectrum, which are markedly less harmful for the surfaces intended to be protected.

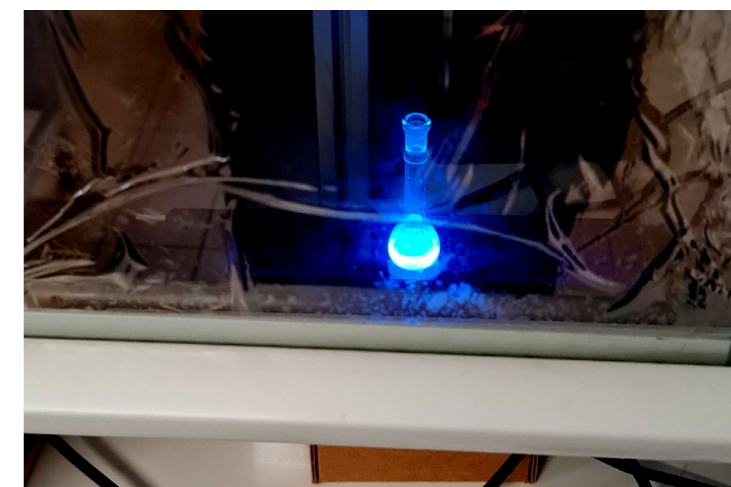
To date, the research activities have been focused on experimental work in order to improve/adapt the N-Hydroxyphthalimide (NHF) derived Carbon Dots to the intended goal. Carbon Dots doped with Cu(III), Co(III), Zr(IV) and Fe(III) were obtained through thermal processing through partial pyrolysis under controlled parameters (temperature, thermal exposure time of the precursors etc) of the ante-prepared NHF complexes with above-mentioned cations. These NHF complexes with above-mentioned cations were respectively prepared at 1/2 and 1/4 metal to ligand ratio. Currently, the prepared nanomaterials and NHF complexes precursors are under structural investigation. Another aspect which is currently under investigation is the determination of the Carbon Dots content within the aqueous dispersion resulted after the preparation. As the conventional methods are not suitable (at least for the small quantities prepared at the lab scale) or not expected to provide accurate measurements, a new method was taken into consideration, which uses a QCM equipment (Quartz Crystal Microbalance). The measurement protocol was adapted to the prepared aqueous dispersions of Carbon Dots and, within the QCM methods constraints, is currently under experimental investigation; so far the results are very promising. Also, a series of polymer matrices were prepared and loaded with the above mentioned photoluminescent Carbon Dots in order to evaluate the effects of the long term exposure to UV-C radiation.



Dr Conchi Ania

Host Scientist

Conchi Ania received her PhD in 2003 from the University of Oviedo (Spain). In 2009, she became a Tenured Scientist at the Agencia Estatal CSIC, and in 2017 she joined the CNRS as Director of Research. She has been a grantee of the European Research Council since 2016 and editor of Carbon journal. She is a highly recognized researcher in the field of carbon materials and their photochemistry. She has an ample background and wide experience on the design of nanoporous materials with modulated properties for applications as electrodes, catalysts and adsorbents and their integration in high-tech environmental remediation and energy conversion/storage. She has an H-index of 43 with over 6000 citations. She has a large experience on coordinating and participating in R&D projects and industrial contracts, currently holding an ERC-Consolidator Grant of the H2020 program- on photochemistry of carbon materials for technological applications.



Photoluminescent Carbon Dots exposed to long term UV-C radiation



Prof. Christine Rousselle

LE STUDIUM Consortium Coordinator

Christine Rousselle is Full Professor at the University of Orléans, a Fellow of the Combustion Institute 2021. Her research fields concern applied Fundamental Combustion (mainly internal combustion engines, with some focus on new combustion modes (lean burn, LTC, RCCI, ...), zero carbon-fuels (ammonia, bioalcohol, biogas, ...), with the use of optical diagnostics and high pressure-high temperature vessels.

She leads the different projects concerning Ammonia Fuel for PRISME Laboratory. She obtained the first ANR GRANT about Ammonia Combustion in 2022, SIAC (Scientific Improvement on Ammonia Combustion).

Since then, she has given more than 20 invited conferences around the world about ammonia combustion and/or ammonia as fuel for engines and published more than 20 papers. She was also a TEDX speaker in 2021.

She is member of several International advisory boards (MarinNH3 , CMT) and a member of the PEPR-H2 Program Committee and of the scientific Council of IFP En.

She is an Associate Editor of the Proceeding of Combustion Institute (until 2024), Elsevier and co-editor of the Journal of Ammonia Energy. She is a member of the Scientific Committee of the Ammonia Combustion Workshop since 2022, organised by KAUST and of the Scientific Committee of the new Symposium on Ammonia Energy.

She is the Chair of the 2nd Edition of the Symposium on Ammonia Energy 2023, which will take place in Orléans.

AMMONIA COMBUSTION FOR ENERGY SYSTEMS, ACES

European Union has recently focused its long-term goal of reducing greenhouse gas emissions by reaching zero carbon emissions in 2050. Green Hydrogen is now considered as a good candidate to reach this deal. But it suffers from some drawbacks such as the storage complexity, safety and cost. Ammonia, the other hydrogen, is more and more considered as the most appropriate hydrogen carrier with advantages such as its lower cost per unit of stored energy; its higher volumetric energy density; easier and more widespread production, handling and distribution capacity, and better commercial viability; Its liquid phase by compression to 0.9 MPa at atmospheric temperature; the well-established, reliable infrastructure already exists for both ammonia storage and distribution (including pipeline, rail, road, ship). A viable energy system based on green NH3 combustion with zero carbon foot-print faces several main scientific and technological challenges. By considering different steps of the process as soon to be optimized, one question remains: how to optimize the combustion of pure ammonia and how to optimize the prediction of ammonia combustion to design accurate systems for power and transports?

This consortium had three main ambitions:

- to give the opportunity during the different stays for all partners to generate an intensive discussion about the main scientific locks still necessary to be studied before considering ammonia as fuel for stationary and unstationary energy systems and also to provide highly accurate models to help industrial design.
- to submit a European proposal for a Doctoral network or COST actions and any call related to their skills.
- during the second year, as the consortium members are involved in the scientific committee of the First Symposium on Ammonia Energy, the applicant applied to organize the second symposium in Orléans to favor the encounter of academics and industrial partners. It will be also a major asset for the recognition of the academic partners from Orléans as well as Regional strategic roadmap 2020-2030 for the deployment of hydrogen in the Centre-Val de Loire, and also the competitiveness cluster S2E2 in energy management.

During the first week of consortium meeting, each partner presented in details their skills about ammonia combustion to draw a roadmap about the fundamental milestones. Indeed, ammonia is not really the 'best fuel' due to its fundamental properties (low flame speed, high auto-ignition temperature, narrow flammability limit...). Therefore, its combustion still produces unwanted NOx and N2O, an important greenhouse gas, and suffers from low efficiencies, which can generate undesirable unburnt ammonia. The consortium also reviewed the different specificities of each type of applications: gas turbines, burners, internal combustion engines. The use of different novel combustion concepts based on a) ammonia pre-cracking; b) stratified injection; c) gas exhaust recirculation; and d) optimized power cycles and/or combustion modes can enable efficiency improvement and low NOx combustion from all applications.

They concluded that for main applications, ammonia helped hydrogen remains the best scenario to meet zero carbon emissions. MILD combustion seems not only interesting for applications but also for fundamental as locally lean ammonia/

air premixture is reached and provided not usual combustion behavior.

If Ammonia is more and more seriously considered as a main energy carrier, ammonia direct applications are currently managed with a "trial and error" philosophy, while assessing and conducting the retrofitting of carbon-based systems. Furthermore, the use of ammonia splitting crackers to deliver hydrogen leads to inefficiencies that could be eliminated if ammonia was employed directly. Unfortunately, Ammonia Science and Technology is still in its infancy, thus it has to be developed through critical steps, starting from fundamental aspects, through the development of high-fidelity models and design tools, to large scale commercial systems, hence promoting technological advancements at high Technological Readiness Levels.

From this conclusion about the state of art not only from fundamental knowledge but also from technologies, the consortium decided to submit a COST Action, called 'TRANSITION' (TowaRds AmmoNia Science and Technology InnovatiONs) in November 2022. The final target of TRANSITION is to solve not only the fundamental gaps in ammonia combustion but also fuel cells, material science, emission control and regulations, while providing for high-fidelity models and reliable design tools that can be used for the design and manufacture of next generation carbon-zero technologies working on this chemical. These advancements will be developed on the basis of trustable and structured experimental database, from lab- to pilot-scale reactors, coupled with advanced measurement techniques. This COST ACTION will allow to achieve technological advancements in ammonia Science and Technology, while paving the routes towards innovative and groundbreaking practical, industrial representative solutions.

PARTNERS



Dr Mara DE JOANNON

is a pioneer of MILD combustion, (low-NOx technology); she leads several European Cost Actions focused on the use of Smart Energy Carriers in advanced combustion technology.

CNR in Napoli - Italy



Pino SABIA

is involved in the consortium and coordinates the proposal TRANSITION with Prof A.Valera-Medina

King's College - United Kingdom



Prof. Fabian MAUSS

is an expert in chemistry and I.C. engine modelling and CEO of several SMEs. He developed one of the few most predictive kinetic mechanisms currently on ammonia oxidation.

Brandenburg University of Technology - Germany



Prof. Epaminondas MASTORAKOS

is an expert of CFD and experiments for stationary combustion systems and knowledge-transfer to the aviation industry (Fellow of the Combustion Institute and co-editor of Combustion and Flame, Elsevier).

Cambridge University - United Kingdom



Prof. Agustin VALERA MEDINA

is a pioneer in experimental investigations of NH3 in gas turbine combustors; . He launched the Symposium on Ammonia Energy and organized the first meeting in August 2022 in Cardiff. It was a real success, and so is the Journal of Ammonia Energy

Cardiff University - United Kingdom



SCIENTIFIC COMMUNICATION

Prof. Feng Huang

Oral communications

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Prof. Yun Hee Jang

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Prof. Dmitri Kharzeev

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Dr Corneliu Sergiu Stan

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BIOMOLÉCULES ET BIOTECHNOLOGIES VÉGÉTALES (BBV)

EA 2106 - UNIVERSITÉ DE TOURS



The Plant Biomolecules and Biotechnology laboratory was founded in 1987 and is located at the Faculty of Pharmacy in Tours. This Laboratory 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, bioinformatics (identification of genes), genetics and metabolomics. The laboratory is also involved in the development of plant biotechnologies (in vitro technologies and GMOs) and in bio engineering (production of plant metabolites in yeast). This laboratory also works on applied research programs to identify new natural preservatives or biologically active ingredients (BAIs) for cosmetics.



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



This laboratory has a long-standing expertise in performing research at the interface between nutrition and cancer, and has received international recognition in this field. The team was the first to link diet-related changes in the breast-associated adipose tissue (lipidome) in relation to breast cancer development and metastasis. UMR1069 has also described the potential benefits of the clinical use of lipid nutrients in order to increase anticancer treatment efficiency. The overall objective of the UMR 1069 is to identify nutritional lipids of interest for oncology by investigating their cellular mechanism of action on energy metabolism and calcium signaling. The fundamental and clinical project of the research unit benefit of the specific expertise of lab members in chemistry/biochemistry of lipids from adipose tissues, tumours and cell membranes. The objective is to identify and use both natural and synthetic patentable lipids, with specific modes of action, to improve the efficacy of anticancer therapy, restrain tumour progression, and to prevent metastases occurrence and/or cachexia.



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



The Nanomedicines and Nanoprobes (NMNS) group is part of the Philippe Maupas Faculty of Pharmacy of the University of Tours. It is led by Professor Igor Chourpa. The group started in 2008 and became an independent "Equipe d'Accueil" E.A 6295 in 2012. Its scientific research centers on the development of nanotechnologies for anticancer drugs and/or contrast agents for imaging with applications in cancer theranostics as well as dermatological and cosmetic sciences. The group's activities combine expertise in biology, chemistry (synthetic and analytical) and physics. This confluence of expertise 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-Val de Loire, La Ligue contre le Cancer, the Institut National du Cancer, ERA.NET Plus and ARD CVL Cosmetosciences / LE STUDIUM.



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



The Insect Biology Research Institute (IRBI) is dedicated to the analysis of interactions between insects and their biotic and abiotic environment. IRBI is a joint research unit of the University of Tours and the CNRS (UMR 7261). Bringing together researchers and lecturers from different disciplines (e.g. ecology, physiology, genetics, (bio)chemistry, physics, bioinformatics and mathematics), IRBI represents a rare place with an asserted international identity on insect sciences. To understand the puzzle of life and to confront the complexity of biological systems, their functioning and their evolution, IRBI integrates approaches at the interface between organismal biology, ecology and evolutionary biology. The areas of transfer range from biological control for sustainable agriculture to the development of new technologies for the control of vector and invasive insects in urban and natural environments, as well as biomimicry or the production of insects for feed and food.



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



The University of Tours Imaging and Brain Unit was created in 1988 with the goal of generating a local network of specialists in different domains in neuroscience. The unit is located at the school of medicine and the University Hospital where medicine students, faculty professors and research scientists come together to exchange scientific ideas in neuroscience. The main objectives of the unit is to improve the understanding of psychiatric and neurologic disorders and to develop new imaging technologies and innovative therapies for the diagnosis and treatment of neuropathological disorders. The host laboratory (Dr. Patrick Vourc'h), Team 2 "Neurogenomics and neuronal physiopathology" is a member of the iBrain unit and his research is mainly focused on developing therapies for the treatment of Amyotrophic lateral sclerosis (ALS). Team 2 is a multidisciplinary team of neurologists, geneticists, biochemists, and molecular biologists that are working together on taking research data from the laboratory into the clinic that can benefit patients in the long run.



LABORATOIRE DE BIOLOGIE DES LIGNEUX ET DES GRANDES CULTURES (LBLGC) UPRES EA 1207 - UNIVERSITÉ D'ORLÉANS



Founded in 1996, the «Plant Lignans» laboratory 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 phenylpropanoid-derived products. The team also works on applied research programs to find new natural preservatives and active ingredients for cosmetic applications. More recently, the team started to work on the green extraction of plant bioactive compounds with cosmetic/pharmaceutic interest, using natural deep eutectic solvents (aka NaDES). In the framework of the PIERIC project (ARD CosmétoSciences), the present work is therefore of special interest for this latter aspect of the research developed in the laboratory.



UNITÉ DE PHYSIOLOGIE DE LA REPRODUCTION ET DES COMPORTEMENTS (PRC) UMR 7247 - CNRS, CENTRE INRAE VAL DE LOIRE, UNIVERSITÉ DE TOURS, IFCE

The Reproductive Physiology and Behaviours Laboratory is affiliated to INRAE, CNRS, the University of Tours and IFCE. The biology and bioinformatics of GPCR signalling systems (BIOS) group investigates the cellular mechanisms and signalling pathways activated downstream of G protein-coupled receptors (GPCRs) and the subsequent cellular response. An emphasis has long been put on key gonadal receptors involved in the control of reproduction, the follicle stimulating receptor (FSHR) and the luteinizing hormone receptor (LHR). The BIOS group uses systems biology approaches, including mathematical modelling and bioinformatics, to decipher GPCR-induced signalling to better understand how receptors control gonad functions. The BIOS group also develops new pharmacological strategies targeting these receptors. Capitalizing on the dynamics initiated in the Centre-Val de Loire region in the framework of the MAbImprove LabEx and the ARD CVL on biopharmaceuticals, the BIOS group has recently isolated and characterized gonadotropin receptor-specific antibody fragments displaying pharmacological efficacy both in vitro and in vivo.

The group focuses on receptors involved in the control of reproduction, mainly, the follicle stimulating hormone receptor (FSHR) and the luteinizing hormone receptor (LHCGR) and on oxytocin receptor which plays an important role in the control of social interactions. BIOS uses systems biology approaches, including mathematical modelling and bioinformatics, to decipher GPCR-induced signalling networks and how they control integrated physiological responses. BIOS also develops new pharmacological strategies targeting these receptors. Capitalizing on the dynamics initiated in The Centre-Val de Loire region in the framework of the MAbImprove LabEx and the ARD "Biopharmaceuticals", the BIOS group is currently developing GPCR-specific antibody fragments displaying pharmacological efficacy for both in vitro and in vivo applications.



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



The INSERM UMR-618 unit «Proteases and Pulmonary Vectorizations» created in 2002 by Prof. F. Gauthier in Tours became the «Research Center for Respiratory Diseases (CEPR)» in 2017 and has since been headed by Dr M. Si-Tahar. Respiratory diseases have a major impact in medical and socio-economic terms. CEPR develops a continuum of research from the understanding of mechanisms of lung infection and inflammation up to the validation of novel therapeutic strategies. CEPR gathers chemists, biochemists, immunologists, microbiologists, cell biology experts and physicians, all experts in the study of respiratory diseases.



BIOLOGIE DES OISEAUX ET AVICULTURE (BOA) **UMR 083 - UNIVERSITÉ DE TOURS, CENTRE INRAE VAL DE LOIRE**



The UMR BOA conducts integrated research on the biology of birds, from the molecular level to that of the animal in its environment. Its objective is to produce knowledge in the fields of physiology and genetics and to contribute to the development of sustainable livestock systems. The Unit is also involved in comparative approaches between species in order to elucidate the specificities of the bird model. In order to promote the transfer of research results into poultry production practices, the UMR BOA, along with ITAVI, co-pilots the action program developed by the UMT BIRD – Poultry Farming, Systems and Territory.



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



The Center for Molecular Biophysics (CBM) is a research unit of the French National Scientific Research (CNRS), affiliated with the University of Orléans. The CBM develops research at the interface of chemistry, biology and physics to study the molecular mechanisms that sustain life or dysfunctions leading to diseases, as well as other disciplines, such as Exobiology. The CBM was funded in 1967 and from this laboratory biophysics was first developed in France (the French Society for Biophysics was created in Orléans).





Dr Abhishek Baghela

LE STUDIUM Guest Research Fellow

From: Premas Life Sciences - IN

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

Nationality: Indian

Programme: SMART LOIRE VALLEY

Dates: October 2022 to April 2023

Abhishek Baghela did his doctoral studies at Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh, India, to secure a PhD in Molecular Mycology. He worked as a research associate at Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India, where he worked on a yeast biology project pertaining to yeast hybrids. He joined National Fungal Culture Collection of India (NFCCI), Pune, India as a Scientist in 2014. He was involved in research on yeast biotechnology and fungal biology. He was also taking care of fungal molecular identification services rendered by NFCCI. He has supervised 2 Ph.D. students and handled various extra and intramural research grants as PI. He has contributed immensely in the area of second generation bioethanol production in India and yeast taxonomy. He has 44 research articles and 5 book chapters to his credit.

THE YEAST CELL FACTORIES FOR PRODUCTION OF THERAPEUTIC mRNA

Messenger RNA vaccines have become a game-changer in the fight against COVID-19, and mRNA is considered the basis for a vast array of therapeutic applications. Currently, in vitro transcription (IVT) is the only available technology for mRNA production; however, it relies on a complex supply chain and a costly purification process. This is a major problem hampering large-scale IVT production and high production costs are a problem for low-income countries. Therefore, the goal of this project is to develop a tailor-made yeast-based messenger RNA (mRNA) factory platform for large-scale and cost-effective manufacturing of mRNA therapeutics. Abhishek Baghela is part of a multi institute consortium consisting of eight partners from five countries, which will be working together over the next three years.

mRNA is a naturally occurring molecule in all forms of life. Yeasts produce mRNA in a very similar manner as humans and they are easy to grow. Furthermore, yeasts have been used for centuries, for instance to bake bread and to brew beer. Nowadays, yeast has been used for the production of medicine (e.g. cough suppressants) and the yeast-based medicine were shown to be safe. However, mRNA production in yeasts has never been attempted. The challenge is that yeasts produce their own mRNA, which is hard to separate from the therapeutic mRNA. Our consortium has devised a strategy to isolate the mRNA of interest by packing it in a container within yeast. The compartment with the therapeutic mRNA can then be separated from the rest. The team will test if production can occur at a large scale for the efficient manufacturing of mRNA therapeutics. Then, the consortium will extract and purify the mRNA and check the quality and purity of the bio-produced mRNA.

The team expect that yeast-produced mRNA therapeutics will be more affordable and easier to make than chemically produced mRNA, thus making it available to everyone. Furthermore, the treatment efficacy of yeast-based RNA therapeutics will be at least very close to that of chemically produced RNA.



Prof. Chantal Pichon Host Scientist

Chantal Pichon is a Professor at the University of Orléans. She is also a senior member of the Institut Universitaire de France: "Chair of Innovation" and Nominated Invited Professor at Berlin Institute of Health -Stiftung Charité in Germany. C. Pichon's main research activities are dedicated mainly to the use of nucleic acids as therapeutics. Lately, she has been particularly interested in messenger RNAs vaccines and therapeutics. She is developing innovative formulations for their delivery for various applications: mucosal vaccination, cell-based therapies and protein replacement therapy. C. Pichon has also patented mRNA bioproduction technology based on a tailor-made yeast-based mRNA factory platform. She has supervised 16 Ph.D. students & 12 Post-doc fellows. She secured 29 grants, out of which 16 as PI and published more than 170 research articles in the international journals of repute. She has also delegated administrative duties at the University of Orléans, Center for Molecular Biophysics, UPR 4301 (CNRS) and various National/international mandates and expert committees.



Prof. Livio Casarini

LE STUDIUM Research Fellow

From: University of Modena and Reggio Emilia - IT

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

Nationality: Italian

Programme: ARD CVL BIOPHARMACEUTICALS

Dates: November 2022 to November 2023

Livio Casarini received his Ph.D. in evolutionary biology, in the year 2009. His research is focused on sex hormone signalling and receptors, steroidogenesis, ovarian and thyroid cancer, as well as on related pharmacological aspects. Livio is an associate professor at the University of Modena and Reggio Emilia and team leader of the research Group in basic and translational endocrinology. Currently, his research activities fall within the field of gonadotropins signalling in the gonads, sex steroid hormones and thyroid pathophysiology. One of his core projects aims to develop a nano antibody-based, non-hormonal contraceptive method.



Dr Eric Reiter Host Scientist

Eric Reiter is a 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 as a researcher at INRA, Nouzilly, France. He visited Robert J. Lefkowitz's laboratory at Duke University, USA for two years between 2003 and 2005. He was group leader at the PRC Unit from 2006 to 2011. He has been deputy director of PRC Unit since 2018. In 2009, he cofounded ReproPharm, and in 2017, MAbSilico, two spin-offs from INRAE. He has published more than 120 peer reviewed papers that have been cited more than 6000 times. Over the last few years, his research work interest has been focused on the development of VHH to pharmacologically modulate GPCRs. He currently coordinates projects in the framework of ARD Biopharmaceuticals Program and the Bill & Melinda Gates Foundation.

ANTIBODY FRAGMENTS TARGETING OVARIAN GPCRS TO CONTROL REPRODUCTION

We are developing nano-antibody fragments (VHH) capable of targeting hormone receptors expressed in the gonads. VHHs modulate the signal induced locally by sex hormones, with the aim of inducing contraceptive effects or, on the contrary, of an enhancement of gamete production. The correlation (or lack thereof) between the in vitro pharmacological VHHs profile, its pharmacokinetics and efficacy/toxicity, will be investigated as well, to maximize the information gathered from gonadal cell functioning.

We have developed a VHH capable of targeting the follicle-stimulating hormone (FSH) receptor (FSHR), located in granulosa cells, in the ovary, and in Sertoli cells, in the testis. This VHH has been synthesized in three different forms, depending on the protein structure it is bound with. These three compounds were tested for their potential to modulate the intracellular signalling induced by FSH, in cells collected from the ovary of donors. We found that they effectively inhibit specific signalling cascades linked with the maturation support for oocyte, without impairing key functions of the cell, such as metabolism and steroid synthesis.



Prof. Livio Casarini introducing his LE STUDIUM Thursday seminar on «Antibody fragments targeting ovarian receptors to control reproduction»



Dr David Crottès

LE STUDIUM Research Fellow

From: University of California San Francisco - USA

In residence at: Nutrition, Growth and Cancer (N2C) - Tours

Nationality: French

Programme: SMART LOIRE VALLEY

Dates: March 2022 to March 2023

Born in December 1986, David Crottès has a long-standing interest in the patho/physiological molecular function of ion channels with a special interest in particular research fields where the investigation of ion channels is still emerging such as cancer and immunity.

For his PhD training, David joined Dr Soriani's team at Institut Biologie Valrose (Nice, France) and investigated the role of a particular chaperone protein, Sigma-1 receptor, in the regulation of ion channels during carcinogenesis.

After graduating in 2014, he joined Pr. Lily Jan's lab at University of California San Francisco, a worldwide leader in ion channels research. In Pr. Jan's lab, David was given the opportunity to develop his own research project and investigate the contribution of chloride channels in oncogenic signaling pathways in pancreatic cancer cells.



Prof. Christophe Vandier
Host Scientist

Christophe Vandier is Professor of Physiology at the University of Tours and Director of the Nutrition-Growth-Cancer Laboratory (Research unit of the University and INSERM, UMR 1069). After working in the field of vascular physiology, Christophe Vandier joined the Nutrition-Growth-Cancer laboratory of the University of Tours in 2004, directed by Prof. Philippe Bougnoux, to develop research on the role of ion channels as molecular actors of the response to lipids in cancer. At the same time, Christophe Vandier participated in the development of the «ion channels and cancer» network of the Cancéropôle Grand Ouest (as coordinator), which has now become the «marine molecules, metabolism and cancer» network that he co-coordinates with Prof. Sylvain Routier of the University of Orléans.

INVESTIGATING THE HETEROGENEITY OF THE CROSSTALK BETWEEN CANCER CELLS AND THE TUMOR MICRO-ENVIRONMENT USING CALCIUM PROFILING

Understanding interactions of cancer cells with their micro-environment is crucial to prevent tumor development and chemotherapy resistance. However, depending on the cancer type, the molecular nature of cancer cells and the composition of the microenvironment, the effect of the microenvironment on the cancer phenotype will be different. Thus, it is important to document the sensitivity of cancer cells to their microenvironment in order to define the most appropriate therapeutic strategy.

In this proposal, Crottès and his team aim to develop a methodology to interrogate the sensitivity of cancer cells to various elements of the tumor microenvironment. This method relies on the particular role of intracellular calcium as an essential second messenger. In cancer cells, variations of intracellular calcium concentration has been frequently observed in response to extracellular stimuli. Thus, the team hypothesize that in response to molecules of the tumor microenvironment variation of intracellular calcium concentration is correlated with the associated cancer phenotype.

Here, in a panel of cancer cell lines representative of different cancers the team will define the profile of cytosolic calcium concentration and the cancer phenotype induced by a panel of molecules representative of the tumor microenvironment. Then, using machine learning methods they will build a classification of cancer cell lines according their sensitivity to elements of the tumor microenvironment and generate a model to predict the cancer phenotype of a cancer cell line from its calcium profile.

This original research project will improve the team's understanding of the heterogeneous relationship of cancer cells with their microenvironment. It will also provide proof-of-concept that calcium profiling could be predictive of the cancer phenotype induced by the microenvironment paving the way for the future development of a diagnosis tool.

To date, the team successfully generated a catalogue of profiles of calcium response induced by a panel of molecules on a panel on cancer cell lines originated from colorectal and prostate cancers. From this catalogue encompassing 6499 calcium responses, the team built a machine-learning model that identifies 36 unique profiles of calcium responses. From this model, the team are able to discriminate colorectal from prostate cancer cell lines proving thus our hypothesis.

Thus, using unsupervised classification algorithm, the team are able to define the origin of a cancer cell based on its profile of calcium response. In the next step of this project, the team will correlate these profiles of calcium responses to the phenotype of cancer cell lines in order to build a model allowing to predict the origin and the phenotype of cancer cells based on the profile of calcium responses.



Ion channels in pathological context, new methods and diagnosis tools conference group (Tours City Hall)



Dr David Crottès and Prof. Stéphane Petoud

ION CHANNELS IN PATHOLOGICAL CONTEXT, NEW METHODS AND DIAGNOSIS TOOLS

This LE STUDIUM Conference aimed to provide an overview of the state-of-the-art of the physio-pathological role of ion channels, with a special emphasis on cancers, and of the new innovative tools in development for their investigation or their targeting.

From this LE STUDIUM CONFERENCE, David Crottès and the other participants had the opportunity to develop and strengthen their network of collaborators. Thus, the Crottès' host lab has been involved in the application to an ANR grant and a MSCA-Doctoral Network as part of the European Consortium METION. Other collaborative research projects are planned in the near future with participants of this LE STUDIUM CONFERENCE.



PRÉVENTION DES CANCERS PAR LES LIPIDES DE L'ALIMENTATION: LE RÔLE DES CANAUX IONIQUES

The environment, especially food, influences the development and progression of tumours and can stimulate or inhibit their formation. The development of several types of cancer could be delayed if the intake of food components that stimulate tumour development were restricted in the diet or, conversely, if factors with inhibiting activity were provided. Lipids, and in particular those provided in the diet, may play this role. In recent years we have identified several lipids or classes of lipids that have anti- or pro-tumour activities. These dietary or synthetic lipids target ion channels that we have demonstrated a role in tumour development. The identification of dietary lipids likely to activate or inhibit tumour development and progression constitutes the basis for tertiary or, in the longer term, primary prevention of cancer through diet. Furthermore, a more detailed analysis of the association between dietary lipids and ion channel that paly a role in tumour progression, taking into account the differences observed in patient subgroups, could provide the basis for an «à la carte» prevention of cancers by dietary lipids.



Ion channels in pathological context, new methods and diagnosis tools conference group (Tour Charlemagne, Tours)



Dr Franciska Vidáné Erdő

LE STUDIUM Visiting Researcher

From: Pázmány Péter Catholic University - HU

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

Nationality: Hungarian

Programme: SMART LOIRE VALLEY

Dates: January 2022 to April 2022

Franciska Erdő obtained her PhD from pharmacology at the Institute for Drug Research, Budapest and Semmelweis University, Faculty of Pharmacy, Budapest, Hungary. Later she worked for different biomedical research institutes (BIOREX Ltd, Veszprém, IVAX Drug Research Institute, Budapest) and joined the research group of Max Planck Institute for Neurological Research, Cologne, Germany and Charité University, Berlin, Germany. Her main research interest was the investigation and experimental modelling of the pathophysiology of stroke, and development therapeutic strategies against stroke. Next, she joined Sanofi-Aventis -Chinoin and SOLVO Biotechnology. Since November 2014 Franciska Erdő has been working for Pázmány Péter Catholic University, Faculty of Information Technology and Bionics, Budapest. Her expertise is on the physiological barriers and drug delivery across the barriers. She was involved in skin analysis and RAMAN spectroscopy at the University of Tours, France and continued the dermatological and cosmetic research in Budapest, Hungary.

KNOWLEDGE TRANSFER ON RAMAN SPECTROSCOPY AND SKIN-ON-A-CHIP TECHNOLOGY TO STUDY TRANSDERMAL DRUG DELIVERY

The three-month visit aimed to establish a collaboration between the university of Tours and the Faculty of Information Technology and Bionics, Pázmány Péter Catholic University (PPC-UNIV) under mutual exchange of competences and skills.

PPC-UNIV → UNIV-T: Establish skin-on-a-chip microfluidic device as a new skin model for permeation studies.

UNIV-T → PPC-UNIV: Provide Confocal Raman spectroscopy as an innovative tool for investigation of skin penetration of topical drugs ex vivo/in vitro.

UNIV-T + PPC-UNIV: Provide an extended characterization of skin-on-a-chip microfluidic device to demonstrate their suitability as skin models for testing penetration of pharmaceutical and cosmetic active molecules.

During the 3-month visit Franciska Erdő and her team could perform a short study with human and animal skin tissues by Confocal Raman spectroscopy and in skin-on-a-chip device. The team could compare the composition of excised skins and artificial skin equivalent (EpiDerm- MatTek) and then conducted a skin-on-a-chip experiment using 2% caffeine cream as a test formulation. Also the barrier function of the skins was evaluated before and after the diffusion studies. The team's results have been evaluated and published in a special issue of Pharmaceutics at the second part of 2022. As a continuation of the collaboration, Erdő's PhD student spent 10 days in the NMNS Laboratory as an Erasmus+ student in November 2022 and performed some additional interesting experiments on healthy and diseased animal skin tissues by Confocal Raman Spectroscopy. Her results are under evaluation and will be published soon in a high impact journal.

SKIN MODELS IN COSMETIC SCIENCE: BRIDGING ESTABLISHED METHODS AND NOVEL TECHNOLOGIES - 2ND MEETING

The objectives of this online conference was the development of imaging and diagnostic techniques for skin research, the presentation of penetration enhancers and additives for topical formulations, as well as the introduction and validation of skin models in cosmetic and dermatological research, and the applications of Skin-on-a-chip - diffusion devices, comparative evaluations of skin models. It attracted a very positive audience of 176 participants from 26 countries.



LE STUDIUM CONFERENCE

After the Le STUDIUM meeting a good collaboration was developed with Prof. Dominique Lunter from the University of Tuebingen, Germany. A review paper was compiled together and published in September 2022 in Experimental Dermatology. Also the speaker Dr. Mais Saleh from the University of Jordan, approached the team for a joint research in the field of skin barrier function. There has also been continuous collaboration with the researchers from the MatTek Company through the participation and interactions with Dr Silvia Letasiova and Marek Puskar.



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 MNMS research group at the University of Tours (France) as associate professor. His 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.



Prof. Stephen Foster

LE STUDIUM Research Fellow

From: North Dakota State University - USA

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

Nationality: New Zealander

Programme: SMART LOIRE VALLEY

Dates: September 2022 to September 2023

Prof. Stephen Foster was awarded a PhD in chemistry at the University of Waikato (New Zealand). Afterwards, he obtained a position at the Entomology Division of DSIR in Auckland (New Zealand) where he worked on insect chemical ecology until accepting a position in the Department of Entomology at North Dakota State University (USA) in 2000. He is a professor in entomology (School of Natural Resource Sciences) at NDSU, where he teaches Insect Physiology and works primarily on the metabolic nature of insect chemical communication. In recent years his research has focused on the use of stable isotope tracers to study quantitative metabolism in insects. He has been an Associate Editor for the Journal of Chemical Ecology since 2006 and is a past President and Secretary of the International Society of Chemical Ecology.



Prof. Jérôme Casas Host Scientist

Jérôme Casas obtained a Ph.D. from ETH Zurich (1989). After a post-doc at Strathclyde University (UK), he was asst. prof. at ETH, moved to UC Santa Barbara, and appointed full Professor in 1995 (Tours, France). He was director of IRBI (2001-2008). His research combines natural history with state-of-the-art technology and modelling. He has contributed to many scientific boards, including BOKON (International Biomimetics Assoc.) and the Interdisciplinary Committee of the Canada Research Chairs, and has received many awards/honors, including the ETH thesis medal, junior/senior member of IUF, Distinguished Invited Professor of the CIS (University of Arizona), the Excellency Chair for bio-inspired technologies (LETI CEA) and a Humboldt Research Prize. He serves on the editorial boards of a number of journals and is editor-in-chief of Current opinion in Insect Sciences.

STABLE ISOTOPE METHODS FOR INSECT PHYSIOLOGY

Professor Stephen Foster and his team started this project using Eupelmus vuilletti, an endoparasite of the bruchid beetle Callosobruchus maculatus. Their aim was to test for its lipogenesis ability (i.e., ability to biosynthesize fats de novo from sugar) using stable isotope tracers. A paradigm of insect parasitoid physiology is that they are unable to biosynthesize fats but, instead, sequester them during feeding on hosts. Recently, this paradigm has been questioned, with studies indicating that some lipogenesis occurs. The team wanted to quantify this in E. vuilletti; i.e., is the amount biosynthesized physiologically important or insignificant? The key to using stable isotopes as metabolic tracers is introducing labeled precursor into the system. They used the behavior of females feeding on nectar. An adult female E. vuilletti along with a small droplet (5 µl) of U-13C-glucose solution (98% enrichment, 30% w/v) was placed inside a microcentrifuge tube and left at 30 oC for up to 7 d. Females were sampled each day, with fats derivatized to fatty acid methyl esters (FAME). Hexadecanoate (16:Acyl); the most common product of fatty acid synthesis) isotopomers were analyzed by gas chromatography/mass spectrometry. The team found that (i) females do not produce significant quantities of labeled 16:Acyl until 3-4 d after the start of the experiment and (ii) the amount of labeled 16:Acyl plateaus by 5 d, with ca. only <1% of the total 16:Acyl being synthesized during the experimental period. The team will next attempt to determine how much feeding takes place under these conditions by analyzing enrichment of sugars.

Goals:

- To adapt and develop stable isotope methods for studying specific insect reproductive physiologies in vivo (development).
- To apply these stable isotope methods to new insect physiological systems and transfer the methods to the host laboratory (application and method transfer).

As part of this project, the team wanted to write a high impact article emphasizing insect physiology and the use of stable isotopes. They submitted a proposal to the Annual Review of Entomology (which has by far the highest impact factor of any entomology journal) on insect endocrine glands. This proposal was successful. The team will now make the writing of this review article a high priority during the remainder of the project time. The article should be published in the 2025 volume.



Moths emitting pheromone and mating



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Prof. Jill Heathcock

LE STUDIUM Research Professor

From: The Ohio State University - USA

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

Nationality: American

Programme: SMART LOIRE VALLEY

Dates: April 2022 to June 2022

Jill Heathcock MPT, PhD is an Associate Professor and Director of the Pediatric Assessment and Rehabilitation Laboratory (PEARL lab) at The Ohio State University in Columbus, Ohio. Dr Heathcock has been a Fulbright Scholar, participated in several large clinical trials funded by the NIH and PCORI, and is part of the National Pediatric Rehabilitation Resource Center (C-progress.org). Dr Heathcock's work focuses on the impact of dose, intensity, and the timing of pediatric rehabilitation interventions. She is also interested in early assessment and improving diagnosis of children with neurodevelopmental disabilities. Dr Heathcock has over 50 publications and has been funded by the NIH for 20 years.

ADDING MOVEMENT ANALYSIS TO DETECT NEURO-DEVELOPMENTAL IMPAIRMENTS IN INFANTS OF OBESE MOTHERS

Obesity during pregnancy is a public health concern because there are adverse consequences for the mother and the infant. Infants of mothers who are obese are at risk for neurodevelopmental disabilities. The most promising target to improve outcomes for the child is through early identification of disability. One of the most challenging issues in health and medicine is the accurate identification of disability during the infancy period -- before babies are able to walk and talk. General Movement Analysis (GMA) is an objective measure of spontaneous movement used to detect poor neurodevelopment.

The projects aims to facilitate and support an international research relationship between our respective teams. Agreements will cover protocol, authorship order, and milestones upfront to achieve. We definitely focus on an interdisciplinary approach. A student's exchange programme is considered to support the research on the long run.

On the scientific side the project aims to:

- Design and implement training to collect General Movements on infants using the General Movement Assessment (GMA);
- Identify differences in General Movements of high risk and low risk infants of
- Explore individual infant characteristics associated with neurodevelopmental delay at 24 months of age in a subset of participants

The collaboration started during the first 2022 3-month visit enabled to cross important steps setting the grounds for future research developments:

1. Participation in journal club, grand rounds, and student presentations with the research team and postgraduate students;
2. Collection of videos with of a high-fidelity mannequin (infant) on the maternity ward to test the data collection protocol with an emphasis on practical and technological aspects including but not limited to: camera view, tripod set up, and video camera specifications; recording and transferring data securely; and adjusting any pragmatic or technology problems as needed;
3. Granted permission and running of first trials the BabyMOVES app using the Demo feature in the hospital and home resulting in a collection of videos with volunteers of infants at home and hospital using the BabyMOVES app. Testing the home data collection's protocol with an emphasis on practical and technological aspects including but not limited to: app set up & specifications. Phone view, recording, and transferring data securely; and adjusting any pragmatic or technology problems as needed;
4. Facilitation of contracts and formal data transfer agreements for secure video transfer between CHRU Tours and The Ohio State University and BabyMOVES;
5. Added considerations for family experience, stakeholder involvement, and stakeholders' participation as part of the research team;
6. Narrowing the focus on infant factors such as preterm birth and experience in the neonatal intensive care unit at primary risk factors for poor neurodevelopment and maternal factors such as obesity as covariates;
7. Submission of an Ethics Protocol and meeting with ethics committee.

The continuation of the project at a larger scale requires more resources and we have worked on reviewing the funding opportunities for neurodevelopmental research in France and created a database of such funding opportunities. In parallel we have submitted a letter of intent for funding to the Thrasher Foundation and began the process of application for National Institutes of Health (NIH) funding with foreign components and for the Fondation de France.



Prof. Frédérique Bonnet-Brilhault

Host Scientist

Prof. Frédérique Bonnet-Brilhault is the head of the Excellence Center in Autism and Neurodevelopmental Disorders and the Child Psychiatry Center of the University Hospital of Tours. She coordinates the Resource Center for Autism CRA of the «Centre Val-de-Loire» Region. She has considerable experience with neurodevelopmental disorders and is an international leader in Autism and Neurodevelopmental Disabilities with over 100 publications.



Prof. Delphine Mitanchez

Host Scientist

Prof. Delphine Mitanchez is the director of Neonatology in Neonatology Department CHRU of Tours, PU-PH of Pediatrics. Pr Mitanchez has considerable experience with maternal obesity and the downstream effects on the mother and child and is a leader in preterm birth and gestational diabetes with over 100 publications.



Prof. Maxwell Hincke

LE STUDIUM Research Professorship

From: University of Ottawa - CA

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

Nationality: Canadian

Programme: SMART LOIRE VALLEY

Dates: March 2018 to May 2018
March 2019 to May 2019
March 2020
April 2022 to June 2022

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:

- 110 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.



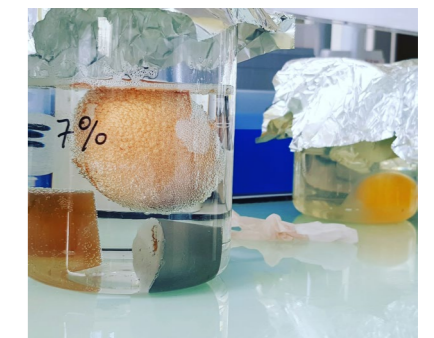
Dr Sophie Rehault-Godbert

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 one patent. She was a partner in various DOVE-coordinated projects.

EVOLUTION OF INNATE IMMUNITY AT BIOMINERALIZED BARRIERS

The calcareous egg of birds and reptiles, and previously dinosaurs, is a successful reproductive adaptation to the desiccating terrestrial environment. Embryonic development within this autonomous chamber has been shaped through evolution to resist physical and pathogenic challenges, while satisfying the metabolic and nutritional needs of the developing embryo. The evolution of the oviparous reproduction model to the viviparous model has led to important distinctions between corresponding extra-embryonic structures, particularly concerning the placenta. In humans, for example, the allantoic sac is not an independent structure as in the avian embryo, but forms part of the umbilical cord. The urine of the human embryo is therefore secreted directly into the amniotic sac whereas the chicken embryo secretes metabolic waste into the allantoic sac, thus forming the AIF (allantoic fluid) (Bellairs and Osmond, 2014). However, the important presence of proteins and peptides in connection with the immune response and defense in human AmF (amniotic fluid) is mirrored by the demonstration of such molecules in the avian AIF and AmF. In contrast, much less is known about the specific molecules that intervene in the mobilization of calcium (decalcification) from the avian ES (Chien et al, 2009), and the potential upregulation of innate immune genes at this critical site. The chorioallantoic membrane (CAM) is three-layered structure that embraces both the embryo and all associated extra-embryonic structures (Gabrielli and Accilly, 2010). It possesses many physiological functions and constitutes the first barrier against ES-penetrating pathogens. However, the molecular players associated with these functions remain largely unknown. Transcriptomic and proteomic studies of the developmental changes that occur in the CAM will be fruitful, particularly if augmented with functional studies of cellular and molecular changes. We believe that the CAM (which can be likened to the mammalian placenta) has many unexplored functions and plays a major role in the development and protection of the living avian embryo. The first step of the project was to perform a literature review describing the progressive transformation of egg innate immunity by embryo-generated structures and mechanisms over the 21-day course of egg incubation (Hincke et al, 2019). This article became the basis for a chapter for the 3rd edition of the Avian Immunology textbook (Réhault-Godbert, et al., 2021), and stimulated the organization of a symposium in 2021 dedicated to comparative immunology between different biomineralized organisms (Hincke and Rehault-Godbert, 2021). As an outcome of this symposium, we proposed a research topic on this theme, as co-editors, to the journal "Frontiers in Immunology" (Hincke et al., 2022). Four articles are published under the framework of this topic, to date, including two of which M. Hincke and S. Réhault-Godbert are co-authors (Kulshreshtha et al., 2022; Moreau et al., 2022). During this residency, we were successful in obtaining financial support to recruit a doctoral student to this project, and thus co-supervised Maeva Halgrain during her research on this project (October, 2019 – September, 2022).



Observation of the structure of the egg shell at BOA laboratory



Dr María Soledad Leonardi

LE STUDIUM Visiting Researcher

From: Institute of Biology of Marine Organisms (IBIOMAR) - AR

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

Nationality: Argentinian

Programme: SMART LOIRE VALLEY

Dates: January 2022 to March 2022

María Soledad Leonardi, born on September 23, 1982, mom of one, graduated from the National University of Mar del Plata, Argentina, majoring in the evolutionary ecology of seal lice. She has over 18 years of experience working with pinnipeds and their long co-evolutionary story with their lice. Soledad Leonardi is an Associated Researcher at the National Scientific and Technical Research Council from Argentina. She has been involved in Antarctic Research since 2014 and is a member of the Working Group Antarctic Wildlife Health Monitoring, Expert Group on Birds and Marine Mammals- SCAR. In 2014, she was awarded the Robert C. Dalgleish Memorial Award to an outstanding young Phthirapterist by the International Society of Phthirapterists.

ADAPTATIONS TO DEEP DIVING IN SEAL LICE, THE EXCEPTION TO THE RULE THAT THERE ARE NO MARINE INSECTS

The main goal of the project is unraveling the adaptations allowing seal lice to spend most of their life where any other known insect is not able to survive, i.e. the deep sea. This project will provide key information for understanding how seal lice can tolerate the extreme conditions to which they are exposed by the particular biology of their hosts, i.e. extreme temperature variation between land and cold water, absence of gaseous oxygen, high salinity, and extreme hydrostatic pressure. In a broader sense, it should shed light on the reasons why insects have been so unsuccessful at colonizing the ocean realm, which represents 99% of the biosphere of our planet.

The specific goals developed during Dr Leonardi's three months-stay were:

- Determine anatomical and physiological adaptations for aquatic survival
- Analyze and describe the tracheal system of different echinophthiriid species
- Acquire knowledge and training in the analysis and measures of metabolic rates
- Evaluate the role of scales in the mechanical protection of the cuticle

Dr Leonardi and her team examined Lepidophthirus macrorhini lice from Southern elephant seals using X-ray microtomography (micro-CT) in the Centre Européen de Recherche et d'Enseignement des Géosciences de L'environnement, Aix-Marseille Université. The micro-CT uses a three-dimensional reconstruction of the sample to explore its anatomy, without requiring dissection or histology. Currently, the team is analysing these images. During my her stay, Dr Leonardi received training in using oxygen optode sensors to measure aerial and aquatic respiration. In the first instance, they performed experiments with mosquito larvae. The consumption of oxygen dissolved in the air and the water was measured in groups of larvae and pupae of Aedes aegypti and Aedes albopictus maintained at different temperatures. The team's experiments showed that the larvae that had contact with the air, even remaining on the surface of the water, obtained 15% of their oxygen from the water. Whereas when they were completely submerged, they were able to get all the oxygen they needed to survive. Recently, the team conducted experiments with lice from southern elephant seals in order to determine if they breathe underwater. The results are being analyzed.



Prof. Claudio Lazzari

Host Scientist

Claudio Lazzari is a professor at the Univ. of Tours and at the Univ. of Buenos Aires, who has conducted research in Argentina, Brazil, Germany, and since 2003 in France. Specializing in animal biology, Claudio's research focuses on the adaptation of arthropods to hematophagous life. Over four decades, he has contributed to unraveling fundamental and applied aspects of the biology of blood-sucking disease vectors, as well as other arthropods. Many of his former trainees are today scientific leaders in different countries. Claudio Lazzari received the RAICES and the Cesar Milstein awards for international cooperation with Argentina, the Edmund Optics educational award, and the International Cooperation Award from the Brazilian-Argentinean Trade Chamber. He has been designated Honorary Professor by the Univ. Buenos Aires, his alma mater, and Corresponding Scientist by the Argentinian Council for Science and Technology.



Dr Maria Soledad Leonardi plucking lice off the back flipper of a southern elephant seal pup to take it back to her lab and test their pressure tolerances



Dr Alberto Marzo

LE STUDIUM Visiting Researcher

From: University of Sheffield - UK

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

Nationality: Italian

Programme : SMART LOIRE VALLEY

Dates: July 2022 to December 2022

Dr Marzo is an Associate Professor at the Department of Mechanical Engineering, University of Sheffield, UK. He has a five-year degree in Mechanical Engineering from the University of Cagliari, Italy, and a PhD from the University of Sheffield. In the early stages of his PhD he was awarded the David Crighton Fellowship, and spent one year of his doctoral studies at the Department of Applied Mathematics and Theoretical Physics, the University of Cambridge. Here he investigated the theory behind flow-induced oscillations in elastic vessels. In 2011-12 he worked as a Principal Research Scientist for the UK National Health Service to support technology development, dissemination, and adoption, for people with long-term disabilities. Dr Marzo's research area stands at the interface between the physical and life sciences. It is firmly rooted in engineering and mathematics in the context of computational fluid mechanics and cardiovascular biomechanics, but has a strong emphasis on clinical interpretation and translation of engineering technologies into clinical tools.

THE ROLE OF HAEMODYNAMICS IN INTRACRANIAL BIFURCATION ARTERIES AFTER ANEURYSM TREATMENT WITH FLOW-DIVERTING STENTS

Intracranial aneurysms (IAs) are balloon-like focal deformations of a blood vessel in the brain, carrying an inherent risk of rupture and bleeding with severe consequences for the patient. When intervention is advocated, clinicians have several options to treat IAs. A minimally invasive option consists of in deploying a medical device (Flow Diverting Stent or FDS) to divert flow from the aneurysm, triggering blood coagulation inside the aneurysmal sac to stop or prevent any existing or potential bleeding. In certain circumstances this treatment causes the occlusion of the arteries surrounding the aneurysm, leading to obstruction of normal blood flow to the brain, and ultimately permanent and often irreversible damage (stroke). The causes behind this complication are not fully understood but there is a strong consensus in the literature that the underlying causes might be associated with adverse alterations to the pre-treatment blood flow in the vascular network surrounding the aneurysm. Unfortunately, these complications are currently preventing the widespread use of this minimally invasive treatment option that would ultimately reduce risk, hospitalization and healthcare costs. Stent-induced alterations to blood flow in a blood vessel can be analysed using a computer model that reproduces, virtually and accurately, the mechanical and anatomical environment of the problem, or by using 3D printed vascular models and a blood mimicking fluid to study the problem experimentally. This attempted to identify, through the use of image-based computer models and ultrasound-based experimental analysis, the possible cause-effect mechanisms, mediated by blood flow, which may explain under what circumstances the deployment of an FDS causes significant changes to flow and ultimately vessel occlusion. The long-term aim is that of providing guidance to clinicians towards a safer and more effective treatment of this condition. So far the project has demonstrated that some of the potential causes previously identified in the literature as possible mechanisms leading to vessel occlusion (presence of collateral vessels that can bypass the obstruction to flow hypothetically induced by the stent) might not be relevant and the and instead the possible causes might instead be linked to the anatomy of the cerebral vasculature. This is in fact an hypothesis previously identified and published by the same investgatorsinvestigators of the Le Studium project.

Another achievement that was made possible by Le Studium was one pertinent to cross-fertilization between myself Alberto Marzo and another Le Studium Fellow, Prof Salvatore Magazù, who is looking at Leonardo Da Vinci's contributions to the field of dynamics. During the many events organized by Le Studium I Dr Mazo had the pleasure of meeting Salvatore, discussing our their respective fields of research, and eventually identifying a potential contribution to Fluid Mechanics from Leonardo Da Vinci. This stems from a representation of turbulent flow made by Leonardo in one of his drawings, "Studies of Turbulent Water" from the Royal Collection Trust, Her Majesty The Queen Elizabeth. In this drawing Leonardo describes turbulence in a stream by showing small eddies superimposed on larger eddies, seemingly identifying the velocity-decomposition concept that is often used in numerical analysis to be able to use computers to simulate these complex flows. Thanks to this concept we they can now use computer models to simulate blood flows in human arteries as in my Dr Marzo's Le Studium Project. Salvatore is now investigating this possible contribution to science by Leonardo with an Historian from Paris and as part of his Le Studium Project.



Dr Ayache Bouakaz

Host Scientist

Ayache Bouakaz obtained his DEA degree (MSc) and his PhD in acoustics in 1992 and 1996 at the National Institute of Applied Sciences in Lyon, France (INSA Lyon). In 1998, he joined Pennsylvania State University at State College, PA, USA as a post-doc for 2 years. From December 1999 to November 2004, he held a position of associate professor at Erasmus Medical Center in Rotterdam, the Netherlands. His research focused on ultrasound imaging, ultrasound contrast agents and transducer design. In 2004, he obtained a position as an Inserm researchere (CR1) and since 2009, he has held the position of Research Director in the Inserm Imaging and Brain unit, where he heads the ultrasound imaging and therapy group. His research focuses on imaging and therapeutic applications of ultrasound. Ayache Bouakaz is has been a «chair professor» at the Jiaotong University of Xi'an in China since 2017. He is the general chair of the international conference IEEE International Ultrasonics Symposium (IEEE IUS) 2016 in Tours, France and co-general chair of the IEEE IUS 2021 edition and he was the vice-president of the IEEE UFFC society from 2017-2021. He has published more than 135 articles in peer-reviewed journals, more than 100 articles published in conference proceedings and has filed 9 patents.



Cardiovascular Modelling: Basic Science to Clinical Translation conference group (Tours City Hall)

CARDIOVASCULAR MODELLING: BASIC SCIENCE TO CLINICAL TRANSLATION

The event aimed to shine light on current and emerging research trends in the characterization of cerebral blood flows, both computationally and experimentally, its correlation with vascular disease and its application to unsolved clinical challenges. Strategic objectives:

- Raising awareness of current research in the area of cardiovascular and cerebrovascular disease;
- Promoting discussion and identify new research topics in the area of cardiovascular and cerebrovascular modelling and experimental analysis;
- Identifying key expertise and foster new research collaborations between the iBrain research group and other research groups/experts in France and the UK;

The event saw participation from internationally recognized leading experts in the area of cardiovascular modelling and ultrasound imaging including representatives from University College London, University of Amsterdam, University of Eindhoven, University of Milan and industrial participation and endorsement from Fujifilm and Bracco. The event received exceptionally positive feedback and comments by participants who liked the scientific program and the organization of the event. Dr Marzo and his partners are now discussing a possible submission to the next call of the Le Studium Consortium to continue the discussions and foster new collaborations.



INNOVER AUJOURD'HUI POUR GUÉRIR DEMAIN : DIAGNOSTICS ET THÉRAPIES PERSONNALISÉS

This public conference presented by Dr Jean-Michel Escoffre, Research Fellow (UMR 1253, iBrain, University of Tours, Inserm, Tours) and Prof. Damien Lacroix, Professor of Biomedical Engineering in the Department of Mechanical Engineering at the University of Sheffield (UK) and Deputy Director of the In Silico Institute of Medicine (Insigneo) presented the new technologies that will be able to integrate the complexity of the human body to prevent and cure diseases for more and more people around the world in the next 20 years.

The ultrasound revolution to tackle neuropathologies

Neuropathologies (neuropsychiatric, neurodegenerative, neurovascular and neurooncological diseases) constitute today a major public health problem and a socio-economic burden. With the ageing of the population, the incidence of these diseases will increase significantly in the coming years. Today, treatments for these diseases are either ineffective or non-existent. Since the 1990s, the scientific community, and in particular medical acousticians, have been developing and validating therapeutic alternatives based on the use of ultrasound: High intensity focused ultrasound, ultrasound delivery of therapeutic molecules, sonodynamic therapy, ultrasound radiosensitisation... Will the revolution in neuropathology treatment be achieved through ultrasound?

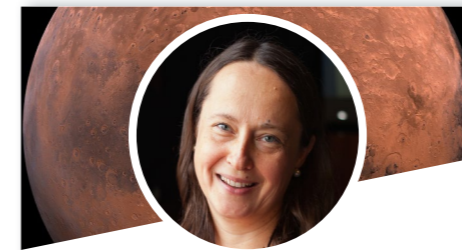
Our digital twin or how to personalise diagnosis and treatment.

The traditional approach to medicine is to treat all patients in the same way: if you have a fractured neck of the femur, get a prosthesis with a standardised shape; if you have a cardiovascular accident, unblock your arteries with a stent. And yet we are all different. Our problems are not the same and therefore the solutions should not be either.

With the development of personalised digital models, we are heading towards a future where we can determine more precisely and specifically for each person the prevention and treatment of osteoarthritis, herniated discs, fractured femurs, heart attacks, diabetes or Alzheimer's, to name but a few diseases.



LE STUDIUM CONFERENCES



Prof. Tetyana Milojevic

LE STUDIUM Guest Research Fellow / advanced grant holder

From: University of Vienna - AT

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

Nationality: Ukrainian

Programme: SMART LOIRE VALLEY

Dates: May 2022 to December 2023

Tetyana Milojevic is an astrobiologist with an expertise in the area of metal-microbial-mineral interactions. She obtained her PhD in biochemistry at Taras Shevchenko National University of Kyiv, Ukraine. She was a deputy head of the Department of Biophysical Chemistry, University of Vienna and a head of Space Biochemistry group (2014-2022) investigating biotransformation of terrestrial and extra-terrestrial minerals and microbial survivability in outer space environment. She has recently received an ERC consolidator grant to decipher microbial biosignatures left on Mars mineral materials. Since May 2022 she has been a holder of Excellence professorship chair in Exobiology at the University of Orléans and a head of Exobiology Group at CBM (starting from 2023).



Dr Frances Westall
Host Scientist

Frances Westall was born in Johannesburg, South Africa (1955). She grew up in the United Kingdom, and studied geology at the Universities of Edinburgh in Scotland and Cape Town in South Africa. She has worked in many countries including a postdoc in marine geology at the Alfred Wegener Institute in Bremerhaven (Germany), followed by research in geobiology (fossil bacteria) at the Universities of Nantes (France) and Bologna (Italy). She was a senior researcher at the NASA Johnson Space Center and the Lunar and Planetary Institute in Houston (USA) in the period after the announcement of possible traces of life in the Martian meteorite ALH84001 by David McKay and his group before becoming the leader of the Exobiology Group of the CNRS in Orléans (France) in 2002, a position she took over from André Brack, a noted prebiotic chemist. She was head of the French Exobiology society from 2006-2008. Specialising in the oldest traces of life on Earth, she has been very involved in the 2018 international mission to Mars from the instrumental side (microscope/close-up imager) and from the science side as well.

“BIOMAMA” BIOGENICITY OF MARTIAN MATERIALS: CRITICAL ASSESSMENT OF BIOSIGNATURES BASED ON CHEMOLITHOAUTOTROPHIC INTERACTIONS

Over the past years, we have been witnessing several important missions to Mars, including Mars 2020 Perseverance rover that landed to Jezero Crater to search for signs of ancient life. Multiple lines of evidence indicate an active hydrogeological history of Mars and chemolithoautotrophy-suited environments within its Noachian terrains. One of the primary aims of Mars missions is to search for signs of ancient life and collect a suite of samples to be returned to Earth via a Mars Sample Return mission. Being a few steps away from retrieving and returning the first Mars samples, Tetyana Milojevic's team need to gain extensive knowledge of how to access their potential biogenicity. In this connection, a valuable source of information can be extracted from microbial fingerprints of chemolithotrophic life based on Martian materials. Chemolithoautotrophy is the most ancient microbial form of life, which enables the transition of energy from a stone to the energy of a living entity. In their project, the team investigate interactions of a wide variety of chemolithoautotrophs with Martian mineral materials (e.g., Martian meteorites). Their recent research on the genuine Noachian Martian meteorite “Black Beauty” permitted visualization and nanometer-scale imaging of microbial life designed and cultivated on Martian materials. They report on laboratory-scaled microbially assisted chemolithoautotrophic biotransformation of the Noachian Martian breccia Northwest Africa (NWA) 7034 composed of ancient crustal materials from Mars. The team decipher biomineralization patterns associated with the biotransformation and reveal microbial nanometer-sized lithologies located inside the cell and on its outer surface layer. These investigations provide an opportunity to trace the putative bioalteration processes of the Martian crust and to assess the potential biogenicity of Martian materials. Their study on the Noachian Martian breccia, composed of ~4.5 Gyr old crustal materials from Mars, delivered a prototype of microbial life experimentally designed on a real Martian material. This life of a pure Martian design is a rich source of Mars-relevant biosignatures which are further investigated in the team's project. They aim to identify preservable biomarkers/biosignatures of chemolithotrophic life on Martian materials after the exposure to Mars-like conditions at low Earth orbit. A first set of desiccated microbial cells grown on “Black Beauty” has already been launched for 1 year outside the ISS to Mars-like conditions in frames of the Tanpopo-4 space mission (2022-2023). They have been preparing towards retrieval of these microbial samples from the International Space Station (ISS) in order to evaluate its survivability in Mars-like environment. High-resolution electron microscopy and spectroscopy techniques will be applied to identify preservable biosignatures of chemolithotrophic life on Martian materials. Resolving the interface of microbial interactions with Mars minerals under the influence of destructive Martian environmental constrains can bring us closer to identify traces of unicellular life for Mars exploration missions. We The team will also reveal a role of mineral encapsulation as a natural shielding crust for cell protection during exposure to Mars-like conditions. The knowledge gained in this project will help to understand and critically interpret the results of future Mars exploration missions. These studies will lay the foundation for efficient nanoanalytical spectroscopy of returned Mars samples to critically assess their potential biogenicity.

Le Studium fellow Tetyana Milojevic has already been integrated in the teaching activities of the CBM and University of Orleans, and provided a lecture course in the winter semester 2022. Furthermore, the habilitation dissertation (HDR) of Tetyana Milojevic has been submitted, validated and already authorized for a defense by a research commission at the University of Orleans.



Prof. Vincent Pecoraro

LE STUDIUM Research Professor

From: University of Michigan - USA

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

Nationality: American

Programme: SMART LOIRE VALLEY

Dates: May 2022 to August 2022

Prof. V. Pecoraro is the John T. Groves Collegiate Professor of Chemistry at the University of Michigan, Ann Arbor. He is renowned for his contributions in Bioinorganic, Supramolecular and Coordination Chemistry and in the fields of Biochemistry and Biophysics. He served for 20 years as an Associate Editor for the ACS journal Inorganic Chemistry. He has received numerous national and international distinctions. Among these are the ACS Award for Distinguished Service in Inorganic Chemistry (2016), the ACS/SCF Franco-American Lectureship (2022), the Vanadis Award (2010), the Blaise Pascal International Research Chair (2011) the Alexander von Humboldt Award for Senior Scientists (1997) and a Doctor Honoris Causa of the University of Aix-Marseille (2021). He served as President of the Society of Biological Inorganic Chemistry (SBIC) from 2020-2022. Prof. Pecoraro is a Fellow of the AAAS and the ACS and has had invited positions as Professeur invité at the University of Paris-Saclay, Aix-Marseille University and Ecole Normale Supérieure (Paris).

LANTHANIDE-BASED METALLACROWNS AS NEAR-INFRARED EMITTING BIOLOGICAL PROBES

The goals of this partnership are to develop, characterize and implement new near-infrared (NIR) emitting probes that contain lanthanides(III) for biomedical imaging. While Prof. Pecoraro and his team have previously prepared highly luminescent Ln(III)-based metallacrowns, biological applications of the first-generation probes were limited by their low solubility in aqueous media, restricted biocompatibility, the high energy excitation required to stimulate emission and/or the lack of targeting specificity to or within cells. The first year of this collaboration has focused on overcoming the limitation associated with high energy excitation. The latter is problematic for biological applications as the photons used to stimulate emission can damage the cell, tissue or organ that is being probed. Moreover, tissue penetration is hindered in the UV and near visible spectrum, which limits the depth that can be investigated. Therefore, synthesizing probes that can absorb and sensitize Ln(III) emission with wavelengths longer than 600 nm are desired. There are two classes of metallacrowns that the team investigate, one which contains two Ln(III) ions encapsulated within a dimeric metallacrown containing 8 Ga(III) ions (Ln₂Ga₈) and the second class that has a single NIR-emitting Ln(III) that is complexed with a metallacrown formed from 16 Zn(II) ions (LnZn₁₆). While these molecules are excellent NIR emitters, they require UV excitation to work. They have spent the past year working on synthetic methodologies to append organic antennae, that exhibits absorption at longer wavelengths (lower energy), to both of these molecular classes of metallacrowns. Prof. Pecoraro and his team have developed a new system using coumarin dyes that extends the excitation wavelengths into the near visible range (around 450 nm) and have shown that these functionalized metallacrowns are capable of sensitizing near-infrared emission of Ln(III). Now, that the synthetic protocols have been established, they will test whether chromophores possessing absorption at wavelengths longer than 600 nm can be attached in order to achieve our their desired endpoint of creation of Ln(III)-based metallacrowns that can excited and emit in the near-infrared range. They have also spent their time investigating whether they can use common bioconjugate chemistry approaches to link to both of molecular classes of metallacrowns biomolecules such as human serum albumin (HSA). The justifications for these studies are that binding of Ln(III) metallacrowns to proteins will enhance their aqueous solubility, biocompatibility, and provide a method to achieve specificity of targeting. The team initiated these studies using HSA since this protein is easy to obtain, is inexpensive and is known to be transported into human cancer cells. The team have now developed ways to link Ln(III)-based metallacrowns to HSA and plan to explore their coupling to other targeting agents such as antibodies or small signaling peptides.



Prof. Vince Pecoraro as a keynote speaker at LE STUDIUM 25th anniversary conference, June 2022



Prof. Stéphane Petoud

Host Scientist

Prof. S. Petoud is an INSERM Research Director. A LE STUDIUM Fellowship in 2009 allowed him to move from the University of 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 lanthanides. 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 recognized by several "Prime d'Excellence Scientifique" from INSERM from 2010 to 2020. 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), eleven grants from "La Ligue Nationale contre le Cancer" and six projects of the Centre-Val de Loire region.



Prof. Rita Singh

LE STUDIUM Visiting Researcher

From: University of Delhi, Department of Zoology - IN

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

Nationality: Indian

Programme: SMART LOIRE VALLEY

Dates: May 2022 to August 2022

As a professor, Rita Singh has specialised in signaling mechanisms of gonadotropins & reproductive challenges in women with polycystic ovary syndrome (PCOS). She got recognized nationally & internationally with prestigious awards and grants like inaugural Faculty member for Quad Fellowships (In STEM Scholars of Quad Countries), USA and fellow of LE STUDIUM, France. She was a member of the 9th Indian Antarctic expedition and received collaborative international grants like INDO-US grants with Medical Schools of VCU & Perelman School of Medicine, UPENN, Philadelphia (1 Yr). She has been invited as a researcher to Medical schools like Hirslanden hospital, Switzerland; Royan college of Medicine, Tehran & academic visitor at NUS, Singapore. She has received Indian Young Scientist award, LS Ramaswami award & Gold Medal for outstanding work in Reproductive health, published research papers in reputed Journals like Metabolism (13.93), TEM (Cell press-10.58) JCEM (6.134), JBC (5.157) and given 90 invited talks in conferences & symposia.



Dr Pascale Crépieux

Host Scientist

Pascale Crépieux is a PI at the Physiology of Reproduction and Behaviors Laboratory in Nouzilly, France. She holds a PhD in molecular biology from the Pasteur Institute in Lille, France, then and was hired as a post-doc fellow at the McGill University, Montreal, Canada. Since 2002 she is has been a tenured scientist at CNRS. Her main research topics are on integration of the FSH gonadotropin signaling network, a major regulator of reproduction in Mammals, into an adapted cellular and physiological response. She pioneered studies of the hormonal control of mRNA local translation in gonadal Sertoli cells. She also explores the functioning of the follicle-stimulating hormone receptor (FSHR) with intra-cellular single chain antibody fragments. In 2001, her studies were awarded by the Fertility and Sterility Foundation. Since 1992, she co-authored 77 publications in international peer-reviewed journals, contributed to 9 book chapters, to one patent, and to more than 95 meeting abstracts. She also supervised 8 PhD theses. In 2017, she was one of the co-founders of the MAbSilico (www.mabsilico.com) small company.

INTERACTION BETWEEN THE FSH RECEPTOR AND INSULIN RECEPTOR SUBSTRATES (IRS-1 AND IRS-2) IN THE PHYSIOPATHOLOGY OF THE POLYCYSTIC OVARY SYNDROME (PCOS)

The goals of this project were to elucidate the cause of metabolic abnormalities in PCOS. The focus of this study was to unravel the defects in the cross-talk between FSHR and IRS-1 and -2 in the presence of high LH /hCG or LHR (as observed in PCOS patients). The objectives were:

- To examine the mechanism of interaction of IRS-1 and IRS-2 with FSHR, LHR and their signaling components.
- To understand the role of Gα/β-arrestin in the cross-talk between FSHR and LHR signaling pathways.
- To explore the role of LH-stimulated Ca²⁺ response in the attenuation of FSH responses.

Background: Polycystic ovary syndrome (PCOS) is a complex endocrinopathy associated with subfertility/infertility and pregnancy complications. Most PCOS women are opting for assisted reproductive technologies (ART) for successful conception, however it is challenging to optimise the relative doses of the gonadotropins (FSH, LH/hCG) for appropriate steroidogenesis. Hormonal imbalance due to high LH in women with PCOS impairs the metabolic microenvironment critical for oocyte maturation (Fig.1). Therefore, it is important to address the impact of untimely high LHCGR expression in early follicular phase and/or high LH levels on FSH and insulin signaling, so that the aetiology of metabolic disorders in PCOS women can be understood. This study is expected to confirm LHCGR as a potential drug target in PCOS women.

Methods: Live-cell Bioluminescence Resonance Energy Transfer (BRET) changes were measured in HEK-293 cells after co-transfection of RLuc8-labelled FSHR, LHR, INSR and YFP-labelled IRS-1 and IRS-2 in different combinations. RLuc8-labelled GRB2 interaction with YFP-labelled IRS-1 or IRS-2 was also monitored after transfections with unlabelled FSHR and LHR plasmids.

Results: During the 3 months' tenure as a visiting scientist, several innovative experiments were done to understand the cross-talk between FSHR, LHR and INSR with respect to the utilization of IRS-1 and IRS-2, in the presence of high expression of LHR in HEK293 cells (all the data in not shown). IRS proteins interact with downstream signaling molecules like GRB2 and this interaction was used as an end point in some experiments, to ascertain the activation of FSHR/IRS2/GRB2 signalling pathway. The effect of higher expression of LHR on cAMP generation at the basal level and by FSH-stimulated FSHR was also studied. Inhibitors of GPCR and tyrosine kinases were used to confirm the interaction of INSR, LHR, FSHR, membrane-localised nanoLuc (by-stander BRET) and IRS-1/IRS-2 (data not shown).

This study demonstrates that IRS-1 and IRS-2 are localised to FSHR. The over-expression of IRS-2 in HEK293 cells increased the basal BRET (no FSH added) when expression of the FSHR was increased (data not shown) and the BRET change decreased after stimulation with FSH (Fig.2). Interaction of IRS-1 and IRS-2 with the downstream signaling molecules like GRB2 was increased by FSH (Fig.3). However, high LHR expression impaired movement and interaction of GRB2 with IRS-1 and IRS-2 in response to FSH (Fig.2&3). High LH concentration promoted the recruitment of IRS-1 and IRS2 to the FSHR but not to GRB2 (Fig.2&3). Our previous collaborative work has indicated that high LHR expression/LH activity decreases sensitivity to FSHR by increasing heteromerization of FSHR and LHR in response to FSH. Our current data demonstrates that there is increase in the basal cAMP levels in the presence high LHR expression in HEK293 cells (Fig.4), however, certain experiments were ongoing and need completion in future.

Conclusion: The team's data unveils a previously unknown mechanism underlying the increased role of gonadotropins in follicular metabolism through the recruitment of IRS- and IRS-2 to the FSHR. The responses of FSHR are adversely affected by high LHCGR/LH. Therefore, LHCGR is a potential target for the development of new therapeutic strategies for women with PCOS.

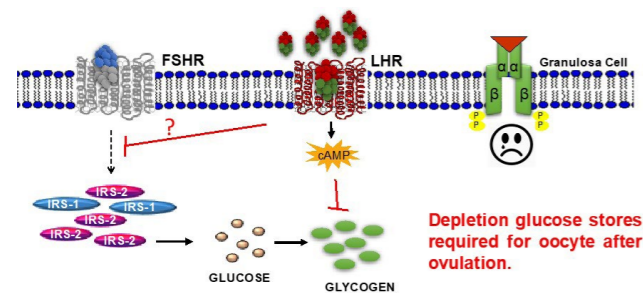


Figure 1. Defects in FSH signaling pathway(s) due to high LHR/LH in women with PCOS

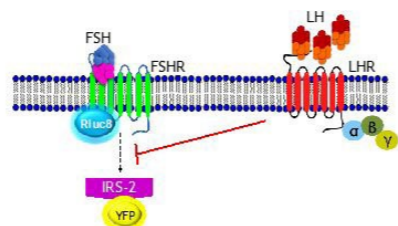


Figure 2. High LH inhibit the release of IRS-2 downstream signaling in response to FSH

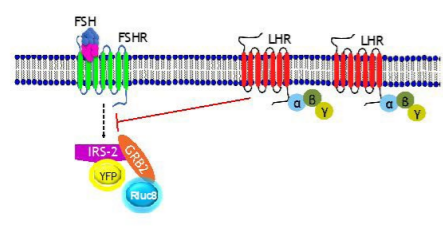
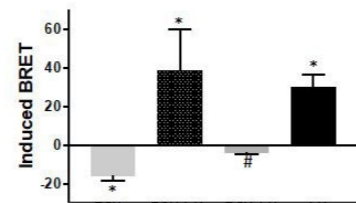


Figure 3. High LHR expression impairs the interaction of GRB2 with IRS-1 and IRS-2 in response to FSH

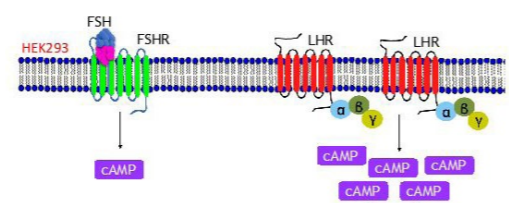
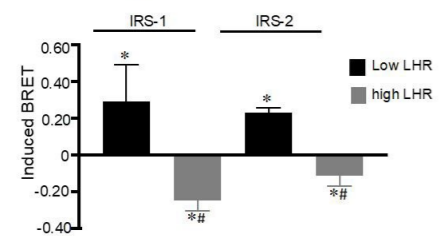
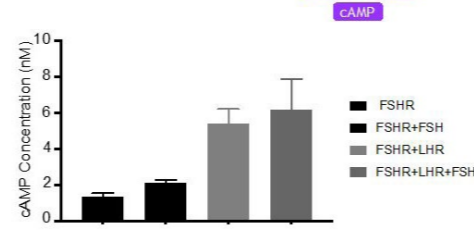


Figure 4. The presence high LHR leads to increase in basal level of cAMP



GONADOTROPINS IN THE PHYSIOPATHOLOGY: CURRENT ADVANCES IN THE MECHANISMS OF ACTION

Human reproductive health and fertility is dependent on the therapeutic use of recombinant gonadotropins (FSH & LH), and their imbalance may contribute to the development of sub-fertility or infertility such as seen in women with polycystic ovary syndrome (PCOS). There is imbalance in the levels of LH and FSH in women not only with PCOS but also with menopause and gynaecological cancers. It is important to understand the mechanisms of gonadotropin signaling, especially for delineating the metabolic defects. It is further imperative to increase the positive outcome of IVF protocols to deal with the sub-fertility in young women due to PCOS or other environmental factors.

Therefore, the objectives of this interdisciplinary conference were to discuss:

- the current challenges in the targeting of GPCRs and finding novel pathways to optimize not only reproduction but also metabolism.
- the differences in mechanism of action of recombinant gonadotropins (rhFSH, rhLH and rhCG) due to protein structure variations such as post-translational modifications (glycosylations or sulfation).
- the role of gonadotropins as non-gonadal ligands.

LE STUDIUM CONFERENCES
VIRTUAL MEETING | 2022

14-15 September 2022

Gonadotropins in the Physiopathology: Current advances in the Mechanisms of Action

LOCATION
VIRTUAL MEETING

CONVENORS
Prof. Rita Singh

LE STUDIUM VISITING RESEARCHER
From University of Delhi, India

IN RESIDENCE AT Physiology of Reproduction and Behavioral (PRB) / Centre for Cell, Gene, and Hormone (CCGH) / Centre for Cell, Gene, and Hormone (CCGH) / University of Tours, France

Dr Pascale Crepieux
Physiology of Reproduction and Behavior (PRB) / Centre for Cell, Gene, and Hormone (CCGH) / University of Tours, France

PROGRAMME REGISTRATION
register@le-studium.com

LE STUDIUM

LE STUDIUM CONFERENCE



Dr Duangjai Tungmunthum

LE STUDIUM Research Fellow

From: Mahidol University - TH

In residence at: Laboratory of Woody Plants and Crops Biology (LBLGC) - Chartres

Nationality: Thai

Programme: ARD CVL COSMETOSCIENCES

Dates: September 2021 to August 2022

Duangjai Tungmunthum completed her Ph.D. from Chulalongkorn University, Thailand, in 2016, and was awarded the DPST Postdoctoral Fellowship to conduct her Postdoctoral research in Japan at the National Museum of Nature and Science in collaboration with the University of Tokyo, Japan. There, she focused on medicinal plants and phytochemistry. After completing her research in Japan, she quickly got a permanent lecturer position at the Faculty of Pharmacy of the Mahidol University, Thailand. She specializes in biochemistry, innovative green extraction methods, biological activity both antioxidant and anti-aging from plant extracts and pure phytochemical compounds for cosmetic and pharmaceutical applications in in-vitro, in-vivo and in-cellulo models. Through her research profiles, she received a research grant as an outstanding young scientist of Mahidol University and the Junior Research Fellowship from the French Government, followed by the French-Thai Mobility Programme 2020-2021 funding by French and Thai Governments. Currently she is a LE STUDIUM Research Fellow in the LBLGC team.



Dr Christophe Hano

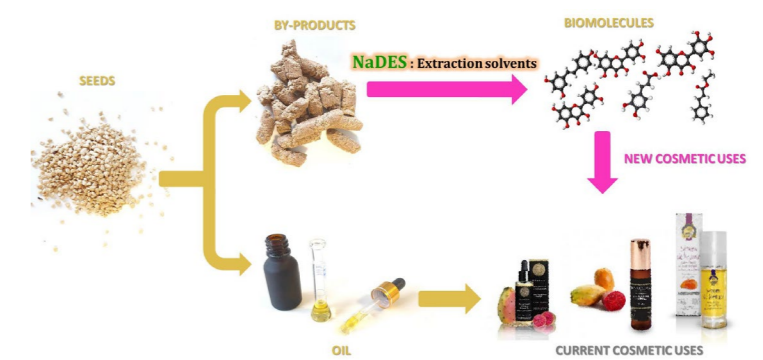
Host Scientist

Dr Christophe Hano is an associate professor who is an expert in phytochemistry, plant molecular biology and plant biotechnology at the LBLGC laboratory (INRAE USC1328 Orléans University) working on the regulation of the biosynthetic pathways of specialized plant metabolites in relation with plant development and impact of environment. Using combined and integrated approaches coupling metabolomics, fluxomics and transcriptomics analysis the main goals of this research are to determine the favorable conditions for the production of plant specialized metabolites and to identify metabolic locks. In brief: he has published more than 160 papers in international Scientific Journals; he is the secretary for the French Plant Specialized Metabolism network and French representative as well as board member in the Phytochemical Society of Europe. He is also a scientific expert for more than 50 International Scientific Journals, and an Editorial board member and/ or Guest Editor for several Journals in the fields of plant natural products.

NATURAL DEEP EUTECTIC SOLVENTS (NADES): COSMETICS IN THE AGE OF GREEN TECHNOLOGIES

The title of the research project supported by LE STUDIUM is PIERIC, which is part of the COSMETOSCIENCES project. There are three main goals to this project. The first one is to create green NaDES-based extraction methodologies for various plant natural product categories from diverse plants for cosmetic applications. The second goal is to characterize the phytochemical compounds of the selected plants species, while the last one is to evaluate the biological activities of these extracts. This part of the project will be carried out in close collaboration with teams from other regional laboratories : ICOA (Organic and Analytical Chemistry - University of Orleans/CNRS), NMNS (Nanomedicines and Nanoprobe - University of Tours) and SIMBA (Synthesis and Isolation of Bio-Active Molecules - University of Tours) and industrial partners.

The six species of potential plant material have been selected and the extraction optimization has been performed. Various types of the new deep natural eutectic solvents (NaDES) for extraction methods have been developed and validated. The phytochemical compounds of the selected plants species have been characterized, and their biological activities such as in vitro antioxidant potentials of the green extracts have been investigated using various assay methods, such as ABTS, DPPH, FRAP, and ORAC, in order to cover all the antioxidant mechanisms of the optimized extracts. Accordingly, the current results of the project have been communicated in the form of an oral presentation in a scientific seminar. In addition, three manuscripts have been submitted to the high-quality international journals in Q1 SJR Scimago Rank, and all three are currently in the peer-review process.



The green NaDES-based extraction methodologies for various plant natural product categories from diverse plants/ plant by-products for cosmetic applications.

NADES FOR BIOMASS VALORIZATION: NEW INSIGHT OF A GREEN TECHNOLOGY

With the growing interest in more environmentally friendly solvents and processes, the introduction of Natural Deep Eutectic Solvents (NaDES) as low cost, non-toxic and biodegradable solvents represents a new opportunity for green and sustainable chemistry. Thanks to their remarkable advantages, NaDES are now arousing growing interest in many fields of research such as food, health, cosmetics and biofuels. Around the world, NaDES are seen as a promising alternative to commonly used petrochemical solvents.

This webinar gathered 158 participants from 25 countries. It offered an overview of recent advances in biomass extraction, from raw materials to NaDES modelling. Exchanges focused on new perspectives in terms of plant valorisation (biomass, biological activities and biotransformations) and extractive processes.

LE STUDIUM WEBINARS

06-07 September 2022

NaDES for biomass valorization: new insight of a green technology

CONVENORS

Dr Duangjai Tungmunthum
2016-2021 Postdoctoral Fellow at National Museum of Nature and Science, Japan

Dr Christophe Hano
Associate Professor of Plant Biotechnology and Bioprocess Engineering, INRAE USC1328 Orléans University, France

Prof. Leslie Boudessouque-Delays
Laboratoire de Chimie des Produits Naturels (LCPN), University of Tours, France

PROGRAMME REGISTRATION
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LE STUDIUM



Dr Vincent Courdavault

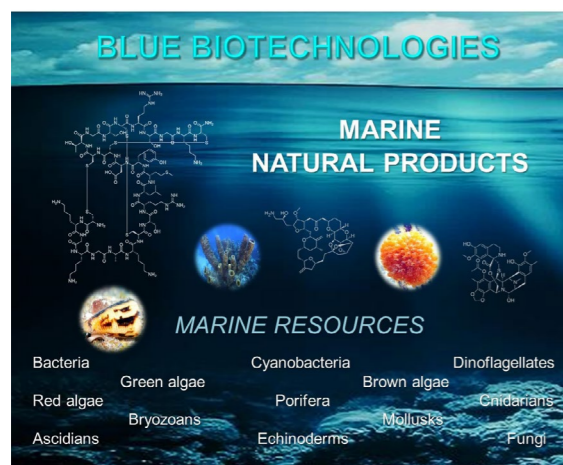
LE STUDIUM Consortium Coordinator

Vincent Courdavault initially studied protein prenylation in plants during his PhD studies. Since 2006, he has held a faculty position at the University of Tours where he is now associate professor in the "Biomolécules and Biotechnologies Végétales" laboratory. His current research involves the elucidation and bioengineering of natural product synthesis with a particular focus on the monoterpene indole alkaloids synthesized in Apocynaceae, such as the famous anticancer drugs vinblastine and vincristine. He is currently managing several projects related to natural product synthesis and valorization, which aim at developing microbial cell factories producing these compounds on demand in order to secure their sourcing. He already collaborated with the members of the consortium for both biosynthetic gene elucidation and bioengineering approaches.

MARINE DRUGS

This LE STUDIUM Consortium is part of the Biopharmaceuticals ARD CVL Programme. It aims at studying the metabolism of natural products, specifically related to specialized marine metabolites, with major pharmacological properties and an interest in human health. To date, the understanding of the modalities/pathways of biosynthesis of these molecules remains mainly superficial (Figure 1). Consequently, the supply of molecules used in the human pharmacopoeia mainly relies on the exploitation of natural resources or via chemical syntheses, which are extremely complex and expensive. The importance of these marine natural products (MNP) as well as the problems generated by the harvesting or cultivation of organisms producing such MNPs are of great interest to the scientific community, civil society (e.g. the recent One Ocean Summit) and funders (Horizon Europe programme 2023-2024).

In this context, Vincent Courdavault and his colleagues wished to set up a consortium of researchers with complementary skills in order to develop innovative approaches in the bioeconomy and marine biotechnology sector, through the future call for projects Horizon CL6 2023 CIRCBIO. Concretely, this LE STUDIUM Consortium has already allowed its members to gather the future members of the research project in order to design and interconnect different tasks (workpackages) dedicated to the elucidation of biosynthetic pathways of different MNPs and the development of new biotechnological processes related to their production (Figure 2). At terms, such a research programme would allow to propose and/or to refine new strategies for the supply of some of these precious drugs by increasing the members' knowledge on the whole MNP metabolism. To date, the consortium, initially composed of 5 members, has already met in September 2022 in Tours to discuss the scientific strategy of the project. On this basis, it has been extended to five other international research groups and four companies that will constitute the final consortium application to Horizon CL6 2023 CIRCBIO.



Marine drugs and resources



The consortium at work during the kick-off meeting

SCIENTIFIC COMMUNICATION RELATED TO THE PROJECT

Publications:

- Méteignier, L. V., Nützmann, H. W., Papon, N., Osbourn, A., Courdavault, V. Emerging mechanistic insights into the regulation of specialized metabolism in plants., *Nat Plants*, 2023, 9(1):22-30. doi:10.1038/s41477-022-01288-7
- Perrin, J., Besseau, S., Papon, N., Courdavault, V. Boosting lignan-precursor synthesis in yeast cell factories through co-factor supply optimization., *Front Bioeng Biotechnol.*, 2022,10:1079801. doi:10.3389/fbioe.2022.1079801
- Le Pogam, P., Papon, N., Beniddir, M. A., Courdavault, V. Computer-Assisted Design of Sustainable Syntheses of Pharmaceuticals and Agrochemicals from Industrial Wastes., *ChemSusChem.*, 2022, 15(19):e202201125. doi:10.1002/cssc.202201125
- Brassart, P. L., Thomas, O. P., Courdavault, V., Papon, N. Towards a Better Understanding of Toxin Biosynthesis in Seaweeds. *Chembiochem*, 2022, 23(16):e202200223. doi:10.1002/cbic.202200223

PARTNERS



Dr Michael JENSEN

is an expert in yeast bioengineering and microbial cell factory creation

Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark



Dr Marnix MEDEMA

is an expert in bioinformatics (transcriptomic / genomic analysis), elucidation of the biosynthesis of natural products

Bioinformatics Group, Wageningen University - The Netherlands



Prof. Nicolas PAPON

is an expert in biological tests and specialize metabolisms

Parasitology and Medical Mycology, University of Angers - France



Prof. Olivier THOMAS

is an Expert in the discovery / characterization and synthesis of marine natural products

Marine Biodiscovery Laboratory / Ryan Institute, National University of Ireland - Galway



Dr Brice Korkmaz

LE STUDIUM Consortium Coordinator

Brice KORKMAZ received his Ph.D. from the University of Tours in 2005 (supervisor: Prof Francis Gauthier). He was recruited by INSERM in 2009 after postdoctoral placements in France (INSERM U618), the United States (Seattle, University of Washington; medical genetics; supervisor, Prof Marshall Horwitz), and Germany (Munich, Max Planck Institute of Neurobiology; supervisor, Dr Dieter Jenne). He has extensive expertise in biochemistry/enzymology and in neutrophilic chronic inflammatory/autoimmune diseases. He has been responsible for a research group in Team 2 of INSERM-U1100 since 2012. He is candidate director for the new Team 2 (Proteolytic enzymes and their pharmacological targeting in lung diseases) of INSERM-U1100 in the next mandate (2024-2029). He has been the chair of the International Cathepsin C Consortium ICat-CC since 2016. He demonstrated that the inhibition and disappearance of NSPs, as observed in patients with CatC deficiency, can be induced by systemic pharmacological inhibition of CatC. This proof of concept validated the relevance of using CatC as a therapeutic target and opened up new perspectives for future therapeutic applications.

PHARMACOLOGICAL TARGETING OF CATHEPSIN C: A KEY THERAPEUTIC TARGET IN CHRONIC INFLAMMATORY AND AUTO-IMMUNE DISEASES

Cathepsin C (CatC), also known as dipeptidyl peptidase I, is a lysosomal amino peptidase belonging to the papain family of cysteine peptidases. CatC catalyzes the cleavage of two residues from the N-termini of peptides and proteins. CatC, which is ubiquitously expressed in mammals, is considered a major intracellular processing enzyme. The best well-known function of CatC is the activation of immune cell-associated pro-inflammatory serine proteinases such as neutrophil serine proteinases (NSPs). The main objective of the «Cathepsin C's Five» consortium is to explore the pharmacological targeting of CatC in fundamental/translational research for drug development and to create productive international collaboration with public sector and the pharmaceutical industry. The creation of such a consortium will allow the emergence of new large-scale research programs highlighting the expertise of each and thus making it possible to respond effectively to international calls for tenders.

To date, the achievements are the following:

- Pharmacological inhibition of CatC in respiratory diseases: The consortium also benefits from the active support of the INSMED laboratory (USA), which Dr B Korkmaz chairs as an expert, the scientific council for research on the CatC inhibitor, brensocatib (BRAB, Brensocatib Advisory Board), currently being evaluated in multiple lung diseases (Chalmers et al., 2020, NEJM). Brensocatib is currently tested in a phase 3 clinical trial as a novel anti-inflammatory therapy for patients with bronchiectasis. In the current context, the members of the consortium have adapted their research and set up a program which consists in analyzing and targeting CatC/NSPs in patients with COVID-19. The results published in European Respiratory Journal (Seren et al., 2021) have initiated a Phase 3 clinical study in patients with COVID-19. Inhibition of CatC in a murine model of acute lung inflammation is in progress (Dr I Coullin, collaborator 2, INEM, Orleans, France). Pharmacological inhibition of CatC in cancer: Epidemiological studies established an association between chronic inflammation and higher risk of cancer. Inhibition of proteolytic enzymes represents a potential treatment strategy for cancer and prevention of cancer metastasis. Upregulation of CatC expression was observed in different tissues during carcinogenesis and correlated with metastasis and poor patient survival. In a review published in Biochemical Pharmacology the members of the consortium described the pathophysiological function of CatC and discuss molecular mechanisms substantiating pharmacological CatC inhibition as a potential strategy for cancer treatment. Inhibition of CatC in a murine model of smoke-induced lung cancer is in progress (Dr AO Yildirim, collaborator 3, CPC, Munich, Germany).
- Pharmacological inhibition of CatC in ANCA vasculitis: Anti-neutrophil cytoplasmic autoantibodies (ANCA)-associated vasculitis (AAV) is an autoimmune systemic small-vessel disease. AAV patients harbor ANCA either to proteinase 3 (PR3) or myeloperoxidase (MPO) both autoantigens exclusively expressed by neutrophils and monocytes. NSPs are implicated as disease mediators employed by the myeloid effector cells to induce necrotizing vasculitis. Pharmacological CatC inhibition strongly reduced NSPs in neutrophils and monocytes neutrophils encouraging clinical studies with adjunctive CatC inhibitor administration in PR3-AAV patients: Targeting Cathepsin C in PR3-ANCA Vasculitis. Jerke U, Eulenberg-Gustavus C, Rousselle A, Nicklin P, Kreideweiss S, Grundl MA, Eickholz P, Nickles K, Schreiber A, Korkmaz B, Kettritz R. J Am Soc Nephrol. 2022, 33(5):936-947. doi: 10.1681/ASN.2021081112. PMID: 35292437

- European Proposal EURO-PROT: The participants of the International Cathepsin C Consortium (ICat-CC) set up in 2016 and Partners of Cathepsin C's Five have joined forces to submit an EU proposal named EURO-PROT (European platform for the repositioning of medicinal products targeting pro-inflammatory neutrophil serine proteases, Coordinator: Brice KORKMAZ, HORIZON-HLTH-2021-DISEASE-04-02). EURO-PROT brings together 47 Partners belonging to 34 Institutions from 14 EU and Associated Countries with a strong complementarity and synergistic approach to address all the ambitious objectives of the call.
- Organization of the 3rd International Symposium on Cathepsin C: The participants of the International Cathepsin C Consortium (ICat-CC) and Partners of Cathepsin C's Five organized the symposium in Tours (6th-8th April 2022, <https://isycatc2022.sciencesconf.org>)

PARTNERS



Prof. Joanna CICHY

provides an experimental platform for detailed evaluation of CatC inhibitors and novel chemical tools in skin pathophysiology, focusing predominantly on psoriasis.

Jagiellonian University - Poland

Prof. Pedro BULLON

Inflammation in periodontal diseases, patient samples collection, cell biology. Research in dentistry including collaboration with Dr Mario Cordero (FGIBICA, Spain) for research on autophagy.

University of Sevilla - Spain



Prof. Ralph KETTRIZ

contributes to the project is to characterize the effect of inhibiting CatC and CatC-like proteases that are involved in NSP zymogens maturation in vitro and in vivo.

Charité-Universitätsmedizin - Germany



Prof. Adam LESNER

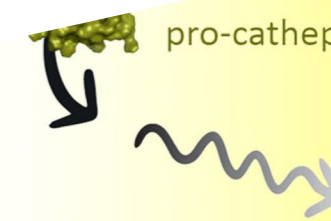
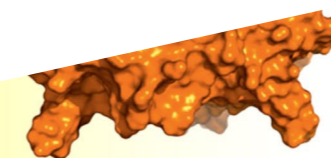
has an extensive experience on design and development of protease substrates/inhibitors.

University of Gdansk - Poland



Introduction Yves-Michel Ginot, LE STUDIUM President

pro-cathepsin G



SCIENTIFIC COMMUNICATION

Prof. Livio Casarini

- De Pascali, F.; Ayoub, M. A.; Benevelli, R.; Sposini, S.; Lehoux, J.; Gallay, N.; Raynaud, P.; Landomiel, F.; Jean-Alphonse, F.; Gauthier, C.; Pellissier, L. P.; Crépieux, P.; Poupon, A.; Inoue, A.; Joubert, N.; Viaud-Massuard, M. C.; Casarini, L.; Simoni M, Hanyaloglu AC, Nataraja SG, Yu HN, Palmer SS, Yvinec R, Reiter E. Pharmacological Characterization of Low Molecular Weight Biased Agonists at the Follicle Stimulating Hormone Receptor. *Int J Mol Sci.* 2021 Sep 12;22(18):9850. doi: 10.3390/ijms22189850.
- Casarini L, Lazzaretti C, Paradiso E, Limoncella S, Riccetti L, Sperduti S, Melli B, Marcozzi S, Anzivino C, Sayers NS, Czapinski J, Brigante G, Potì F, La Marca A, De Pascali F, Reiter E, Falbo A, Daolio J, Villani MT, Lispi M, Orlando G, Klinger FG, Fanelli F, Rivero-Müller A, Hanyaloglu AC, Simoni M. Membrane Estrogen Receptor (GPER) and Follicle-Stimulating Hormone Receptor (FSHR) Heteromeric Complexes Promote Human Ovarian Follicle Survival. *iScience.* 2020 Nov 18;23(12):101812. doi: 10.1016/j.isci.2020.101812.

Dr David Crottès

Oral communications

- Crottès, D.; Guéguinou, M.; Mahéo, K.; Fromont-Hankard, G.; Jan, Y. N.; Vandier, C.; Jan, L. J. Profiling of ion channels expression to investigate cancer heterogeneity at the "Ion Channels in Cancer" Meeting, Lille, France, 6th December 2022
- Crottès, D. and Vandier, C. From bioelectricity to personalized therapeutic strategies in cancer, Oral communication at LE STUDIUM Thursday seminar, Tours, France, 6th October 2022
- Crottès, D.; Brouard, T.; Guéguinou, M.; Mahéo, K.; Jan, Y.N.; Vandier, C.; Jan, L.J. Heterogeneity of ion channels and calcium signalling in cancers, oral communication at LE STUDIUM Conference "Ion channels in pathological context, new methods and diagnosis tools", Tours, France, 22nd September 2022

Scientific publications

- Guéguinou, M.; Ibrahim, S.; Bourgeois, J.; Robert, A.; Pathak, T.; Zhang, X.; Crottès, D.; Dupuy, J.; Ternant, D.; Monbet, V.; Guibon, R.; Flores-Romero, H.; Lefèvre, A.; Lerondel, S.; Le Pape, A.; Dumas, J. F.; Frank, P. G.; Girault, A.; Chautard, R.; Guéraud, F.; García-Sáez, A. J.; Ouaissi, M.; Emond, P.; Sire, O.; Héroult, O.; Fromont-Hankard, G.; Vandier, C.; Tougeron, D.; Trebak, M.; Raoul, W.; Lecomte, T. Curcumin and NCLX inhibitors share anti-tumoral mechanisms in microsatellite-instability-driven colorectal cancer. *Cell Mol Life Sci.* 2022 May 8;79(6):284. DOI: 10.1007/s00018-022-04311-4. PMID: 35526196

Dr Franciska Erdő

Oral communications

- Erdő, F. In vitro skin models and RAMAN spectroscopy, oral communication at Cosmetosciences seminar, Orléans, France, 24th February 2022
- Erdő, F. Studying drug and cosmetic delivery across the skin barrier, oral communication at LE STUDIUM Thursday seminar, Tours, France, March 3rd 2022
- Erdő, F. Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies - 2nd meeting, LE STUDIUM Conference, Virtual meeting, 7th-8th April 2022
- Erdő, F. Recent advances in skin research using skin-on-a-chip microfluidic devices, PhD Workshop, Indore, India, 25th August 2022
- Erdő, F. Comparative structural and functional analysis of excise skins and human reconstructed epidermis, 95th Dermatologist Conference 2022, Debrecen, Hungary, 16th September 2022
- Erdő, F. Comparative analysis of chemical composition and permeability properties of artificial and excised skins – Reduction and replacement, EUSAAT 2022 Conference, Linz, Austria, 22nd September 2022
- Erdő, F. Comparative analysis of chemical composition and permeability of artificial skins and excised skins, Global Summit on Skin care and Cosmetology 2022, Virtual meeting, 5th December 2022

Scientific publications

- Kocsis, D.; Kichou, H.; Döme, K.; Varga-Medveczky, Z.; Révész, Z.; Antal, I.; Erdő, F. Structural and functional analysis of excised skins and human reconstructed epidermis with Confocal Raman Spectroscopy and microfluidic diffusion chambers, *Pharmaceutics* 2022, 14, 1689, <https://doi.org/10.3390/pharmaceutics14081689>

- Lunter, D.; Klang, V.; Kocsis, D.; Varga-Medveczky, Z.; Berkó, S. and Erdő, F. Novel aspects of Raman spectroscopy in skin research, *Experimental Dermatology.* 2022;00:1–19, DOI: 10.1111/exd.14645

Prof. Jill Heathcock

- Heathcock JC. General Movement Assessment and Motor Optimality Scores as part of Neurodevelopmental Assessment in High-Risk Infants. (Ultra) Early intervention in NDD: Understanding development to facilitate functioning. Autism and Neuro-Development REsearch Workshop. Tours, France, April 1, 2022.
- Heathcock JC. Pediatric Assessment and Rehabilitation for neurodevelopmental disabilities. Le Studium Thursday. Tours, France, April 6, 2023

Dr María Soledad Leonardi

Oral communications

- Leonardi, M. S.; Lazzari, C. R. The ocean's «itch-hikers», Oral presentation at Le Studium Thursday Monthly Seminar, 3rd March 2022. Tours, France.
- Leonardi, M. S.; Lazzari, C. R. The ocean's «itch-hikers». Kikikose Seminar at Institut de Recherche sur la Biologie de l'Insecte (IRBI), University of Tours, France, 3rd March 2022.
- Leonardi, M. S.; Soto, F. A.; Crespo, J. E.; Negrete, J.; Lazzari, C. "Hay un piojo en el fondo de la mar"... ¡y sobrevive!, IX Congreso Argentino de Parasitología, Salta, Argentina, 1st – 3rd June 2022
- Leonardi, M. S. Coordination of Symposium: El estudio de piojos anopluros en Argentina, perspectivas y nuevos abordajes. IX Congreso Argentino de Parasitología, Salta, Argentina. 1st – 3rd June, 2022.

Scientific publication

- Leonardi, M. S.; Crespo, J. E.; Soto, F.; Lazzari, C. R.. How did seal-lice turn into the only truly marine insects? *Insects*, 2022, 13, 46. DOI 10.3390/insects13010046

Dr Alberto Marzo

- Marzo, A. Oral communication at INSERM Assemblée Générale, Tours, Faculty of Medicine, France, September 2023
- Marzo, A. Oral communication at iBrain Faculty Seminar, Tours, Faculty of Medicine, France, November 2023
- Marzo, A. Cardiovascular modelling: Basic Science to Clinical Translation. Oral communication at LE STUDIUM Conference, Tours City Hall, France, December 2023

Prof. Tetyana Milojevic

Oral communications

- Milojevic, T.; Albu, M.; Kölbl, D.; Kothleitner, G.; Bruner, R.; Morgan, M.L. Life of a Pure Martian Design or Chemolithotrophy on the Noachian Martian Breccia NWA 7034 via Experimental Microbial Biotransformation. Oral communication at AbSciCon 2022, Atlanta, USA, 15th-20th May 2022
- Milojevic, T.; Foucher, F. and Westall, F. Exobiology Group: Microbial-Mineral Interactions on Earth and beyond, at "Rencontres Chercheuses et Chercheurs 2022", Orléans, France, 6th July 2022

Posters

- Kölbl, D.; Rabbow, E.; Rettberg, P.; Beblo-Vranesovic, K.; Parpart, A.; Mita, H.; Yamagishi, A.; and Milojevic, T. Metallosphaera sedula on a Mission – mimicking Mars in frames of the Tanpopo 4 mission, Poster at Europlanet Science Congress 2022, Granada, Spain, 18th–23th September 2022, EPSC2022-465, <https://doi.org/10.5194/epsc2022-465>.
- Westall, F.; Milojevic, T.; Clodoré, L.; Foucher, F. et al. Early planetary organisms and their biosignatures, Poster at AbSciCon 2022, Atlanta, USA, 15th-20th May 2022
- Westall, F.; Clodoré, L.; Foucher, F.; Milojevic, T.; Hickman-Lewis, K.; Cavalazzi, B. The challenges of detecting traces of life in Martian sediments: the necessity of sample return, Poster at COSPAR 2022, Athens, Greece, 16th-24th July 2022

Scientific publications

- Milojevic, T.; Cramm, M.A.; Hubert, C.R.J.; and Westall, F. "Freezing" Thermophiles: From One Temperature Extreme to Another. *Microorganisms* 2022, 10, 2417. <https://doi.org/10.3390/microorganisms10122417>.
- Cavalazzi, B.; Westall, F.; Noack, L.; Taubner, R.; Milojevic, T.; and Finster, K. Special issue: Open questions and next steps in astrobiology in Europe – celebrating 20 years of EANA. *International Journal of Astrobiology*, 2022, 21 (5), 261-267. doi:10.1017/S1473550422000362

Prof. Vincent Pecoraro

- Eliseeva, S. V.; Nguyen, T.; Lathion, T.; Lopez Bermudez, B.; Salerno, E.; Kovalenko, A.; Badescu Singureanu, C. C.; Collet, G.; Besnard, S.; Guénée, L.; Natkunarajah, S.; Lerondel, S.; Pecoraro, V. L.; Petoud, S. Lanthanide(III)/gallium(III) and lanthanide(III)/zinc(II) metallacrowns for near-infrared luminescence and photoacoustic imaging, Invited talk at FrenchBIC Webinars 2022, 19th October 2022
- Eliseeva, S. V. Lanthanide(III)-based metallacrowns for near-infrared optical imaging and nanothermometry. Invited talk at 3èmes Journées scientifiques du GDR AIM, Orléans, France, 3rd-5th October 2022
- Eliseeva, S.V.; Lopez Bermudez, B. A.; Salerno, E. V.; Nguyen, T. N.; Carlos, L. D.; Pecoraro, V. L.; Petoud, S. Luminescent lanthanide(III)-based metallacrowns: from design to applications, Plenary lecture at XXXI. Tage der Seltenen Erden Terrae Rarae 2022, Leipzig, Germany, 27th-29th September 2022

Prof. Rita Singh

Oral communications

- Singh, R. Cross-talk between FSH and LH: Implications for metabolic disorder in women with PCOS, Invited Speaker at LE STUDIUM International Conference on 'Gonadotropins in the Physiopathology: Current advances in the Mechanisms of Action', Virtual conference, 14th September 2022
- Singh, R. Gonadotropin Imbalance and FSH-signaling defects in granulosa cells and Physiopathology of PCOS at Physiology of Reproduction and Behaviors Laboratory, Invited Speaker, Department for Physiology of Reproduction, INRAE, Val de Loire, Nouzilly, France, 20th June 2022
- Singh, R., Selective defects in the signaling mechanisms of gonadotropins and metabolic disorders in PCOS, Invited Speaker at CRBCED and SRBCE conference 2022, CSIR-CCMB, Hyderabad, India, 14th-16th September 2022
- Singh, R. Reproductive and Mental health issues in Adolescent Girls, Invited Speaker at National Conference on Lifestyle Diseases – A Matter of Concern to Adolescents under the auspices of the Indian Society for the Study of Reproduction and Fertility (ISSRF), BBVP, BITS Campus, Pilani, Rajasthan, India, 17th-18th September 2022.
- Singh, R. Impact of high LH levels on Glucose uptake and storage in granulosa cells, implications in the pathogenesis of polycystic ovary syndrome, Invited Speaker at 32nd Annual Meeting of the ISSRF along with the International Conference on Reproductive Healthcare, Virtual meeting organized by ISSRF, India, 11th-13th February 2022

Scientific publications

- Musnier, A.*; Bourquard, T.*; Vallet, A.; Matthias, M. L.; Bruneau, G.; Ayoub, M.A.; Travert, O.; Corde, Y.; Gallay, N.; Boulo, T.; Cortes, S.; Watier, H.; Crépieux, P.; Reiter, E.; Poupon, A. New antibody similarity measure both identifies large sets of epitopes binders with distinct CDRs and accurately predicts off-targets reactivity. *Int. J. Mol. Sci.*, 2022, 23, 9765. * equal contribution
- Raynaud, P.*; Gauthier*, C.; Jugnarain, V.; Jean-Alphonse, F.; Reiter, E.; Bruneau, G.; Crépieux, P. Intracellular VHH to monitor and modulate GPCR signalling, *Front. Endocrinol.*, 2022, 13, 1048601, *equal contribution

Dr Brice Korkmaz

Oral communications

- Korkmaz, B. Pharmacological targeting of cathepsin C: from pathophysiology to treatment, Departmental seminar, Chiesi Farmaceutici S.p.A., Parma, Italy, 27th September 2022
- Korkmaz, B. Neutrophil serine proteases and cathepsin C as pharmacological target in cancer, University of Sao Paulo/Faculty of Medicine/Departmental seminar, Sao Paulo, Brazil, 6th June 2022
- Korkmaz, B. Targeting neutrophil serine proteases and cathepsin C, Departmental seminar, Brussels, Belgium, 13th January 2022
- Korkmaz, B. The past, present and future of pharmacological targeting of cathepsin C, 3rd International Symposium on Cathepsin C, Tours, France, 6th-8th April 2022

- Cichy, J. Targeting serine proteases through cathepsin C inhibition in neutrophil-associated skin diseases, Invited by the Scientific Committee of the 3rd International Symposium on Cathepsin C, Tours, France, 6th-8th April 2022
- Cichy, J. Generation of iPSCs-based models to study involvement of inhibitors of neutrophil proteases in neutropenia, 3rd Working Groups Meeting COST EU-NETInnochron, Tuebingen, Germany, 19th-20th May 2022
- Kettritz, R. The proteinase 3 alpha1-antitrypsin balance in ANCA vasculitis, Invited by the Scientific Committee of 3rd International Symposium on Cathepsin C, Tours, France, 6th-8th April 2022
- Ebert, M. (Kettritz's group) Methionine oxidation compromises protective alpha1-antitrypsin effects in PR3-ANCA Vasculitis, International vasculitis and ANCA workshop, Dublin, Ireland, 3rd-6th April 2022

Posters

- Korkmaz, B. Therapeutic targeting of cathepsin C in neutrophil-mediated rare diseases
- Annual Scientific Meeting, Rare Diseases Foundation, Collège de France, Paris, France, 31st May 2022
- Ebert, M. (Kettritz's group) Methionine oxidation compromises protective alpha1 antitrypsin effects in PR3-ANCA vasculitis, International vasculitis and ANCA workshop, Dublin, Ireland, 3rd-6th April 2022

Scientific publications

- Jerke, U.; Eulenberg-Gustavus, C.; Rousselle, A.; Nicklin, P.; Kreideweiss, S.; Grundt, M.A.; Eickholz, P.; Nickles, K.; Schreiber, A.; Korkmaz, B.; Kettritz, R. Targeting Cathepsin C in PR3-ANCA Vasculitis, *J Am Soc Nephrol.*, 2022 DOI: 10.1681/ASN.2021081112.
- Kriaa, A.; Mariaule, V.; Jablaoui, A.; Rhimi, S.; Mkaouar, H.; Hernandez, J.; Korkmaz, B.; Lesner, A.; Maguin, E.; Aghdassi, A.; Rhimi, M. Bile Acids: Key Players in Inflammatory Bowel Diseases? *Cells*. 2022 5;11(5):901. DOI: 10.3390/cells11050901.
- Ebert, M. J.; Jerke, U.; Eulenberg-Gustavus, C.; Kling, L.; Jenne, D. E.; Kirchner, M.; Mertins, P.; Bieringer, M.; Elitok, S.; Eckardt, K. U.; Schreiber, A.; Salama, A. D.; Kettritz, R. Protective alpha1-antitrypsin effects in autoimmune vasculitis are compromised by methionine oxidation. *J Clin Invest*, 2022, DOI: <https://doi.org/10.1172/jci160089>



EARTH ECOLOGY & ENVIRONMENT SCIENCES

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HOST LABORATORIES IN EARTH, ECOLOGY & ENVIRONMENT SCIENCES

BUREAU DE RECHERCHE GÉOLOGIQUE ET MINIÈRE (BRGM)



BRGM, as we know it today, is the result of two centuries of scientific exploration. Since its founding in 1959, the French Geological Survey has continually adapted to economic, geopolitical, and technological changes. From its creation in 1959 to meet the new challenges of the sub-surface, through major dates and many adventures, BRGM has become one of the internationally-recognized organizations in the fields of geoscience and environmental issues. Under partnerships with numerous public and private stakeholders, it focuses on scientific research, providing scientifically-validated information to support public policy development and international cooperation.

Its activity meets 4 objectives:

- understanding geological phenomena and related risks,
- developing new techniques and methodologies,
- producing and distributing data for surface, subsurface and resource management,
- providing the tools required to manage the surface, subsurface and resources, prevent risks and pollution, and manage policies in response to climate change.

It is in line with six major scientific and societal challenges: geology and knowledge of the subsurface, groundwater management, risks and spatial planning, mineral resources and the circular economy, energy transition, data and digital infrastructures.

UNITÉ DE RECHERCHE ECOSYSTÈMES FORESTIERS (EFNO)

UR1455 - CENTRE INRAE VAL DE LOIRE

Formerly part of the National Research Institute in Science and Technologies for the Environment and Agriculture (IRSTEA), the Forest Ecosystem Research Unit (EFNO) is part of the Centre INRAE Val de Loire since 2020. INRAE is France's National Research Institute for Agriculture, Food and Environment. The Unit is located at the Domaine des Barres, home of the Domaine des Barres arboretum preserving more than 2,600 plant and tree species from over the world. Through its research, EFNO intends to contribute significantly to a better understanding of the functioning of forest ecosystems, particularly lowland forests, and their ability to adapt to management practices and climate change, in order to propose management methods best suited to local situations. The many research projects at EFNO focus on interactions between forest management and climate change, biodiversity, wildlife, forest stand heterogeneity, and genetic diversity. The Unit welcomes many internships allowing students to acquire a first research experience on forest ecosystem functioning



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.



LABORATOIRE DE PHYSIQUE ET CHIMIE DE L'ENVIRONNEMENT ET DE L'ESPACE (LPC2E)

UMR 7328 - UNIVERSITÉ D'ORLÉANS, CNRS, CNES



The LPC2E (Laboratoire de Physique et Chimie de l'Environnement et de l'Espace) is a joint research unit of the CNRS, the University of Orleans and the CNES (Centre National des Etudes Spatiales). In common with the ISTO (Institut des Sciences de la Terre d'Orléans) and the Station of Radioastronomy of Nançay, it is one of the founding laboratories of the OSUC (Observatoire des Sciences de l'Univers de la région Centre-Val de Loire).

The fields of activity of its three scientific teams range from the atmosphere to the most distant space: physico-chemistry of the atmosphere, physics of space plasmas, planetology to study the environment of planets and small bodies (e.g. comets) of the Solar System, pulsars and gravitation.

This research relies mainly on the scientific exploitation of instruments on board balloons, satellites or space probes. The LPC2E is one of the CNRS-INSU (Institut National des Sciences de l'Univers) space laboratories, working in close partnership with the CNES to propose, design, build and operate these instruments, then make their data and observations and publish the results available to the scientific community.





Dr Rock Ouimet

LE STUDIUM Research Fellow

From: Quebec Ministry of Forests, Wildlife, and Parks, Forest Research Branch - CA

In residence at: UR Ecosystèmes Forestiers (EFNO) - Nogent sur Vernisson

Nationality: Canadian

Programme: SMART LOIRE VALLEY

Dates: April 2022 to April 2023

Rock Ouimet got his Ph.D. from the Faculty of Forestry, Geography, and Geomatics at Laval University in 2015, with the speciality in forest soils and tree health. He has been working for the Quebec government at the Forest Research Branch for 32 years. He is associated professor at the Department of Wood and Forest Sciences at Laval University since 1996. Rock Ouimet has been involved in forest soil related research including critical loads of acid deposition for forests, forest decline and dieback, forest health monitoring, forest ecosystem carbon accumulation and cycle, and long-term effects of biomass harvesting in the boreal forest in Eastern Canada.

APPLICATION OF THE CRITICAL BIOMASS HARVESTING CONCEPT FOR IMPROVING THE DIAGNOSIS OF SOIL SENSITIVITY TO FOREST BIOMASS HARVESTING IN THE CENTRE-VAL DE LOIRE REGION

The use of forest biomass to produce energy is viewed increasingly as a means to reduce fossil fuel consumption and mitigate climate warming. However, still little is known on the impact such practices have on soil carbon reserves. The objective of the project is to find soil properties that can explain potential soil C and N losses at some sites subjected to whole-tree and biomass harvesting compared to stem-only harvesting. The separation of soil organic matter in two fractions, a recalcitrant (e.g. mineral-associated organic matter) and a more labile one (e.g. particulate organic matter) may explain the pattern of soil C and N losses or not by additional biomass harvesting. To reach this objective, we, first, examined more in depth an experiment carried out in Quebec, Canada, where whole-tree biomass or stems only were harvested 30 years ago. We determined how soil properties can explain the observed lower soil C and N stocks in plots subjected to whole-tree harvesting. We found a good agreement between some soil characteristics and their C and N stocks dynamics following whole-tree harvesting. A paper on these findings is in preparation. Second, we used these relationships to assess the sensitivity of soils to carbon depletion of the region for the Centre-Val de Loire (CVL) region. We started by building a database of forest soil properties. This database is now cleaned, and structured, counting currently 653 soil profiles. It took several months to get the raw data from the different institutions due to administrative process (signature of agreements). More soil profile data is being found from various studies in the CVL region. We also got data on the soil C fractions from the Oak-Pine Mixture (OPTMix) experiment located in the CVL region; we will analyze how they are related to forest composition. We used these soil profiles to assess their sensitivity to whole-tree harvesting. In France, a diagnostic key at the national scale has been set up to predict soil sensitivity to nutrient fertility loss after tree biomass harvesting. Following the regional project DEFIFORBOIS, criteria have been refined specifically for the CVL region. According to these keys, the majority of the CVL region is considered highly sensitive to forest biomass harvesting. Now, we will (i) calculate the labile and recalcitrant soil C fractions in these soils to understand how well they compare to the current sensitivity classification, and (ii) study the impact of forest types (deciduous, coniferous, and mixed forest stands) on soil C fractions.



LE STUDIUM monthly seminar at EFNO, Domaine des Barres, September 2022



Dr Nathalie Korbouleswky
Host Scientist

Natalie Korbouleswky's research work is to better understand the functioning of the ecosystem, in particular the impacts of management practices and disturbances on organisms and bioelement fluxes. For this, her research is based on a functional approach of nutrient fluxes in soil-plant relationships. Her research scope is at different scales: nutrient flows between the different compartments of the ecosystem, intra- and inter-specific and inter-specific relationships, and their impacts on forest growth and yield. She also studies the impact of pressures (management, climate change, disturbance by ungulates) on the spatial and temporal distribution of resources (nutrients, water) and their consequences on interspecific relationships (plants-plant and herbivores-plant) and soil-plant relationships.



Prof. Akkihebbal Ravishankara

LE STUDIUM Research Professor

From: Colorado State University - USA

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

Nationality: American

Programme : SMART LOIRE VALLEY

Dates: June 2017 to July 2017
May 2018 to July 2018
May 2019 to July 2019
May 2022 to July 2022

Prof. Ravishankara is a University Distinguished Professor at the Departments of Chemistry and Atmospheric Science at Colorado State University, USA. He chaired the US National Academy's Board on Atmospheric Science and Climate, served on the Editorial Board of the Proceedings of the National Academy of Science (USA) till 2021. Prof. Ravishankara was also a member a Foreign Member of the Royal Society (London, UK), and a Foreign Fellow of the Indian National Science Academy. He is a member of the Science Advisory Panel of the Climate Clean Air Coalition of UNEP. Before moving to CSU, 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, USA. Prof. Ravishankara's work relates to stratospheric ozone depletion, climate change, and regional air quality. His laboratory and atmosphere measurements and modelling studies have contributed to deciphering the ozone layer depletion, including the ozone hole; quantifying the role of chemically active species on climate; and advancing understanding of the formation, removal, and properties of pollutants.

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 understand better the role of nitrous oxide in the Earth's climate and ozone layer depletion and the information required to make any policy to curb N₂O emissions. One of the critical needs is to quantify the budget of nitrous oxides- i.e., quantification of various sources, both natural and anthropogenic, and loss processes. This needs to be done as a function year to enable understanding of the past and predicting the future influences of N₂O.

This proposed work aims to provide information on all the loss processes through a combination of laboratory studies, chemical calculations, field measurements, and atmospheric modelling.

In the past, laboratory studies of the reaction of N₂O were completed, and manuscripts describing this work were published. Theoretical studies were carried out in collaboration with a scientist from Lille and two scientists from the University of Florida (USA) to explain the non-reactivity of N₂O with the OH and NO₃ radicals. The experimental work was carried out using unique apparatuses available in ICARE. Based on the results from these multiple experimental and theoretical studies, the team have ruled out any significant tropospheric chemical loss of N₂O. This work dramatically improves the teams' understanding of the atmospheric lifetime of N₂O. Collectively, these studies showed that the reaction of NO₃ with N₂O is very slow. Further calculations showed that this pathway would not be viable in Earth's atmosphere.

In the past year, in collaboration with LPC2E at Orleans, Prof. Ravishankara and his team have examined the vertical profile of N₂O and its trends over the past three decades from the surface to the mid-stratosphere. This involved collaborations between Drs. Gisele Krystzofiak, Thierry De wit, Valery Catoire, and Vanessa Brocchi of LPC2E, Dr Douglas Kinnison of the National Center for Atmospheric Research at Boulder, CO, USA, and a host of scientists who provided field data. The paper showed that the N₂O abundance is increasing in the stratosphere at rates congruent with those seen at the surface. This paper is accepted for publication.

In collaboration with Drs. Max McGillen and Wahid Mellouki, a University of Orléans Ph.D. student, Ms. Lisa Michelat studied how OH radical reactivity changes with substituents in olefins of interest to the atmosphere. This paper was published last year. In addition, Ms. Michelat visited Colorado State University, USA, for three months and conducted theoretical calculations. A paper describing this work is in progress.



Dr Abdelwahid Mellouki
Host Scientist

Dr Abdelwahid Mellouki graduated from the Universities of Tours, Orléans, and Paris 7 (France). He spent two years as a Research Associate at the National Oceanic and Atmospheric Administration's Aeronomy Laboratory (Boulder-Colorado, USA). Dr Mellouki is a Research Director at ICARE in Orléans (France). His research focused on many aspects of atmospheric chemistry, including studying the atmospheric oxidation mechanisms of anthropogenic and biogenic carbon-containing species and halogen chemistry. He has conducted many experimental studies on the atmospheric fate of chlorofluorocarbons (CFCs) substitutes, as well as on CH₄ and N₂O, which are considered important greenhouse gases (GHGs).



Dr Anne-Sophie Sergent

LE STUDIUM Visiting Researcher

From: National Scientific and Technical Research Council (CONICET) - AR

In residence at: Integrated Biology for the Development of Tree and Forest Diversity (BioForA) - Orléans

Nationality: French

Programme : SMART LOIRE VALLEY

Dates: April 2022 to June 2022

Anne Sophie Sergent obtained her PhD in forest biology at Val de Loire University -France- in 2011 before joining the National Scientific and Technical Research Council CONICET -Argentina-. Her research activities are carried out within the ecology, ecophysiology and wood laboratory (LEEMA) of INTA Bariloche. Her primary research interest is forest trees ecophysiology and dendro-ecology, focusing on the relationships between wood structure, growth rate and physiological mechanisms involved in drought resistance. Her current project aims to assess the geographical and genetic variations of wood traits involved in the adaptability of *Austrocedrus chilensis* to drought. Since 2019, she is strongly involved in international collaborations. She is currently leading the functioning of the NetForSur network in Argentina. This network imply more than 30 scientists from over 10 research units, in France (Bordeaux, Clermont-Ferrand, Avignon, Nancy, Orléans, Aix-en-Provence) and South America (Argentina, Chile, Peru).

MODELLING TREE DROUGHT VULNERABILITY IN THE ANDEAN PATAGONIAN FOREST

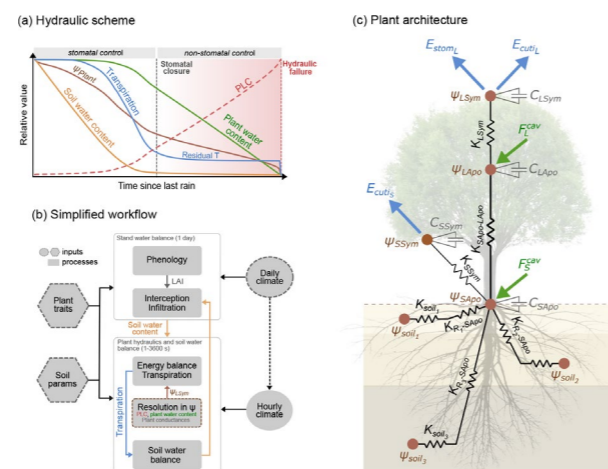
Forests cover 31 % of the global land area, being one of the main carbon sinks, sequestering 25% of human CO2 emissions and providing a wide range of ecosystem services (wood production, soil retention, water quality, landscaping, etc.). In addition to a worrying rate of deforestation and degradation, the ongoing climatic change represents an increasing threat for many forests worldwide. During the last decades, tree mortality events caused by extreme droughts have been recorded all around the world. These events affect the provision of ecosystem services and enhance different types of disturbances such as fires and the loss of biodiversity. All biomes from wet to dry, tropical, Mediterranean to temperate are vulnerable to drought increase, with most species already living at the limit of sustainable conditions. In this context, identifying and understanding the mechanisms of drought-induced tree mortality and developing predictive models are key to forecasting future events and implementing efficient actions for forest conservation. The project aims to predict tree vulnerability to global change in one of the most emblematic tree species of the Andean Patagonian forest (*Austrocedrus chilensis*), by modelling current and future forest mortality risk using cutting edge process-model combining hydraulic traits with eco-hydrological approaches. *Austrocedrus chilensis* is an endemic species of Patagonia - South America, threatened by land-use change, decline and mortality in the framework of less favourable growing climate conditions. To reach these objectives, we used hydraulic, foliar, ecological and dendrochronological traits data already obtained in a network of twelve natural sites, distributed in the natural area of the species. During the fellowship, the activities were focused on the modelling part of the project to parametrize and validate the mortality risk model. I used the SurEau model, which is dedicated to the mechanistic modelling of xylem hydraulic failure and tree mortality. SurEau was used to predict xylem embolism and water content at the plant or stand level - taking into account both hydraulic processes and eco-hydrological conditions (climate, leaf area index and soil water holding capacity). The hydraulic part of the model was successfully parameterized with the set of estimated hydraulics traits including embolism resistance, stomatal closure, leaf minimal conductance and capacitance. The model was able to reproduce the hydraulic status measured at different dates during the growing season in natural conditions, allowing the reconstruction of the risk of mortality that occurred in the past. We determined how intraspecific drought resistance traits variability can contribute to alleviate mortality risk. Since the end of the fellowship, we continue to collaborate in the frame of International Associated Laboratory LIA FORESTIA (INRAE-INTA-UNAH- CP). We are currently working to upscale the risk evaluation to all the species distribution and model the risk under future conditions. The results will be not only disseminated to the academic scientific community but also shared with key stakeholders and decision-makers in charge of the administration of native forest conservation and management.



Dr Philippe Rozenberg

Host Scientist

Philippe Rozenberg is a Research Director at INRAE Val de Loire, Orléans. He holds a Master's degree in ecology from the Paris VI University, a PhD degree on Forest Sciences from AgroParisTech (Paris) and an Habilitation degree from the University of Orléans. He is a research director at INRAE Val de Loire, Orléans, the leader of the "genetic and Physiology of Adaptation" team of the research unit BIOFORA and a member of the INRAE national scientific council. He develops a research program on "adaptation of forest trees to climate" in natural as well as in artificial forest tree populations. In this context, he investigates the evolutionary adaptation and the phenotypic plasticity of forest trees using tree- ring analysis and wood formation studies. He has coordinated more than ten national and international research projects, directed eight PhD theses and published more than sixty research articles in international scientific journals.



Overview of the SurEau-Ecos plant hydraulic model Ruffault et al, 2022



Prof. Neil Sturchio

LE STUDIUM Visiting Researcher

From: University of Delaware - USA

In residence at: French Geological Survey (BRGM) - Orléans

Nationality: American

Programme : SMART LOIRE VALLEY

Dates: June 2022 to July 2022

Neil C. Sturchio received his Ph.D. (1983) in Earth and Planetary Sciences from Washington University (USA) with focus in mineralogy and geochemistry. He worked at Argonne National Laboratory (Illinois, USA) from 1983-2000 where he performed research pertaining to nuclear waste isolation, geothermal energy, groundwater contamination, and mineral-water interfaces. He was elected a Fellow of the Geological Society of America in 1997. From 2000 to 2014 he served as Professor and Head of the Department of Earth and Environmental Sciences at the University of Illinois at Chicago (USA), where he established the Environmental Isotope Geochemistry Laboratory. Since 2014, he has served as Professor and Chair of the Department of Earth Sciences at the University of Delaware (USA), where he established the Environmental Isotope Science Laboratory. His principal research interests include stable and radioactive isotope tracer studies of groundwater contaminants and groundwater residence times as well as synchrotron radiation studies of mineral-water interface processes.

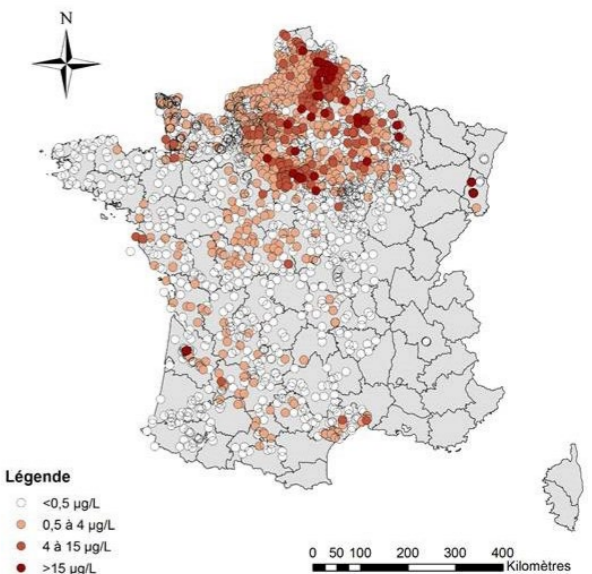
GROUNDWATER CONTAMINATION IN FRANCE: A LEGACY OF WORLD WAR I

First World War (WWI) munitions included nitro-aromatic compounds, nitrated and nitrite high explosives, chlorate and perchlorate that may be released in soils and then migrate to groundwater. Recent investigations led by BRGM show that, more than a hundred years after the outbreak of the WWI, many former battlefields and sites related to WWI production and destruction of military chemicals and munitions are still contaminated by these compounds. This raises major public health, industrial and economic issues. Furthermore, perchlorate and nitrate in soils and groundwater may also come from agriculture practices (Chilean nitrate fertilizers) and/or industrial activities. ANSES (French Agency for Food, Environmental, and Occupational Health and Safety) revealed in 2011, by a nationwide survey of groundwater quality, the widespread occurrence of perchlorate in groundwater of northern France, in the region affected by military activities during WWI, but also in other regions (e.g., Centre-Val de Loire, Aquitaine, PACA) (see Figure). Large uncertainties remain about the sources and fate of these contaminants. Likely sources of perchlorate, chlorate, and nitrate include residues of World War I munitions as well as imported Chilean nitrate fertilizers, both of which contain substantial amounts of perchlorate having distinct isotopic compositions. The measurements of the isotopic composition of chlorine, carbon, nitrogen, and oxygen in perchlorate, nitrate, and nitroaromatics extracted from groundwater, soils, and residual munitions remaining in the World War I battlefields can help better determine the source characteristics of these contaminants. In addition, they can provide information on the effectiveness of natural attenuation of these compounds by microbiological and abiotic processes in the soils and aquifers. Information about perchlorate and nitrate sources throughout France is relevant to assist in developing a strategy for remediation of these hazardous contaminants to minimize their impact on public health through the reduction of human exposure in the drinking water and food supplies. Few laboratories in the world are capable of analyzing the isotopic composition of these compounds (especially for perchlorate, 17O in nitrates). Pr. Neil C. Sturchio (University of Delaware) has extensive experience in the isotopic analysis of perchlorate, nitrate, and nitroaromatics. He is widely considered one of the leading experts on the occurrence and isotopic composition of perchlorate and other groundwater contaminants in the environment. As part of this project, Pr. Neil C. Sturchio has transferred his detailed knowledge of the methods for extraction and isotopic analysis of perchlorate to the laboratories at BRGM. In addition, his expertise on the measurement of the isotopes of nitrate (especially 17O) and nitroaromatics has been shared to develop these new analytical capabilities at BRGM using the new IRMS funded by the "Région Centre-Val de Loire", in good agreement with the strategy of the institute.

Dr Patrick Ollivier

Host Scientist

Dr Patrick Ollivier holds a Ph.D. (2006) in Environmental Geosciences. He carried out his doctoral research in Geochemistry focusing on i) quantifying the groundwater and coastal waters exchanges using isotopes (226Ra), ii) estimating the element fluxes transported by rivers to the ocean and iii) quantifying the physical erosion and chemical weathering processes in Rhone basin. He was a postdoctoral fellow at the University of Delaware (USA) where he initiated studies both on the biogeochemical cycles of trace elements (e.g., polonium, tellurium, selenium, sulfur) and on nanoparticles. He started his position at BRGM in 2010. His research focuses on the understanding of the geochemical and biological processes involved in the origin, fate and transport of organic and inorganic compounds (e.g., major and trace elements, pesticides, radionuclides, explosives, natural and anthropogenic organic matter) in dissolved and particulate (e.g., NP) forms in the environment.



Map of France showing distribution of perchlorate concentration in untreated drinking water supplies (ANSES, 2013; map updated 2018)



Dr Jean-Paul Vernier

LE STUDIUM Visiting Research

From: NASA Langley Research Center - USA

In residence at: Laboratory of Physics and Chemistry of Environment and Space (LPC2E) - Orléans

Nationality: French

Programme : SMART LOIRE VALLEY

Dates: November 2021 to January 2022

Dr Jean-Paul Vernier earned his PhD from the University of Versailles (France) in 2010 using balloon-borne measurements and satellite observations to investigate the distribution and properties of aerosols in the stratosphere. His research relied on developing retrieval algorithms to study volcanic aerosols using satellite sensors. From 2010 to 2012, Dr Vernier held a NASA postdoctoral fellowship at NASA Langley Research Center (Hampton, VA, USA). He discovered the Asian Tropopause Aerosol Layer, a new phenomenon linked to the transport of Asian Pollution into the stratosphere. He has been employed by the National Institute of Aerospace since 2017 and studies the impacts of natural disasters and pollution on atmospheric composition, air quality and climate. He received the 2013 H.J.E. Reid award for the most significant paper at NASA Langley. He has served as Science Principal Investigator of 6 NASA-funded international field missions since 2014 and is the current Principal Investigator of two NASA Roses projects. He is a member of the Committee on Earth Observing Satellites (CEOS) and co-chairs the SPARC-VolRes initiative. He was a contributing author of the fifth assessment report (AR5) of the Intergovernmental Panel on Climate Change (IPCC).

IMPACTS OF POLLUTION, VOLCANOES AND WILDFIRES ON THE EARTH'S MIDDLE ATMOSPHERE

The Earth's surface temperature has been rising by ~1.5°C since the industrial era due to the continuous influence of anthropogenic activities and the release of greenhouse gases in the atmosphere. Over the same period, particulate matters also known as "aerosols" emitted either from human activities (e.g. soots from transportation and power plants) and natural sources (dust, volcanic ash, sea salts) also affected the Earth's climate system. This project aims to study the properties of aerosols in the middle atmosphere using satellite observations, balloon-borne measurements and numerical simulations. Jean-Paul Vernier and his team plan to simulate their behaviors using state-of-the-art aerosol transport models to understand how they affect solar radiation, ozone chemistry and identify main sources and transport pathways. In addition, they plan to analyze balloon-borne measurements obtained during several field campaigns in India since 2015 to test if model simulations can reproduce observations of the vertical extent, observed aerosol size distributions, and other chemical properties of Asian Pollution. Finally, they aim to develop additional aerosol sensors to gather new information on the chemical, physical and optical properties of aerosols transported in the stratosphere. The team's research work will focus on the aerosol content at high altitudes (upper troposphere and stratosphere). It will give decision makers and government in Asia scientific basis to explain how upper atmospheric pollution could harm the Earth's climate system, stratospheric ozone and alter precipitation. In addition, the alarming increase of extreme wildfires affecting not only people on the ground but with global implications because of long-range smoke transport in the stratosphere is extremely concerning. Their research work, focusing on how wildfires can harm stratospheric ozone and potentially affect the Earth's climate is extremely important to understand climate changes.

Since the beginning of the Vernier's LE STUDIUM fellowship in November 2021, the team's work focused on field deployments to study atmospheric aerosols using balloon-borne observations. Through a collaboration between the LPC2E, the Groupe de Spectrométrie Moléculaire (GSMA) and the National Institute of Aerospace/NASA Langley Research Center, 12 balloon flights were conducted under the Radiosounding of Extreme events and Aerosols in the Stratosphere (REAS). Using optical particle counters and other payloads, they characterized the vertical distribution of atmospheric aerosols and Trace Gases. They identified the influence of volcanic plumes from La Soufriere eruption and likely smoke from extreme wildfires. They characterized the optical properties (backscatter) using a lightweight backscatter sonde. Finally, two balloon-borne lightweight systems were developed and tested to sample stratospheric aerosols for laboratory analysis. The 7-week campaign deployment in Reims constitutes the major achievement of this fellowship with the development of new sensors and flight systems which provided unique measurements of stratospheric aerosols.



Eyjafjöll eruption in 2010



Dr Gwenaël Berthet

Host Scientist

Dr Gwenaël Berthet is a specialist of chemical and physical processes in the stratosphere controlling the budget and the variability of the ozone layer through double competence consisting in developing/using optical instruments onboard balloon-platforms and global chemistry-transport modelling. He is involved in the organization of balloon campaigns. He participates to the better understanding of stratospheric aerosols and their chemical/radiative impacts. For instance, he is the first to have quantified the chemical impact of a volcanic eruption of moderate amplitude (i.e. ~20 times less sulfur injected than a major eruption like the one of Pinatubo in 1991) on stratospheric ozone. He used to belong to the CNRS Section 19 National Committee from 2016 to 2021 and coordinates the workpackage dedicated to the impact of volcanic eruptions and fires from the Labex VOLTAIRE.



Prof. Juan César Vilardi

LE STUDIUM Research Professor

From: Faculty of Exact and Natural Sciences, University of Buenos Aires - AR

In residence at: Integrated Biology for the Development of Tree and Forest Diversity (BioForA) - Orléans

Nationality: Argentinian

Programme : SMART LOIRE VALLEY

Dates: April 2022 to June 2022

Juan César Vilardi is Consulting Full Professor of the University of Buenos Aires, Argentina, and Principal Researcher of CONICET. He founded the Laboratory of Applied Population Genetics and has been in charge of degree and post-degree courses related to Evolutionary and Population Genetics at his institution and other Argentinian research and educational centers. He carried out a postdoctoral stay in INRA-Orleans, France and scientific visits to Israel, Venezuela, Brazil and the USA. His research line is related to population and evolutionary genetics, mainly oriented to genetic structure and adaptive strategies in different biological models, including insects and forest trees. He has directed eight PhD theses and published more than 145 research articles in international scientific journals. He received the Academic Excellence Award 2022, from the University of Buenos Aires.

ADAPTIVE STRATEGIES OF FOREST TREES TO CLIMATE CHANGES: MICROEVOLUTION AND PLASTICITY

The aim of this project is to coordinate and implement an integrated study of the genetic and plastic adaptation to climate of an important forest tree species, European larch. The study combines powerful and recent population and quantitative genetics methods with data collected on an integrated multidisciplinary experimental trial installed by INRAE along an altitude gradient in the French Alps. This experimental trial gathers permanent forest plots with reciprocal transplant experiments, dendroecological phenotyping and microsatellite and SNP genotyping of the trees in the permanent plots. This integrated trial provides the opportunity to improve the quantification and the separation of the effects of phenotypic plasticity and genetic adaptation on the past and present response of European larch to climate variation. In this context, the role of Pr JC Vilardi is to direct and harmonize all components of the ecological genetic and genomic analysis with the project partners.

Specific objectives

1. Estimating the local adaptation of phenotypic traits derived from the microdensity profiles including the information of inter-annual norms of reaction.
2. Investigating the genetic determinism of phenotypic plasticity along the elevation gradient based on molecular markers patterns.

Achievements to date

The database is composed of 568 individuals sampled at four sites along an altitudinal gradient (1350, 1700, 2000, and 2300 m asl respectively). Each individual has been genotyped for 46388 SNP and measured for four phenotypic annual ring traits (ring width, early, late, and average wood densities) and their respective norms of reaction (plasticity traits).

The whole set of molecular markers was scanned to identify putative adaptive loci on the basis of FST statistics. The analysis conducted with the Bayescan Software allow to identify 197 loci (outlier loci) with evidence of local adaptation (diversifying selection).

The association between these loci and the phenotypic and plasticity traits was evaluated by means of the method of conditional inference trees. The approach searches for the most probable genotypic combinations associated with trait variation among individuals. The first results indicated that three phenotypic traits (ring width, early wood density, and average wood density), as well as three plasticity traits (ring width, late wood density, and average wood density plasticities) may be associated to a variable number of putative adaptive SNP markers. In most cases the relationship between traits and markers is rather complex suggesting the occurrence of interaction (epistasis) among loci.

Previously, differences for trait averages had been recorded among sampling sites. The present analysis evaluated such differences on the basis of differences in genotype frequencies among sites.

The most relevant result was that in spite of the low genetic and geographical distances, trait differences between sampling sites may be explained by multilocus genotype frequencies of some putatively adaptive molecular markers.



Dr Philippe Rozenberg

Host Scientist

Philippe Rozenberg is a Research Director at INRAE Val de Loire, Orléans. He holds a Master's degree in ecology from the Paris VI University, a PhD degree on Forest Sciences from AgroParisTech (Paris) and an Habilitation degree from the University of Orléans. He is a research director at INRAE Val de Loire, Orléans, the leader of the "genetic and Physiology of Adaptation" team of the research unit BIOFORA and a member of the INRAE national scientific council. He develops a research program on "adaptation of forest trees to climate" in natural as well as in artificial forest tree populations. In this context, he investigates the evolutionary adaptation and the phenotypic plasticity of forest trees using tree-ring analysis and wood formation studies. He has coordinated more than ten national and international research projects, directed eight PhD theses and published more than sixty research articles in international scientific journals.



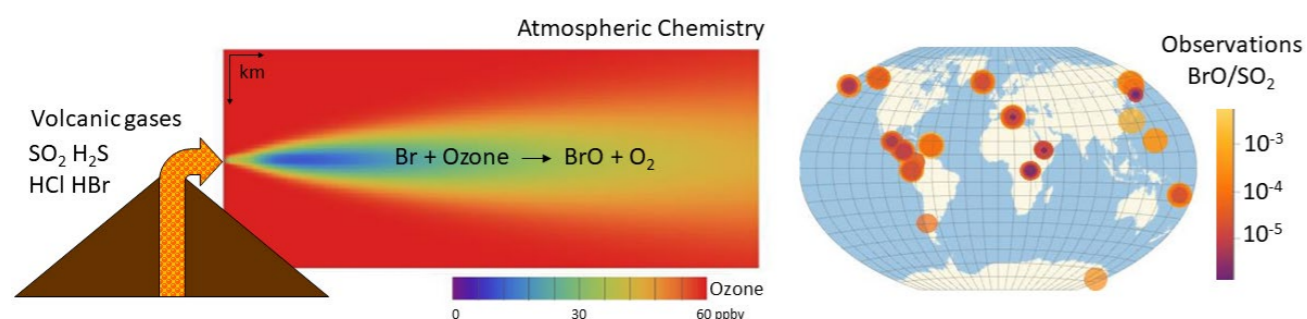
Dr Tjarda Roberts

LE STUDIUM Consortium Coordinator

Dr Tjarda Roberts is a CNRS Researcher at LPC2E. Her group investigates the chemistry of volcanic plumes from the hot crater emissions to the cooled chemically reactive plume through the development of numerical modelling tools that simulate the plume atmospheric chemistry processes, and by in-situ sensor measurements at the volcano crater-rim. A second research strand develops low-cost sensor methods to characterise sources of urban pollution in the wintertime Arctic. She developed one of the first numerical models that explains the formation of BrO in volcanic plumes via the "bromine explosion" and the application of low-cost small sensors for observations of gas and particle pollution in volcanic and Arctic settings. Tjarda Roberts was awarded the CNRS Bronze Medal in 2020, was profiled in a Bande Dessinée commissioned by CNRS dr08 "Les Sciences'Elles" in 2021 and was invited to teach Géosciences at the Paris Ecole Normale Supérieure in 2022.

H'ALLO VOLCANO ! : AN INTERDISCIPLINARY STUDY ON THE ATMOSPHERIC PLUME PROCESSING AND IMPACTS OF VOLCANIC HALOGEN EMISSIONS

"H'allo Volcano !" is an interdisciplinary study on the atmospheric plume processing and impacts of Volcanic Halogen Emissions. It seeks to deliver an overview synthesis on halogen processing in volcanic plumes. As well as sulfur and ash, volcanoes emit halogens (HF, HCl, HBr, HI). These can be converted into reactive forms such as BrO, OClO in the downwind plume through chemical reaction cycles which cause the destruction of ozone. However, the plume halogen processes are complex, involve multi-phase chemical reactions on particles, and occur over multiple scales, going from meters-scale at the hot (1000 °C) crater to up to 1000's km scale in the cooled plume that disperses into the troposphere or stratosphere. The halogen emissions from volcanoes also vary over time as a function of the magmatic processes. A better understanding of the physico-chemical processes that occur in volcanic plumes will enable the consortium to improve understanding of the chemistry-climate impacts of volcanic eruptions that emit halogens alongside sulfur and ash. It may also enable to unlock the potential for using observations of halogens in volcanic plumes to inform about changes in the volcanic emission source and magma conditions as part of monitoring of eruptive activity. H'allo Volcano brings together specialists on the hot and cold plume atmospheric processes that link halogens, ash and sulfur. The consortium includes experts in field-observations, laboratory experiments and numerical modelling. Specific goals include: to identify the controls on the atmospheric processes leading to the formation of BrO in volcanic plumes and how these processes can control the injection and chemical impacts of volcanic halogens interacting with sulfur/ash in the troposphere and stratosphere. The kick-off meeting in May 2022 provided the opportunity to brain-storm the group's research theme all together, and explored the volcanic plume processes from emission to regional-scale with a particular focus on hot-to-cold near-source processes, understanding the interactions of ash with gases, and on challenges and opportunities brought by new TROPOMI satellite observations of BrO/SO₂. This meeting also initialised activities including the cross-group co-supervision of a PhD student, cross-group employment of a recent PhD as postdoc. Several group members also participated to a field-work activity on Mt Etna in July 2022, and/or joined together to present work and learn new field techniques at the IAVCEI Volcanic Gas Workshop in Peru in November 2022. The next meetings in 2023-24 will aim to consolidate our the group's knowledge on the plume processes that can be linked to halogen observations in dispersed plumes, through focusing on some eruption case studies. The consortium will identify any remaining knowledge gaps that could be addressed by future research via joint-proposals. They will discuss their workshop activity findings with researchers across the Orléans campus (LPC2E, ICARE, ISTO: atmospheric, combustion and magma processes), and plan ways to engage with the wider international community on volcanic halogens and plume processes the via planning of either an in-person workshop or online activity.



PARTNERS



Dr Nicole BOBROWSKI

is specialist in field measurements at volcanoes including the remote sensing of plume BrO and SO₂.

INVG - Italy & Heidelberg University - Germany



Jonas KUHN

is specialist in field measurements at volcanoes including the remote sensing of plume BrO and SO₂.

Heidelberg University - Germany



Dr Elena MATERS

is specialist in the volcanic ash component of the plume and numerical modelling of the chemistry-climate impacts of large explosive eruptions.

University of Cambridge - United Kingdom



Alexander NIES

develops model tools to simulate the atmospheric processes that form BrO and destroy ozone in volcanic plumes, and make in-situ measurements of volcanic gas-particle emissions (hydrogen). He is a fellow of the Combustion Institute and co-editor of Combustion and Flame, Elsevier.

LPC2E, CNRS / University of Orléans - France



Prof. Thomas WAGNER

brings expertise in satellite remote sensing of volcanic plume BrO and SO₂ on regional to global scales.

MPIC Mainz - Germany



May 2022 meeting in Orleans

SCIENTIFIC COMMUNICATION

Dr Rock Ouimet

- Ouimet, R., et al. Carbon and nitrogen status of forest soils sensitive to additional biomass harvesting at LE STUDIUM Thursday Seminar, 8th September 2022, Centre INRAE Val de Loire, Nogent-sur-Vernisson, France.
- Korboulewsky, N., et al. Bois-énergie : comment y voir plus clair pour une récolte durable at Cycle de conférences INRAE, 18th December 2022, Ardon, France

Prof. Akkihebbal Ravishankara

- Michelat, L.; Mellouki, A.; Ravishankara, A. R.; El Othmani, H.; Papadimitriou, V. C.; Daële, V.; McGillen, M. R. Temperature-Dependent Structure-Activity Relationship of OH + Haloalkene Rate Coefficients under Atmospheric Conditions and Supporting Measurements, ACS Earth Space Chem., 2022, 6, 12, 3101-3114

Dr Anne-Sophie Sergent

- Sergent AS, Dalla-Salda G, Bellon S, Diez JP, Fernández ME, Martin-StPaul N, Porté A, Rathgeber C, Rozenberg P, Martinez-Meier A, Integrar disciplinas para el estudio de la respuesta adaptativa de los bosques al cambio climático, oral presentation, VIII Congreso Forestal Latinoamericano, Mendoza, 27-30/03/2023

Prof. Neil Sturchio

- Hube, D., Ollivier, P., Sturchio, N.C. Environmental Time-Bomb: Tracing the Explosive Legacy of World War I in Northern France. Targeted journal: Nature (in progress)

Dr Jean-Paul Vernier

- Hube, D., Ollivier, P., Sturchio, N.C. Environmental Time-Bomb: Tracing the Explosive Legacy of World War I in Northern France. Targeted journal: Nature (in progress)

Prof. Juan César Vilardi

- Vilardi, J.C. Strategies to identify adaptive trait variation in forest tree populations at LE STUDIUM Thursday seminar, Orléans, France, 5th May 2022
- Vilardi, J.C. Eco-Genetic Studies in Woody Species of the Genera Prosopis and Acacia in the Ecoregions of Chaco and Monte. at « Internationalisation des recherches sur la forêt en région Centre-Val de Loire » LE STUDIUM Workshop, Orléans, France, 9th June 2022

Dr Tjarda Roberts

- Nies A., Roberts T. J., Kuhn J., High-temperature kinetics of halogen radicals in early-stage volcanic plumes, Poster, Labex Voltaire II Meeting, University of Orléans, France, 29th June 2022
- Schunke J., Roberts T., Krysztofiak G., Nies A., SO₂-to-Sulfate chemistry in the Holuhraun eruption plume, MIST: Modeling Imaging Sensing and Tracing of emissions and volcanic plumes National Workshop, Clermont-Ferrand, France, 19th-21st October 2022.
- Roberts T.J., Tracing the plume chemistry and impacts of volcanic halogens in the Troposphere, MIST: Modeling Imaging Sensing and Tracing of emissions and volcanic plumes National Workshop, Clermont-Ferrand, France, 19th-21st October 2022.
- Nies A., Roberts T. J., Kuhn J., High-temperature kinetics of halogen radicals in early-stage volcanic plumes, MIST: Modeling Imaging Sensing and Tracing of emissions and volcanic plumes National Workshop, Clermont-Ferrand, France, 19th-21st October 2022.
- Nies A., Kuhn J., Roberts T. J., High-temperature kinetics of halogen radicals in early-stage volcanic plumes, IAVCEI Volcanic Gas Workshop, Arequipa, Peru, November 5th-14th, 2022.



COMPUTER SCIENCE, MATHEMATICS & MATHEMATICAL PHYSICS

HOST LABORATORIES IN COMPUTER SCIENCE,
MATHEMATICS & MATHEMATICAL PHYSICS

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Prof. Sergey Solodhukin

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HOST LABORATORIES IN COMPUTER SCIENCES, MATHEMATICALS & MATHEMATICAL PHYSICS

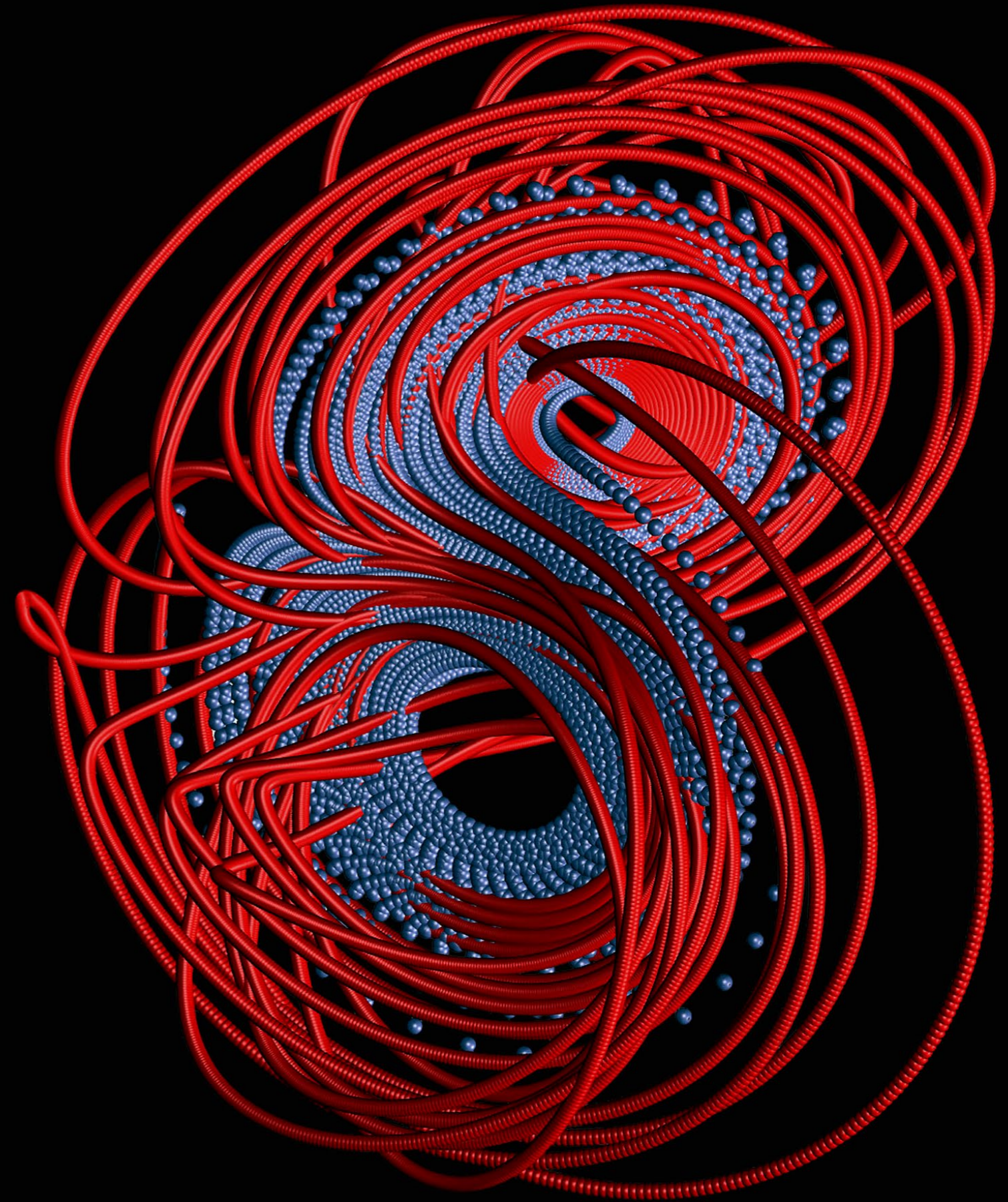
INSTITUT DENIS POISSON (IDP)
**UMR 7013 - CNRS, UNIVERSITÉ D'ORLÉANS,
UNIVERSITÉ DE TOURS**



The Institut Denis Poisson (IDP) was created in 2018, bringing two laboratories together: the Laboratory of Theoretical Physics and Mathematics (LMPTP), located in Tours, and the Laboratory of Mathematics (MAPMO) located in Orleans.

The IDP is a multidisciplinary laboratory with mathematicians and theoretical physicists working in a large variety of fields. It is well known for its high standard works in gravitational physics, quantum field theory, Riemannien geometry and dynamical systems.

The IDP in Tours consists of 42 professors and lecturers and 7 CNRS researchers (4 Chargés de Recherche and 3 Directeurs de Recherche). The administrative and technical support is provided by 3 secretaries, 1 librarian and 2 technicians. It is responsible for teaching within the Master programs «Fundamental physics and applications» (M1), «Non-linear models in Physics» (M2).





Prof. Sergey Solodukhin

Sergey Solodukhin is a professor of physics (classe exceptionnelle since 2018) at the University of Tours. He is a world class expert in the field of theoretical high energy physics and gravitation. He is an author of about 90 papers with more than 6000 citations. Among many other things he has established, in a 2008 paper, a fundamental relation between the conformal anomaly and the entanglement entropy, known in the literature as Solodukhin's formula.

EXPLORATION OF DUALITY, GEOMETRY, AND ENTANGLEMENT (EDGE)

The aim of this consortium is to bring a European group of experts together to discuss and work on the recent developments in the rapidly growing field lying in the intersection of geometry, quantum field theory and duality, to help grow a research effort in this fast moving area. Our goal is to coordinate the international efforts and generate new ideas. We intend this small initial collaboration to grow into something larger in the near future.

As of the end of 2021, the Consortium has organized two meetings. The first meeting took place online between 2nd-5th June 2020. The meeting was very successful, all members and collaborators of the consortium gave presentations. Some extra participants (outside of the consortium) also attended the on-line meeting.

The second meeting took place between 13th-17th December 2021. It was originally planned as an in-person meeting. However, due to the situation in Europe caused by the pandemic, it eventually took place as a hybrid event. Some members of the Consortium were able to come to Tours and participate in-person, while the others actively participated via Zoom. Several French scientists from ENS, Paris were also invited to participate and attended in-person. The meeting was generally successful and resulted in fruitful scientific exchange between the participants. Even in this hybrid form the second meeting was a very positive scientific event, one of very few partially in-person meetings organized in France in 2021.

PARTNERS



Prof. Jan De Boer

brings his expertise in many geometrical aspects of the holographic duality between string theory and gravitational physics.

University of Amsterdam - Netherlands



Prof. Manuela Kulaxizi

brings her expertise in the conformal field theory (CFT) and in establishing the relations between the CFT and black holes.

Trinity College - Iceland



Prof. Gary Gibbons

brings to the consortium his unique expertise, at the intersection of in gravitational physics, physics of black holes, string theory and mathematical physics.

DAMTP, Cambridge - United Kingdom



Prof. Christopher Herzog

expertise in string theory, holographic duality and condensed matter plays a key role in the consortium's efforts; he assists the general coordination of the consortium's activities.

King's College - United Kingdom



Prof. Erik Tonni

brings his experience in the applications of the methods of the conformal field theory to various statistical models, holographic computations of the entanglement entropy via the minimal surfaces in the anti-de Sitter space-time.

International School for Advanced Studies (SISSA) - Italia



HUMAN & SOCIAL SCIENCES

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HOST LABORATORIES IN HUMAN AND SOCIAL SCIENCES

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



The Centre d'Études Supérieures de la Renaissance (CESR) was founded in 1956 through the initiative of Gaston Berger. It is a training and research center, where fifty researchers and about fifty doctoral students are committed to the study of the Renaissance in Europe, from Petrarch to Descartes and, thanks to numerous collaborations, to the study of heritage, mainly in the Loire Valley. It has developed research on Digital Humanities (e.g. the Database RENUMAR: De minute en minute 2.0) and on the different aspects of Heritage (through the ARD "Intelligence des Patrimoines", with the Program "Gastronomy, Health and Well-Being"). In accordance with its dual scientific and educational vocation, it has obtained over the course of its history the dual status, unique in France, of training and research unit of the University of Tours and joint research unit under the triple supervision of the University of Tours, the National Center for Scientific Research and the Ministry of Culture. The CESR is organized on a multidisciplinary basis which allows it to be structured around seven research fields: «History», «History of Art», «History of Science», «French and ancient literature», «European literature», «Musicology» and «Philosophy».

Continuing the tradition of the "humanist studies internships", the CESR organizes an international colloquium on humanist studies at the beginning of every summer, as well as study days, thematic schools, conferences and workshops throughout the year. The CESR has a proven track record of continuous international collaborations, benefitting from specialist staff and specific equipment used for digitization projects.



FRANÇOIS-RABELAIS INTERDISCIPLINARY INSTITUTE FOR LEGAL STUDIES

EA 7496, UFR FACULTÉ DE DROIT, D'ÉCONOMIE ET DE SCIENCES SOCIALES - UNIVERSITY OF TOURS



IRJI organizes and promotes all research by researchers in the fields of private law and forensics, public law, legal history, institutions, economics, and political science. The laboratory has the necessary infrastructure for research, including a 200 m² library with wide opening hours and an extensive documentary collection.

International mobility and labour migration are fraught with practical difficulties for any practicing lawyer, even at the regional level. Private law researchers, especially in the field of family law and property law, wish to further develop their European and international cooperations. The laboratory accepts well-known scientists, this cooperation is necessary to improve the quality of ongoing scientific work and student education.



LABORATOIRE LIGÉRIEN DE LINGUISTIQUE (LLL) EA 4710 - UNIVERSITÉ D'ORLÉANS



Laboratoire
Ligérien de
Linguistique

The Laboratoire Ligérien de Linguistique (LLL) was formed by successively bringing together researchers and staff from four entities: the University of Orléans and the François-Rabelais University of Tours (since 2004), the French National Library (BnF) and the CNRS (since 2012). Today, the LLL is a joint research unit (UMR 7270) home to researchers from the CNRS and the universities of Orléans and Tours and to agents from the BnF. Located on three sites, it is attached to the Ministry of Higher Education and research and to the Ministry of Culture and Communication for the BnF unit. The LLL has focused its activity on the making up, the processing and the exploitation of oral corpora in all its dimensions. It covers a whole range of subjects – linguistics, phonology and phonetics, morphology, lexicology, syntax, semantics and pragmatics, discourse analysis, taking into account diachrony, didactic applications and natural language processing (NLP). It contributes to the description of a great variety of languages in a significant way with a strong interest in languages used in teaching (e.g. the ESLO corpus – an oral portrait of the town of Orléans). (See: <https://lll.cnrs.fr/en/laboratory/>)



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



POLEN's areas of research revolve around the issues of power and authority in their different forms (political power, religious authority, social practices, cultural, literary and artistic models, legal frameworks and judicial norms). It addresses their different modes of expression, representation and diffusion (texts, images and all forms of symbolic and artistic production). In contrast, these topics raise questions of contestation, subversion and marginality.

This general project is addressed in particular ways by the different component research groups, according to their particular focus and the research fields of their members.

Teams of POLEN :

- CESFiMA : Centre for Research into the Late Middle Ages : the construction of norms and models by centres of authority and learning ; the diffusion, contestation and reconstruction of knowledge, norms and models.
- CLARESS : From the Classical Age to the Restoration of the French Monarchy: private and public practices of writing and reading; writings of the inner self; authority and the written word; interaction of the public and the private in written practices.
- CEPOC : Centre for Contemporary Political Studies: types and norms of political discourse; social and cultural connections between literature and politics; memory and its written expression; non-discursive political writing (images, rituals, ceremonies).

POLEN is a member of the Human Sciences Loire Valley's Home.



RÉCEPTION ET MÉDIATION DES LITTÉRATURES ET DES CULTURES ÉTRANGÈRES ET COMPARÉES (RÉMÉLICE) EA 4709 - UNIVERSITÉ D'ORLÉANS



The RÉMÉLICE laboratory, founded in 2012, brings together lecturers/researchers and doctoral students working in the fields of arts, letters, languages, and humanities from an international perspective, with a particular interest in the study of language-culture and the notion of cultural transfer. Its members study the English-speaking world, Spain, Latin American countries, Japan, China as well as the French-speaking world, often through a comparative focus. The laboratory is a member of the Federation for the Study of Contemporary Civilizations, as well as of the ALMOREAL Network, which works on cultural exchanges and crossed perspectives between Hispanic and Hispano-American worlds.

The laboratory seeks to go beyond disciplinary, national, or linguistic partitions, to study the different forms of cultural transfer that exist (links between various forms of art or artistic expression from the visual to the written word, studies on translation and its evolution, intercultural approaches in education, in the world of work, etc., relations between media and politics or media and history). Its members are also interested in all related questions that concern the relationship with others, the very notions of «foreign» or «foreignness», cultural heritages, choices of culture / language / society, by considering their transfers / transformations in an international context.



Prof. Maya Boutaghou

LE STUDIUM Visiting Researcher

From: University of Virginia - USA

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

Nationality: French

Programme : SMART LOIRE VALLEY

Dates: September 2022 to June 2023

Maya Boutaghou is Associate Professor of French and Global Cultures at the University of Virginia and Andrew W. Mellon Faculty (Institute of the Humanities and Global Cultures). Her main research areas in Comparative Literature include: Multilingualism, Postcolonial Literatures, Literary Theory, Theory of the Subject, Historiography and Cultural Theory. She is the author of *Occidentalismes, Romans historiques postcoloniaux et identités nationales au XIXe siècle* (2016), *Honorable Mention - ICLA Ana Balakian Prize 2019*, and *Ernest Renan, Qu'est-ce qu'une nation? Genèse et postérité, de l'Empire à la nation* (2020). She guest-edited: "The Algerian War of Independence and its Legacy in Algeria, France and Beyond," *L'Esprit créateur* (2014), edited *Représentations de la guerre d'indépendance algérienne* (2019), and co-edited issues of *SITES: "Mapping Francophone Postcolonial Theories"* (2018), of *Cultural Dynamics: "The Minor in Question"* (2020), and of *Les Lettres Romanes: "Littératures francophones et pouvoir herméneutique"* (2021). Her articles are published in several international journals and edited collections. She is also the author of a novel, *Voyage d'Alger* (Alger: Aframed, 2019). With Anne Donadey, she is currently preparing the *Dictionnaire Assia Djebar* (to be published by Honoré Champion); and guest-editing a special issue for *Expressions Maghébines* on New Historiographies of Algeria.



Prof. Aude Déruelle

Host Scientist

Aude Déruelle is a former student of the ENS-Ulm (1993) and "agrégée de lettres modernes". She is currently Professeur of Contemporary Literature at University of Orléans and the Director of the laboratory POLEN. Her domain of expertise includes: History and Literature, Historiography, Fiction in 19th and 20th century French literature. She has published extensively on the relation between History and Literature and is recognized as an eminent scholar in the field. Her most recent publications are: *Balzac lecteur, Année balzacienne*, 2021 (codirection avec Philippe Dufour), 2021. *Jardins et littérature, Travaux de littérature n°XXXIV*, Droz, 2021. *Michelet, Histoire de la Révolution française* (P. Petitier dir.), Gallimard, « Bibliothèque de la Pléiade », édition du tome IV en collaboration avec Jean-Claude Caron, 2019.

INTERDISCIPLINARY FORMS OF HISTORICAL WRITING IN COLONIAL AND POSTCOLONIAL CONTEXT: "COLONIAL AND POSTCOLONIAL URBAN HISTORIOGRAPHIES"

This current project addresses new ways of rewriting cultural history from a decolonial perspective without erasing previous narratives but trying to enlighten them and read them with decolonial lenses. "Colonial and Postcolonial Urban Historiographies" in combination with "alternative forms of historical writings", develops how urban colonial and postcolonial cities are archival material accessible to understand colonial and postcolonial urban sensorial fabric and violence. Literature and visual arts are core to this exploration of modern urban culture. The sensorial/emotional dimension of this complex urban fabric is missing. It can be restored by an interdisciplinary approach inviting literary scholars. The ultimate goal of this project is to develop a website with digitalized archives and establish links to other institutions with access to public archives; this website should also host podcasts related to public intellectual history from the francophone diasporic voices. The digital project is core to the follow up of the "Interdisciplinary forms of historical writings"; it will make visible the connections, between sensorial experiences in colonial contexts, contemporary voices and academic discourse.

This is a long-term project of 2-3 years. The collection of data started at the end of 2022 and involved a few visits in North Africa and of French archives in France. Private documents are also a source of investigation.



Collection Bibliothèque Nationale de France, Algiers, Construction du Boulevard de l'Impératrice 1863



Dr Alberto Campagnolo

LE STUDIUM Research Fellow

From: University of Udine - IT

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

Nationality: Italian

Programme : SMART LOIRE VALLEY

Dates: May 2022 to April 2023

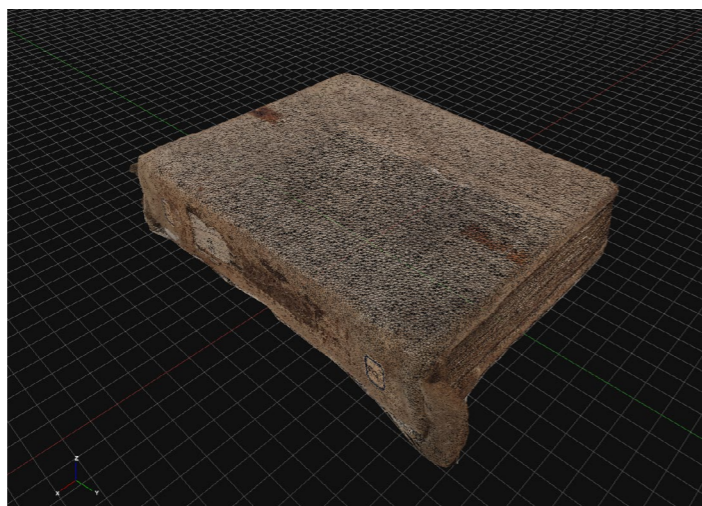
Alberto Campagnolo trained as a book conservator in the competitive European Course for Conservators-Restorers of Book Materials (1998-2001), and after a BA in Conservation of Cultural Heritage (Ca' Foscari University: 2001-2006), he received full scholarships from the UK's AHRC for an MA in Digital Culture and Technology (King's College London: 2007-2009) and for a PhD (University of the Arts, London: 2010-2015). From 2016 to 2018, he was a Mellon-funded CLIR Postdoctoral Fellow in Data Curation for Medieval Studies at the Library of Congress (Washington, DC). In 2017-2018 he was co-PI of the CLIR/Mellon-funded project 'Labeculae Vivae'. In 2019, he was a Research Fellow at the Schoenberg Institute of Manuscript Studies (University of Pennsylvania), of which he is now a member of the Advisory Council. He was then a Visiting Scholar at VeDPH (Ca' Foscari University: 2019-2020). Since 2018, He has been the Editor-in-Chief of the Journal of Paper Conservation.

FROM FEATURES TO DATA POINTS AND PIXELS: INVESTIGATIONS INTO THE TRANSMEDIATION OF THE ARTEFACTUAL NATURE OF BOOKS INTO THE DIGITAL

Books are three-dimensional objects that need more than visual statements to be investigated, e.g., touch to feel bumps and scratches. The study of the book as an object relies on autoptic investigations into material features. To a certain degree, some information on the materiality of books can be inferred from catalogues, but, for the most part, one needs to investigate the objects directly, objects that may be dispersed across various institutions and countries as traditional digitization can transmediate only limited information regarding an object's materiality. Aside from metadata assignation, advanced imaging techniques, such as RTI and photogrammetry, can acquire and bring into the digital material features linked to the topography (raised and indented features, such as the marks left by tooling for decoration or during production, e.g. board preparation, parchment scraping, page ruling) and stratigraphy (composite layers of materials, e.g. illumination pigment application, sewing supports laced into the board and covered by the pastedown) of the surfaces of books. Photogrammetry also reconstructs the three-dimensional development of the object in a three-dimensional virtual space. Advanced imaging techniques have been applied to books, mostly to help recover textual elements, study illumination characteristics and bookbinding tooling, with some experimental applications to sewing threads. This project has two main aims and objectives:

- apply advanced experimental imaging (RTI and photogrammetry) to reveal and convey digitally material aspects of the book (both manuscript and printed books);
- consider in general the modalities in which books as objects can be transmediated into the digital to aid autoptic investigations and distant reading of the objects.

Advanced imaging techniques have been applied to books (mostly experimentally) with specialized (and often expensive) equipment. However, it would be of great help if more data could be gathered utilizing common and everyday technologies, like a mobile phone camera and open access or affordable processing tools, still warranting scientifically sound data that can inform reliably about the history of the object. Such techniques could be applicable by conservators in their daily work and by scholars before more advanced techniques can be used, should this become necessary and advisable. Our primary investigations have then so far focused on establishing a methodology that can be reproducible with simple tools and free or affordable software and equipment to capture material aspects of books through imaging techniques such as RTI and photogrammetry.



Codex



Prof. Elena Pierazzo
Host Scientist

Elena Pierazzo is a professor at the University of Tours and director of the Centre d'études supérieur de la Renaissance. She is responsible for the Masters in Intelligence of Culture and Heritage Data and in Digital Mediation of Culture and Heritages. Elena Pierazzo graduated in 1996 from Ca' Foscari University Venice, Italy and completed her PhD at the Scuola Normale Superiore di Pisa in Italian Philology in 2001. She worked for the University of Pisa (2000 - 2006), and in 2002, she was awarded a research fellowship at Villa I Tatti (Florence), the Harvard University Center for Italian Renaissance Studies. She was lecturer in Digital Humanities at the Department of Digital Humanities, King's College London (2006 - 2014), where she was the chair of the Teaching Committee and director of the MA in Digital Humanities. She was then professor at the University of Grenoble 3 'Stendhal' (2014 - 2019). She was a member of the Text Encoding Initiative (TEI) Council (2007 - 2011) and Chair of the TEI Board of Directors (2012 - 2014).



Dr Francesca Fantappiè

LE STUDIUM Guest Research Fellow /
MSCA Individual Fellowship

From: The Harvard University Center for Italian Renaissance Studies - IT

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

Nationality: Italian

Programme : SMART LOIRE VALLEY

Dates: October 2021 to September 2023

Francesca Fantappiè is an historian of Theatre and Performing Arts. She obtained the Italian National Habilitation as associate professor (Theatre, Music, Cinema, Television, Audiovisual Media) in 2018. Her publications relate to all aspects of spectacle: text, music, dramaturgy, stagecraft and scenography, theatre architecture, performers, social, political and economic contexts (from Renaissance to Ancient Regime). She holds discoveries (including the unpublished first version of *Dafne* by Rinuccini, which may be the first libretto ever written), and valuable publications (including *Staging "Euridice"* (1600), Cambridge University press, 2021). She curated the exhibition *Florence and the Birth of Opera: Documents and virtual reconstructions* (2019). Her book *Per teatri non è Bergamo sito* (2010) offers an original picture of a city's society and mentality through the architectural construction of its theatres. In 2019, she co-organised the conference *Florence Circa 1600: Patrician Families and the Financing of Culture*.

FINANCING FESTIVALS, MUSIC AND THEATRE: REAL EXPENSES AND FICTIONAL EXPENDITURES IN FRANCE BETWEEN THE SIXTEENTH AND SEVENTEENTH CENTURIES

The research is a EU-funded SPECTACLE ECONOMICS project (H2020-MSCA-IF-2020 - Marie Skłodowska-Curie Individual Fellowships 2021-2023) which investigates the financing and economic realities of civic and court festival productions in early modern France. This interdisciplinary survey aims to shed light on an often-disregarded aspect of the history of the theatre and music, since there is still no specific, systematic research that has dealt with quantifying the expenditure on such ephemeral cultural activities that could themselves be the subject of both blame (as a wasteful use of time and money) and praise (propaganda in favor of the sovereign, the state, and civic communities). The conventional view of festivities as a case of lavish conspicuous consumption is often supported by one set of sources reporting on it, such as printed descriptions, diary entries, letters, and so forth. But the information contained within these documents is usually determined by their function (official propaganda) or its sources (hearsay and gossip). Financial accounts, however, often present a different picture wherein expenses are carefully controlled and subject to prudent budget management. The results of this pioneering research will make a further step towards a comprehensive study of the economics of spectacle at a transnational and European level.

Since during the last two years (due to the current Covid-19 situation) the cultural sectors of performing arts (music and theatre) have been often disregarded by the politics, among the goals of the project there is also the dissemination of the scientific results at a general level - both with online digital communication to broadcast the results in an accessible and informative way on the web, and through social media - in order to contribute to the debate on the need to finance the performing arts in contemporary society.



Prof. Philippe Canguilhem
Host Scientist

Philippe Canguilhem is Professor of Musicology at the University of Tours since September 2019 and a senior member of the Institut Universitaire de France - previously he was Professor of Musicology at the University of Toulouse. He was a fellow at Villa I Tatti (2005-6) and at the Italian Academy of Columbia University (2013). He directed the *Fabbrica* project, on improvised counterpoint in the Renaissance. He is active as a concert performer of Renaissance and Baroque music. His research focuses on the history of Renaissance music, and on the theory and practice of ancient music (vocal and instrumental, polyphonic and monodic), with particular attention to the performative context and the social status of musicians and singers. He has edited three volumes and he is author of numerous articles and chapters of collective books, 1 double CD, and audio resources on the Web. He is member of three editorial boards of internationally accredited music magazines (*Recercare*, *Epitome musical*, *Revue de musicologie*). He is active as a concert performer of baroque oboe and Renaissance reed instruments in four Renaissance and Baroque musical ensembles.



Dr Francesca Fantappiè presenting at LE STUDIUM Thursday seminar on «Les extravagances nécessaires»: Exploring the funding of spectacle in Early Modern Europe



Dr Cynthia Gabbay

LE STUDIUM Research Fellow

From: University of Humboldt, Centre Marc Bloch - DE

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

Nationality: French

Programme : SMART LOIRE VALLEY

Dates: November 2021 to November 2022

Cynthia Gabbay is a Studium 2021 Fellow Researcher at the University of Orléans and an Associate Researcher at Centre/Zentrum Marc Bloch Berlin (HU). She is also a member of the international research group "The Impact of the Spanish Civil War in the Intellectual Life of Spanish America" at Universidad Complutense de Madrid. She has a PhD in Latin American and Romance Studies from The Hebrew University of Jerusalem (2012), and has completed several postdoctoral research stays in Jewish Studies both in Israel and Germany, where she was awarded an Alexander von Humboldt fellowship. She coordinates the online series "Simania: Salon Readings" (LAJSA), where she also serves in the Board of Directors. Moreover, she is a coeditor of the scientific journal *Lingua Franca* (SHARP). Based on her PhD (2012), which was awarded the Kirtchuk Prize in Latin American Studies, her first book was published as *Los ríos metafísicos de Julio Cortázar: de la lírica al diálogo* (Hispanica/Eduvim, 2015). Her edited volume, *Jewish Imaginaries of the Spanish Civil War: In Search of Poetic Justice* is in press (Bloomsbury, New York, 2022). Cynthia Gabbay's fields of interest are semiotics, translation studies, Jewish languages, popular culture, and poetry.

TRANSLATION AFTER THE SHOAH: TOWARDS AN EPISTEMIC RECOVERY OF THE JEWISH POETIC ARCHIVE

This project, inaugurated on November 16th, 2021, is framed in the interdisciplinary field of Translation Studies. It aims to pursue a comparative examination of four Roman translations of the lament *Dos lid funem oisgehargetn yidishn folk*, written in the antechamber of Auschwitz by the Polish poet Yitsjok Katzenelson (1886-1944), one of the most important bilingual Yiddish-Hebrew poets and dramaturges of his time.

The study proposes to focus on the poetic forms and language of these translations, and to offer a sociocultural perspective devoted to analyzing their role in the unearthing, symbolic as well as physical, of the Jewish voice and its reincorporation into the contemporary polyglot Jewish archive. The research explores the intercultural and inter-historical relations that these translations produce, especially in the case of the Judeo-Spanish translation and the role it plays – paradoxically – when translating from one endangered Jewish language (Yiddish) into another one (Judeo-Spanish). These translations are considered as actions working towards an epistemic recovery of the Jewish poetic archive inhumed during the Shoah.

The main goal of the study is to produce new knowledge on the practice of Jewish translation, its material culture and cultural transmission.

The initial hypothesis stipulated here is that the 21st century (starting from the formal end of the Cold War, 1989) gave place to a large phenomenon of epistemic recovery, through which an important memory making is being held. In this framework, Jewish memory and cultural productions are being recovered and reestablished. In the heart of this phenomenon, translation plays a significant role, and the translation of Jewish literature, especially into (and between) endangered languages, might become a discipline in itself. This study aims at understanding the phenomenon, and at placing it in the global, as well as the more specific, Romance languages contexts.

Research questions:

What are the poetics of each of the French, Spanish and Judeo-Spanish translations of *Dos lid*? Which are the political and ethical implications of unearthing Katzenelson's texts through translation, and thus of symbolically repeating – distinctly in each language – the exhumation of the poems from the concentration camp? In which ways do they produce a difference responsible for denouncing the genocide as well as ensuring, at the same time, the permanence of the Jewish voice? What are the multidirectional memories evoked and produced through these translations?



LE STUDIUM Conference: Jewishness between Latin America and Europe: Languages in Contact, Linguistic Imaginaries and Translation in May 2022 at the Hôtel Dupanloup



Dr Brigitte Natanson

Host Scientist

Brigitte Natanson holds a doctorate in Ibero-American Studies (University of Rouen Haute-Normandie) with a doctoral thesis on immigration to Mexico, where she lived for 3 years. She holds an authorization to supervise research (Habilitation à diriger les recherches or HDR) on the literature of immigration in Latin America. She is currently Emeritus Professor within the Letters, Languages and Human Sciences department of the University of Orléans, member of the EA 4709 research unit. She has translated works by Alfonso Reyes and José Martí, as well as published in international and national journals on immigration literature, Latin American theater, translation and women in Latin America in the 19th century. She has also edited several collective works, the last of which is: *Imaginarios, naciones y escritura de mujeres del siglo XIX en América Latina*, Alicante, Universidad de Alicante, 2021. She co-directs the project "Héritages et ruptures de l'Europe dans la construction de la judéité latino-américaine" (funded by CIERA) with the University of Lorraine, including a conference to be held in Orléans (Rémélice and Studium) in May 2022.



Prof. Alina Goncharova

LE STUDIUM Guest Research Fellow

From: Sumy State University - UA

In residence at: Institute of Interdisciplinary Law Research (IRJI) - Tours

Nationality: Ukrainian

Programme : SMART LOIRE VALLEY

Dates: March 2022 to December 2023

Professor Alina Goncharova is an Associate Professor of Sumy State University (Educational and Scientific Institute of Law), Ukraine. Her main areas of research in civil law include the order of inheritance in the occupied territories, the process of registration of inheritance by children born thanks to reproductive technologies after the death of their parents, and the inheritance of intellectual rights.

She was born in Ukraine and in 2012 she defended her thesis and received a Ph.D. degree at the Taras Shevchenko National University of Kyiv, majoring in «Civil Law and Civil Procedure; family law; international private law». For more than 15 years, she has been thoroughly engaged in the research of inheritance problems, has more than 80 publications on this topic in international rating and domestic publications, has author's certificates. She received an Award of the National University Odesa Law Academy «The best scientist of Ukraine in civil law» in 2016.



Prof. Fabienne Labelle

Host Scientist

Fabienne LABELLE received a Ph. D. Degree in private law from the University of Rennes (2003) and has been a lecturer authorized to conduct research in private law at the University of Tours since 2015. She currently teaches civil law and company law at the Faculty of Law in Tours and carries out part of her research in family property law, notarial law, and wine law. She's also co-director of the Master's degree in property law. Her research activities at the University of Tours are dense: participation in 3 research programs, co-directing a PHC POLONIUM devoted to «European perspectives on adoption», scientific director of 10 symposiums, several participations in national and international symposiums (20), and more than 40 publications... She supervised a thesis defended in January 2023 and accompanied many student works in memory (+70). She is currently working to bring together a consortium of researchers to carry out new research work in both notarial law and wine law.

INHERITANCE PROBLEMS IN THE OCCUPIED TERRITORIES

The goal of this research project is to form an understanding of the exercise of the right to inheritance, development of new recommendations aimed at resolving the identified problems, and further improvement of the legislative regulation of relations that arise during the exercise of inheritance rights. There are about 70 territories in the world with similar status and protection problem ownership and other property rights in these territories periodically arise from varying degrees of severity and become the subject of consideration by various instances, first of all of the European Court of Human Rights. It should be noted that difficulties arise for the heir when registering inheritance rights due to insufficient awareness of their rights and the procedure for protecting inheritance rights. It is recommended that changes should be made to the legislation on the protection of property rights and acceptance of inheritance from the testator, whose last place of residence or immovable property is in the occupied territories.

The war fundamentally changed the normal way of life of Ukrainians and the functioning of the legal system. The standard term for receiving an inheritance six months was supplemented by four months (but no more than four months). Prof. Goncharova and her team consider this period to be too short. Consideration of inheritance cases is subject to civil jurisdiction and can be carried out in two forms: legal proceedings and separate proceedings. The opening of proceedings is carried out on the basis of the filing of a claim and a statement, respectively. The mechanism for consideration of inheritance cases in the temporarily occupied territory of Ukraine, although not completely perfect, allows for ensuring the realization of such a right in this territory. Analyzing court practice in the Unified State Register of Court Decisions, most of such cases relate to establishing the fact of death in the temporarily occupied territory, obtaining a death certificate, and determining the place of opening of inheritance. The team propose to introduce a rule regarding the suspension of the term of inheritance for the period of occupation. Such a proposal was sent by Prof. Goncharova to the «Fursa Legal Center» (Kyiv) to provide recommendations on changes to the legislation of Ukraine.



Prof. Alina Goncharova presenting at LE STUDIUM Thursday seminar on «Inheritance in the occupied territories and in the area of antiterrorism operations: the experience of Ukraine» in December 2022, University of Tours



Prof. Salvatore Magazù

LE STUDIUM Research Professor

From: University of Messina - IT

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

Nationality: Italian

Programme : SMART LOIRE VALLEY

Dates: July 2020 to October 2020
June 2021 to September 2021
June 2022 to September 2022

Salvatore Magazù is full professor of Experimental Physics and Dean of Physics at Messina University, President of the Interuniversity Consortium of Applied Physical Sciences, Director of Centro Universitario di Ricerca per lo Studio degli Ambienti Estremi e degli Estremofili, member of the L'Oréal-UNESCO For Women in Science Jury. In 2016-2017 he was a LE STUDIUM research fellow at CBM and ICMN (CNRS). From 2013 to 2015 he was chair of the LE STUDIUM Consortium COSMO. Between 2010 and 2012 he was Chair of the Scientific Board of the European Synchrotron Radiation Facility. Before that, from 2009 to 2010, he was a LE STUDIUM researcher at CEMHTI-CNRS, and from 2008 to 2010 he was a member of the scientific College of the Institut Max Von Laue - Paul Langevin. He is spin-off founder, president of the Scientific Council and Administration Council member of the Start-up ATHENA Green Solutions. His research activity has produced more than 380 Scopus scientific publications, an H-index of 51, and many awards, among which the Scientia Europea 2000 Award by the French Academy of Sciences.



Prof. Pascal Briost

Host Scientist

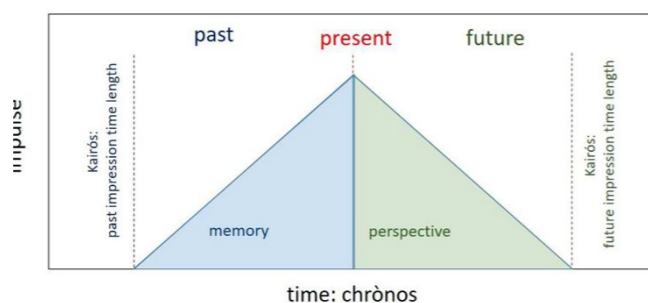
Pascal Briost is a University Professor in History and has been a member of the Center for Higher Renaissance Studies (CESR) since 1994. He is a specialist in cultural history and history of England (PhD from the European University Institute in Florence in 1992). His work is currently mainly in the field of the history of science and technology. He has been a member of the steering committee of the French Society for the History of Science and Technology since 1995. He has published several articles on the intellectual and scientific history of the Renaissance and created the scientific design of Leonardo da Vinci Park in Clos-Lucé in Amboise in 2002. He is currently in charge of feeding the Renaissance website for which the CNED and the CESR share responsibility.

INTERDISCIPLINARY ANALYSIS OF LEONARDO DA VINCI'S STUDIES ON DYNAMICS

The project investigates, through a synergistic approach integrating different disciplines and sources, of Leonardo da Vinci's scientific production with a specific focus on Dynamics. From a general viewpoint, it emerges that Leonardo did not pursue an approach based on disjunction, reduction and abstraction, i.e. on reality simplification, but used an approach nowadays perceived as essential for the investigation of complex systems.

The study reviewed the time and space perspectives developed by Leonardo, as they emerge from an analysis of the texts and drawings he left. At the outset, the attention focused on the concept of linearity, often employed by Leonardo as a simplified and quantitative approach to the study of reality. Leonardo regularly employed triangles and pyramids in his studies to demonstrate the direct proportionality between various quantities and physical parameters, simply putting the triangle's heights and bases into correlation. In Manuscript M 45r, Leonardo implicitly uses the concept of function and more specifically a linear relationship between a dependent variable, in the dealt case velocity, and an independent variable, i.e. time. This is more than just a text integration; it compensates for Leonardo's lack of a formal language for describing the concept of function and helps him to deal with quantitative relationships. We can consider that Eugene of Sicily translated Ptolemy's works on astronomy and optics into Arabic and subsequently into Latin, using for the Greek word «konos» the term «piramis» and it is because of this translation that Leonardo often used the term «pyramid» to describe a triangle. Leonardo routinely conducted several tests and checks by using the pyramidal approach. We have to emphasize that measuring procedures were challenging at his times due to the absence of universally accepted units for lengths and weights as well as due to the roughness of the tools available for measurements; as a result, Leonardo used to substitute proportionality evaluations to measure data. Leonardo believed that linear proportions were to be used in both time [e.g. in the Impetus hypothesis in Dynamics] and space [e.g. "aerial" and "perdimenti" perspectives] because he believed that linear relationships were inherent in Nature. Regarding the time perspective, in Codex Sul volo degli uccelli 12 r, he wrote Every movement tends to be sustained, that is, every moving body continues to move as long as the impression of the power of its motor is preserved in it. In other words, a body will move until the impression of the power of its movement is stored in the body, and this impression constitutes the memory of the movement itself. It emerges that a body with a constant impression or with a memory characterised by an infinite decay time will move eternally; on the other hand, a body with a limited memory, i.e. with a limited decay time for the memory, will move with a decreasing impression over the time. Leonardo's dynamics include both Aristotle's Dynamics (i.e. infinitely short memory), which corresponds to a synchronous proportionality between cause and effect, and Newton's dynamics (i.e. infinitely long memory), which correspond to a synchronous proportionality between the cause and the rate of change of the effect and can be incorporated into the modern linear response theory. The Leonardo's spatial perspective is characterised by the concept of "Prospettiva dei perdimenti": while the time perspective is dynamical and depends only on the present time, the spatial perspective is static and gives rise both to a loss of the object's details and color change with its distance from the observation point, i.e. to a spatial memory; though it has infinite points of observation.

In synthesis, Leonardo attributes to time a quality that can be associated to its role of universal degrading agent with a finite memory that decreases the original impression while the same perspective vision emerges for space where a finite memory gives rise to both a detail losing and a color change of an object with the distance.



Dr Alexander Robinson

LE STUDIUM Guest Research Fellow / MSCA Postdoctoral Fellowship

From: University of Cambridge - UK

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

Nationality: British

Programme : SMART LOIRE VALLEY

Dates: October 2022 to September 2024

Alexander Robinson is a Marie-Sklodowska-Curie postdoctoral fellow at the CESR (Université de Tours), where his project is devoted to music in Renaissance Avignon (c.1500-1630). As an independent scholar, he has taught at King's College London, Cambridge University, and Surrey University. His research focuses on early music, particularly that from early modern France, as well as the use of such repertoire in film and on TV. He has published articles (in English and French) in *Musica Disciplina*, *French History*, *Journal of the Royal Musical Association*, *Revue de musicologie*, and *The Musical Quarterly* (forthcoming). He is also a co-editor of two forthcoming volumes: one for Routledge, with James Cook, Alexander Kolassa and Adam Whittaker (*History as Fantasy in Music, Sound, Image and Media*), the other for Brepols, with Marc W. S. Jaffré and Bram van Leuven (*Marginalised Voices and Figures in French Festival Culture, 1500-1800*).



Prof. Philippe Vendrix

Host Scientist

Philippe Vendrix is the former Director of the Centre d'Études Supérieures de la Renaissance (2008-2015). He obtained his PhD in musicology in 1991, with the highest distinction from the examination jury at the University of Liège. He has been a member of the Council of the American Musicological Society, 2001-2004. He was elected in 2010 to the Alumni College of the Belgian Royal Academy. He has editorial management responsibilities in various collections including *Ricerca*. 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 was the president of the University of Tours from 2016 to 2020.

MUSIC, RELIGION AND CIVIC IDENTITY IN RENAISSANCE AVIGNON (C.1500-1630)

This EU-funded interdisciplinary project (AVIGNONMUSIC, Marie Skłodowska-Curie Individual Fellowships 2022-2024) will reveal how musical life in Renaissance Avignon (c.1500-1630) was directly interlinked with events happening on a broader religious, social and political level. Alongside being the first in-depth study of Avignon's musical life during this period, it represents a significant and much-needed departure from the Parisian/royal court focus that has typified almost all previous scholarship on French Renaissance music. Two fundamental issues will provide the basis for this investigation: a) the question as to whether Avignon's musical life can be said to reflect localised and/or nationalised trends; and b) the effect that Avignon's unique status as a Papal enclave had on its institutions and musical practices (for example, in the presence of Italian personnel or musical developments). These broader issues will serve as a backdrop for exploring the full spectrum of musicians' professional activities, as well as the various contexts within which they made the city resound – i.e. from its ecclesiastical establishments (such as Notre-Dame des Doms Cathedral and the Collégiale Saint-Agricol), to the instrumentalists attached to the city's guilds, to the various civic spectacles within which musicians participated (like ceremonial entries). The results of this innovative survey will thus constitute a major contribution to the fields of early modern soundscapes and cultural studies; by extension, they will also shed new light on Avignon's urban identity at this time, thereby leading to a better understanding of music making in France during the long sixteenth century.

- A 2-day conference at the CESR, Université de Tours (provisionally scheduled for February 2024) on the subject of musical culture and civic identity in Renaissance France. The papers presented at this conference will be supplemented by a concert reconstruction of the music heard in Maria de' Medici's Avignon entry of 1600. This will involve three internationally renowned French early music groups: Ensemble Clément Janequin (a vocal group specializing in Renaissance music); Les Sonardori (a Renaissance violin band); and Les Sacqueboutiers (an ensemble of cornetts, shawms and sackbuts).
- An essay collection developed from the aforementioned conference, co-edited with Philippe Vendrix (the project's host scientist), for Brepols as part of their "Épître Musical" series. The provisional title of this collection is *Vie musicale et identité urbaine dans la France de la Renaissance*.
- A Monograph, with the provisional title *Music, Religion and Civic Identity in Renaissance Avignon (c.1500-1630)*. This will constitute the main output from the fellow's research project, and it will also be the first book-length study to explore Avignon's musical life during this period.



Dr Esperanza Rodríguez-García

LE STUDIUM Guest Research Fellow

From: NOVA University of Lisbon - PT

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

Nationality: Spanish

Programme : SMART LOIRE VALLEY

Dates: September 2020 to August 2022

From May 2022, Esperanza Rodríguez-García holds a tenure-track position at the Universidad Complutense de Madrid, obtained through the competitive "Ramón y Cajal" programme, from the Spanish Ministry of Science. She was a MSCA Individual Fellow (Sep 2020-Apr 2022) at the CESR-Université de Tours (project rated 100/100), while on leave from her post at the CESEM-Universidade Nova de Lisboa (Portugal). She was also a Guest Fellow at Le Studium.

She previously worked for universities in the UK, where she obtained her PhD.

Her research interests concern music-within-culture in the Early Modern period in the Iberian Peninsula. She has specialised in methodologies such as the history of reading, source studies and critical editing, historiography, and prosopography. More recently she has developed an interest in Digital Musicology and works on database design and curation, computer-assisted analysis, music encoding, and valorisation of music as intangible heritage through the re-enactment of historical soundscapes.



Dr David Fiala

Host Scientist

David Fiala has been an Associate Professor in Musicology at the CESR-UT since 2009 and is a former editor (2007-2013) for the Revue de Musicologie). He has published widely on musical patronage and musicians' careers in the late medieval and early modern periods. His other specialisms are digital humanities and e-musicology. His interests include the Modelization of historical documentation; Digital Music Encoding (in MEI), investigating addressability of musical scores, digital libraries and analysis of imitation in musical works of the Renaissance and 3D/4D Modelization of musical spaces, specially by reconstructing historical buildings no longer extant. He is a member of the Scientific Board of the TGR Huma-Num. He has co-directed three PhDs and has an extensive experience in supervising and training postdoctoral researchers from Italy, Australia, Canada, France and The Netherlands.

EXPERIENCING HISTORICAL SOUNDSCAPES: THE ROYAL ENTRIES OF EMPEROR CHARLES V IN IBERIAN CITIES

This MSCA Individual Fellowship has a twofold focus, research and training, with different but complementary objectives. It has three goals concerning research. First, to identify, describe and assess the structural sonic and spatial elements of Royal entries in Iberian cities during the life of Emperor Charles V (d. 1558). A musicologically-informed overview of all the entries' accounts will enhance, through comparison, the extent of our understanding of the sources and their vocabulary (RO1). Second, to map and contextualise sonic events within their spatial coordinates, to provide them with whole historical and cultural meaning (RO2). Finally, to facilitate the experiencing of soundscapes through the creation of tools to retrieve and valorise them as intangible cultural heritage, in the shape of an immersive multimedia event (RO3).

There are four goals concerning training. First, to master advanced tools for data organisation and management, including Data mining and archiving (TO1). Second, to become proficient in managing and transforming historical data for use in digital formats by creating a relational database anchored to a GIS map contextualising and spatialising soundscapes (TO2). Third, to become competent in designing multisensory immersive events (through the modelisation of the soundscape of a Royal entry) (TO3). And finally, to master the theoretical framework and the techniques of digital mediation of culture, heritage and tourism applied to management and museography of intangible heritage (TO4).

This 24-month project was shortened by 8 months and had to be stopped on 30 April 2022. This was due to Esperanza Rodríguez-García taking a tenure-track position at the Universidad Complutense de Madrid. This situation created severe difficulties for the project. In the short period reviewed here (Jan-Apr 2022), the researcher focused on modifying the project and creating the infrastructures necessary to allow it to continue and be finished in Spain. For that, she concentrated in the technical infrastructure that supports the project. This resulted in the design and implementation of two infrastructures: one, a GIS application to produce a geolocalised sound walk with the technology provided by SonicMaps, and two, a database with data link to maps showing locations where the events happened.



Prof. Britta Thörle

LE STUDIUM / ATHENA
Visiting Researcher

From: University of Siegen - DE

In residence at: Ligérien Laboratory of Linguistics (LLL) - Orléans

Nationality: German

Programme:ATHENA European University

Dates: October 2022, March to July 2023

Britta Thörle is a university professor of Romance and Applied Linguistics at the University of Siegen. Her main research area is spoken language and the relationship between language and interaction in French and Spanish. She explores the development of interactional competence in learners of French and Spanish as foreign languages. Her work resulted in several international publications, journal issues (including "LIA - Language Interaction Acquisition" 7/1, 2016; "Corpus Pragmatics" 5/1, 2021) and conferences ("Methodological Approaches to Discourse Markers in Second Language Acquisition", Siegen 2018; supported by the German Research Foundation). Her research covers as well professional and organisational communication. In this field, she is co-editor of two handbooks on language in organizations ("Sprache in Organisationen", Berlin/Boston: de Gruyter 2018) and on languages for special purposes ("Manuel des langues de spécialité", Berlin/Boston: de Gruyter 2016). More recently, she has also been working on public crisis communication in the context of the corona pandemic (see special issue of the journal "Zeitschrift für Literaturwissenschaft und Linguistik" 51/3, 2022).

ATTITUDES AND LANGUAGE USE OF INTERNATIONAL EXCHANGE STUDENTS DURING THEIR STAY IN ORLÉANS: THE EXAMPLE OF DISCOURSE MARKERS IN L2 FRENCH

With the ESLO corpus (Enquêtes SocioLinguistiques à Orléans), created in the 1960s and continued since 2008, the University of Orléans holds one of the most important sociolinguistic corpora of spoken French. ESLO is conceived as the "sound portrait of a city" through its residents, portraying different social identities, their language use and attitudes, as well as the diversity of urban communication situations and everyday practices. The goal of the AVR project is to extend the methodology of the ESLO corpus to a group of residents that has not yet been considered, namely the group of foreign exchange students who complete part of their studies in Orléans. The University of Orléans receives up to 150 international students per year as part of the Erasmus+ programme. The research interest of the project aims at the questions of how the students' perception of the city, its inhabitants and the language changes during the first 5-6 months of their stay in Orléans and how the students' language use in oral interaction evolves during this period. The latter is examined using the example of discourse marker (DM) acquisition. DMs are "small words" such as bon, enfin, voilà, hein, etc., which are often overheard as "superfluous", but which in oral interaction fulfil a variety of conversational functions with regard to the control and structuring of turns and topics, argumentation or formulation work. The mastery of these elements is considered a resource and an indicator of fluency and interactional competence in the foreign language (L2).

The project has the following objectives:

- to compile an interview corpus with international students, methodologically based on and complementary to ESLO
- to describe the international student's perception of Orléans, their language use in oral interaction and how both things evolve during the stay in Orléans
- to complement the ESLO-FLEU project with language-acquisition related research
- to strengthen the cooperation between the partner universities Orléans and Siegen in the field of linguistic research

The first part of the stay (one week in October 2022) was for data collection. With the support of Marie Skrovec, her students and the sound and video studio of the faculty LLSH, 14 interviews with international students were recorded during the week of 3-8 October 2022 and are currently being transcribed at the University of Siegen. The same students will be interviewed again approximately 6 months after their arrival (March 2023) to examine changes in their language use and perceptions of Orléans. The preparation and analysis of these data will be the subject of the second part of the residency (March to July 2023).



Dr Marie Skrovec

Host Scientist

Marie Skrovec is a Senior Lecturer in Language Sciences, Linguistics and Language Teaching at the University of Orléans. Her research focuses on oral corpora and the analysis of spoken French. She studies different linguistic objects (future tense, relative clause, discourse markers, dislocation) according to several angles of variation (micro-diachronic, situational, generational, social) and also questions the links between oral corpora and the elaboration of resources in the teaching of French as a foreign language. She is involved in the organisation of conferences and workshops (e.g. 50 ans de linguistique sur corpus oraux. Apports à l'étude de la variation, Orléans, November 2018) and is co-editor of a book (Linguistique interactionnelle, grammaire de l'oral et didactique du français, PUFC, 2019) and a journal issue (Micro-diachronie de l'oral, Langage n°226, 2022).



Dr Bernard Gratuze

LE STUDIUM Consortium Coordinator

Bernard Gratuze is director of research at the Institut de Recherche sur les Archéomatériaux (IRAMAT-CEB), CNRS/ Université d'Orléans. He received his PhD and the HDR, at the Analytical Sciences Department of the University of Orléans. His current research interests include the development of analytical protocols using LA-ICP-MS for glass and lithic materials to study their production and trade from Protohistory to the Modern Period. He studies glass making processes and recipes since the beginning of the second millennium B.C. with particular interest for transition periods. He identified Indian's glass beads import in Western Europe during Merovingian period (5th-6th c.) and specific glass production from lead slag in Melle at the beginning of the 8th c. He is a member of French and International glass associations (AFAV & AIHV). He was director of the IRAMAT from 2006 to 2017 and a member of the bureau of section 32 of the National Committee of the CNRS between 2016 and 2021.

EARLY MEDIEVAL GLASS PRODUCTION, MULTI-ANALYTICAL TECHNIQUES, TO UNDERSTAND THE DAWN OF A TECHNICAL REVOLUTION

The aim of this project is to highlight one of the most emblematic technical changes that went through on glass production in the Middle Ages: the transition of the fluxing agent from soda to potash that is documented in two sites from the 8th century. By using wood and sand available in northwestern Europe, glassmakers first put an end to the dependency on oriental imports and primary glass productions made with natron, only available in the eastern Mediterranean. Secondly, they were able to reorganize the whole craft and could have primary and secondary productions located in the same place. However, the mechanisms leading to this transformation are not yet clear. In order to enlighten this change, written documents are scarce and the archaeological sources are the main source of information. Thanks to archaeometry and to the analytical techniques that were recently developed, these could be exploited at the best and glass artefacts can now deliver many crucial data to retrace the socio-economic history and to understand the evolution of techniques and knowledge. By associating two laboratories dedicated to archaeometry and specialists in ancient glass, this project will enable the team to understand the mutations that affected the North European glass craft following the changes in fluxes and to place these mutations in the broader context of the transitions that affected all fire-related crafts at the end of the Middle Ages in North-West Europe. To do this, the team will use the most appropriate analysis methods to produce comparable and homogeneous data. This is all the more important as two ERC projects, Rural Riches (PI Prof. Fr. Theuws, University of Leiden) and Glass Routes (PI Dr N. Schibille, CNRS, CEB Orléans), in which both laboratories are involved, deal with this period and with glass-related issues. With the Le Studium project, the team will link these projects in order to produce uniform results that will therefore be much more sustainable. In order to obtain these results, it is essential to be able to calibrate the methods used with the same reference materials. The glass standards currently used are those of the Corning museums of glass. Four main types of glass were synthesised in the early 1960s and are still used by the various laboratories working on this subject. However, some of them are no longer available. Based on the chemical composition of early medieval glass, new glasses will be synthesised from «clean» material in order to obtain the same compositions for fresh and unaltered material. These will then be analysed with the different methods involved in the project and the results compared. From there, we the team will start from a common and solid basis. The results will be published and these reference glasses will be kept and offered to all laboratories working on this problem. These standards are currently being synthesised and the first results should be discussed in early 2023. The team's other work consisted in making a state of the art of the glass productions before the mutation and in comparing the results obtained by the various methods used on the same set of glass objects. The results obtained during recent work on the Germigny and Saint Sever tesserae show the limits linked to the objects themselves when the analysis is carried out in totally non-destructive mode for the PIXE-PIGE. These limits are linked to the homogeneity of the composition on the scale of the analysis, to the surface condition of the objects and to the presence of corrosion layers on their surface. These parameters lead to significant drifts for certain major elements measured by PIGE (Al, Na in particular), which can make it difficult to classify these glasses using the parameters generally used (Al, Si and Ti contents). As far as early medieval glass from recycling or mixing of different earlier primary productions is concerned, it appeared unnecessary to distinguish sub-groups within this group and that the designation «glass from mixing» or «recycling» is sufficient to characterise this type of production. In this sense, the sub-group 'Foy 2.2' defined by D. Foy and his co-authors in 2003 does not really correspond to a specific primary production, but rather to a phenomenon of recycling of glass from the Foy 2.1 sub-group with older glass. It was therefore suggested to simplify the names and to use only the term «Foy 2 group» to designate this Egyptian primary production of the second half of the first millennium.

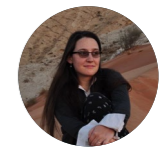
PARTNERS



Dr Gregoire CHÈNE
is in charge of the organization and supervision of scientific work and analyses at Liege University. PXRF, Raman and hyperspectral analyses
University of Liege - Belgium



Prof. Patrick DEGRYSE
is in charge of isotopic analyses and of the synthesis of new glass reference material
KU Leuven University- Belgium



Dr Alicia VAN HAM-MEERT
is in charge of isotopic analyses and of the synthesis of new glass reference material
KU Leuven University- Belgium



Mette LANGBROEK
is specialist of Merovingian beads and will be in charge of the meeting about glass coloration. He provides archaeological material, especially Merovingian beads and discuss the results of analyses
University of Leiden - The Netherlands



Dr Nadine SCHIBILLE
does the analyses in the CEB in Orléans and select the most representative samples for the ancient glass groups that will be discussed and analysed with the different methods
IRAMAT-CEB / CNRS, University of Orléans - France



Prof. David STRIVAY
is in charge of the organization and supervision of scientific work and analyses at Liege University. PXRF, Raman and hyperspectral analyses
University of Liege - Belgium



Olivier VRIELYNCK
is specialist of Merovingian beads and will be in charge of the meeting about glass coloration. He provides archaeological material, especially Merovingian beads and discuss the results of analyses
Walloon Heritage Agency - Belgium



Dr Line VAN WERSCH
provides archaeological material, especially, glass coming from secondary production places. She is in charge of the organisation of the workshop about secondary glass. She also managed the experimental archaeology during the last meeting.
University of Liège - Belgium



SCIENTIFIC COMMUNICATION

Prof. Maya Boutaghou

- The connections between Mediterranean and the Caribbean and the configuration of colonial port-cities: Algiers-Fort de France,» 5 to 7 July 2022, Doctoral Seminars at the Summer School of Global Studies and Critical Theory held at University of Bologna
- Books or book chapters and provide what is appropriate from the following Book Title, Chapter Title, Pages, Editor(s) and Publisher
- Boutaghou, M. (2022). "History and untold memories: New realism in Assia Djebar's films", in Margaret Higonnet, Steen Bille Jørgensen and Svend Erik Larsen (ed.), Landscapes of Realism: Rethinking Literary Realism in Comparative Perspectives, Volume II Pathways through Realism. Amsterdam: John Benjamins, pp. 2017-229

Dr Alberto Campagnolo

- Campagnolo, A. 'La materialità del libro e la sua digitalizzazione. Metodologie e strumenti verso una Codicologia Digitale', oral communication at online seminar "A Bridge between Two Worlds: the Disciplines with a Historical Vocation and the DHs Permanent Seminar Series", ILC-CNR, Pisa & DSU-UniVE, Venice, Italy, 20th September 2022
- Campagnolo, A. Codicologia Digitale, tra conservazione, restauro, e modelli informativi, online guest lecture for the class in Archaeology of the Book (prof.ssa Maddalena Signori), University of Rome 'Tor Vergata', 17th October 2022

Dr Francesca Fantappiè

Congresses:

- Fantappiè, F. ; Brosius, A. Co-organizers of the panel "Women, music, theatre and money: female performers and patrons between Italy and France (1560-1660)", Annual meeting of the Renaissance Society of America, Dublin, Ireland, 30th March-2nd April 2022

Papers:

- Fantappiè, F. Performing Charity and Magnificence. Christine of Lorraine and the procession of dowries, Renaissance Society of America Annual Meeting, Dublin, Ireland, 30th March-2nd April 2022
- Fantappiè, F. 'Les extravagances nécessaires': exploring the funding of spectacle in Early Modern France, Oral communication at LE STUDIUM Thursday monthly seminar, University of Tours, 7th April 2022
- Fantappiè, F. The courts spectacle between Florence and Paris: migrations of genres and reciprocal influences (1610-1625), International conference "Musical and theatrical migrations: performance practice in 17th and 18th century Europe", Queluz National Palace, Lisbon, Portugal, 8th-10th July 2022
- Fantappiè, F. New light on Piero di Matteo Strozzi (1551-1614): Re-thinking the Camerata's contribution to the birth of opera, International conference "Vincenzo Galilei: the renaissance dialogue between music and science", Villa I Tatti, Florence, Italy, 6th-7th October 2022

Seminars:

- Fantappiè, F. Théâtre, Musique et Spectacle entre Florence et la France aux XVIe et XVIIe siècles: l'influence de Marie de Médicis, presentation for the seminar on the artistic patronage of Maria de' Medici, Université Paris 1 Panthéon-Sorbonne, France, 9th February 2022
- Fantappiè, F.; Carter, T. Staging "Euridice" (1600): Theatre, Sets, and Music in Late Renaissance Florence, lecture for the "Early Music Online Research Day", Koninklijk Conservatorium Brussel (KCB) Research Festival "Polyphonic Performance Spaces", Free University of Bruxelles, Belgium, 5th December 2022
- Fantappiè, F.; Carter, T. Staging Euridice: Theatre, sets and music in late Renaissance Florence, lecture for the PhD teaching program in History of Theatre and Performing Arts 2022-2023, SAGAS, University of Florence, Italy, 14th November 2022

Prof. Alina Goncharova

Oral communication

- Goncharova, A. Report on the inheritance rights of women and children, Co-organizer of the international conference «International Symposium of International Studies», Manisa, Türkiye, 12th-13th May 2022
- Goncharova, A. Report on Inheritance in the occupied territories and in the zone of antiterrorism operations: the experience of Ukraine, Oral communication at LE STUDIUM Thursday monthly seminar, Tours, France, 1st December 2022
- Goncharova, A. Report on inheritance with a foreign element, Co-organizer of the symposium «Notarial practice of private international law: news and professional tools in family law from the Ukrainian example», Faculty of Law, Economics and Social Sciences, University of Tours, France, 6th January 2023

Scientific publications

- Goncharova, A. Inheritance in the occupied territories and in the area of antiterrorism operation: the experience of Ukraine, Amazonia Investiga, 2022, 11(50) DOI: <https://doi.org/10.34069/AI/2022.50.02.6>
- Goncharova, A. Elemento estrangeiro na regulação jurídica sucessória: a experiência do Regulamento (UE), Revista Jurídica Portucalense, 2022, 650/2012 DOI: [https://doi.org/10.34625/issn.2183-2705\(31\)2022.ic-01](https://doi.org/10.34625/issn.2183-2705(31)2022.ic-01)

Books

- Goncharova, A. Conciliation procedures in the civil process: theory and practice (notary, court, advocacy, executive proceedings). Scientific and practical manual. (Series «Procedural sciences») / by general ed. doctor of legal sciences, professor, honored lawyer of Ukraine S. Ya. Fursy. K.: Alerta, 2022. 287-324 p. (in Ukrainian).

Prof. Salvatore Magazù

Oral communication:

- Magazù, S. Leonardo da Vinci's Dynamics: An Interdisciplinary Approach, Convegno Nazionale della Società Italiana di Storia della Scienza (Ad limina Frontiere e contaminazioni transdisciplinari nella storia delle scienze), Catania, Italy, 30th May – 1st June 2022.

Scientific publication:

- The time and spatial perspectives of Leonardo: time impression, spatial information leak and memory, Salvatore Magazù, Atti Convegno Società Italiana di Storia della Scienza 2022, 2022, in press.

Dr Alexander Robinson

- Robinson, A. 'At tibi quid gratum Religione magis?': Musique, cérémonies et allégories dans les entrées françaises de dignitaires ecclésiastiques (ca 1590 – ca.1629). Revue de musicologie, 2022, 108 (2), pp. 299-352.

TRANSDISCIPLINARY APPROACH

Emblematic of the transdisciplinary approach developed by LE STUDIUM Loire Valley Institute for Advanced Studies since 2010 to energise the regional scientific community exchanges are the monthly LE STUDIUM THURSDAY seminars. These cross-disciplinary meetings take place every first Thursday of the month, gathering LE STUDIUM Research Fellows in residence LE STUDIUM Consortium groups, 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. All international researchers visiting the Centre-Val de Loire region are invited to attend these meetings. LE STUDIUM logistics enable all LE STUDIUM Research Fellows to participate to these events where ever they take place in Orléans, Tours or in other cities. Regional PhD students of Doctoral Schools have the possibility to register and attend these seminars to enlarge their scientific field and discover new disciplines. Regular attendance enables them to validate credits. The formation of an international multidisciplinary scientific community creates the necessary conditions that catalyse the development of scientific and human interactions between researchers and scientific partners to strengthen research & development at an international level.



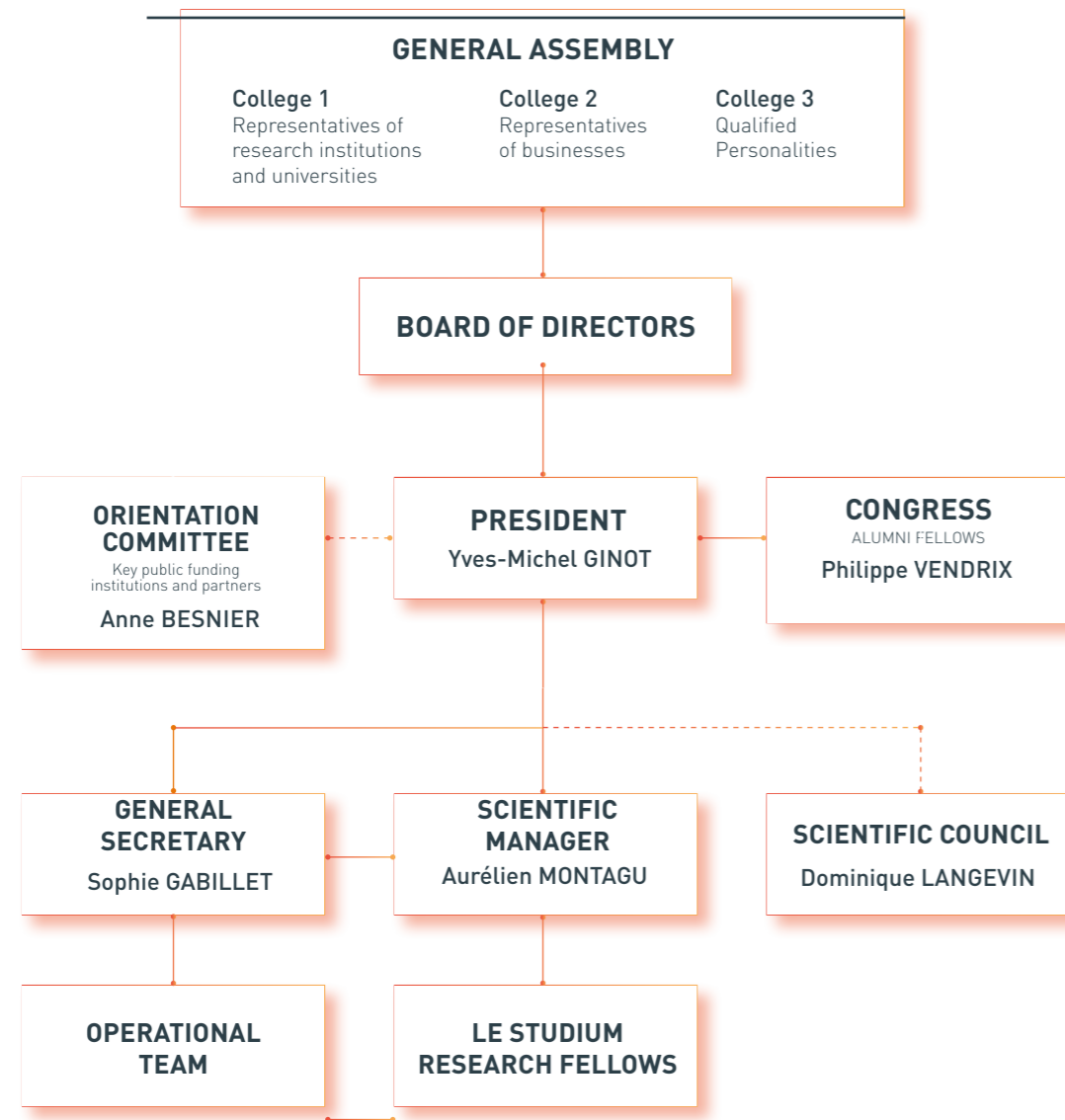
AMMONIA LE STUDIUM Consortium group

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

In all regional cities (Blois, Bourges, Chartres, Orleans and Tours) LE STUDIUM Research Fellows 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 accomodation as well as high-quality integration support and assistance. During their residency period in the region, each of them has the opportunity to attend many international events and to organise at least a major one. In Orleans where LE STUDIUM headquarters are located, Research Fellows are regularly welcomed in the heart of the city in the prestigious Hotel Dupanloup, the International University Centre for Research. This 16thcentury 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 Hotel Dupanloup in Orleans, LE STUDIUM houses Research Fellows 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 city with a highly developed touristic and cultural offer. Every year, social and networking events are organised, giving international LE STUDIUM Fellows and visitors a chance to discover more of the regional scientific and cultural environment, deepen their scientific knowledge in a wide spectrum of disciplines and take part in instructive interdisciplinary exchanges.



GOVERNANCE



LE STUDIUM Loire Valley Institute for Advanced Studies is a non-profit organisation of Law 1901 registered in 1996 in Orleans, 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, composed of 3 collegia:

- Representatives of research and higher education institutions,
- Representatives of businesses and poles of competitiveness,
- Qualified personalities,

meets annually to review the past year's activities.

Every four years, this General Assembly reviews the composition and elects a new Board of Directors among its members.

Local and regional institutions are represented at LE STUDIUM Orientation Committee. They provide advices and recommendations on the development of the organisation.

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, appointed for four years, reports to the Board of Directors. He oversees the activities performed by a small dynamic team based in Orleans.

SCIENTIFIC COUNCIL

LE STUDIUM Scientific Council establishes the final ranking of applications and recommends Fellowship, Professorship, Visiting Artist, Visiting Researcher and Consortium awards. It is composed of independent external senior scientists who gather twice a year to analyse applications and the scientific reviews provided by a pool of a thousand experts. They finalise the selection of the Smart Loire Valley General Programme and the French Institute for Advanced Study Awards. 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 CVL programmes and the ATHENA Visiting Researchers Programme. For the calls for applications 2022, LE STUDIUM Scientific Council members were:

PRESIDENT

Dominique LANGEVIN

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

MEMBERS

Dominique ALLART

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

Josep-Maria ARAUZO-CAROD

Professor, Director of the Center for Research in Economics and Sustainability, University of Rovira i Virgili - ES

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

Bruno CHAUDRET

Chemist, CNRS Director of research LPCNO, University of Toulouse INSA - FR

Athena COUSTENIS

Astrophysicist, CNRS Director of research LESIA, Paris Observatory - FR

Mark GOERBIG

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

Marc GOUJON

Social and Human Sciences, Centre National de Recherche Scientifique - FR

Olga GUERRERO-PEREZ

Professor, Environmental chemistry & Chemical Engineering, Higher Technical School of Industrial Engineering, University of Malaga - ES

Aylin Carla HANYALOGLU

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

David HULMES

Emeritus Research Director, Centre National de la Recherche Scientifique, Tissue Biology and Therapeutic Engineering Laboratory, Lyon - FR

Piotr LAIDLER

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

Jean-Claude LECRON

Professor, Biochemistry & Immunology, University of Poitiers, Hospital practitioner at the University Hospital of Poitiers - FR

Federica MIGLIARDO

Professor, Biophysicist, Università 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

Alain PAVE

Professor, Biometrics and Evolutionary Biology, Lyon. Member of the Academy of Technologies - FR

Jean-Pierre SAMAMA

Research Director in Biophysics, Centre National de Recherche Scientifique, Synchrotron Soleil - FR

Laurent TISSOT

Professor, Contemporary history, University of Neuchâtel - CH

Emmanuel TRELAT

Professor, Mathematics, Sorbonne University, Director of the Mathematical Sciences Foundation in Paris - FR

Brigitte VALLÉE

Research Director, Computer Sciences and Mathematics, Centre National de Recherche Scientifique and University of Caen - FR

Ralph WATZEL

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

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

Anne BESNIER

Vice-President Higher Education and Research, Region Centre-Val de Loire

Pascal BONNET

Vice-President Research, University of Orléans

Nicolas DUBOULOZ

Director of Higher Education, Research and Technology Transfer, Region Centre-Val de Loire

Gaël GAUTIER

Director Research & Valorisation, INSA Centre-Val de Loire

Marc GUERIN

President Centre INRAE Val-de-Loire

Carine VAN HEIJENOORT

Representative CNRS Regional Delegation Centre Limousin-Poitou-Charentes

Emmanuelle HUVER

Vice-President Research, University of Tours

Hélène PAUWELS

Research Branch, BRGM, Orléans

Mustapha SI-TAHAR

Inserm Scientific Correspondent

LE STUDIUM

Yves-Michel GINOT

President

Sophie GABILLET

General Secretary

Aurélien MONTAGU

Scientific Relations Manager

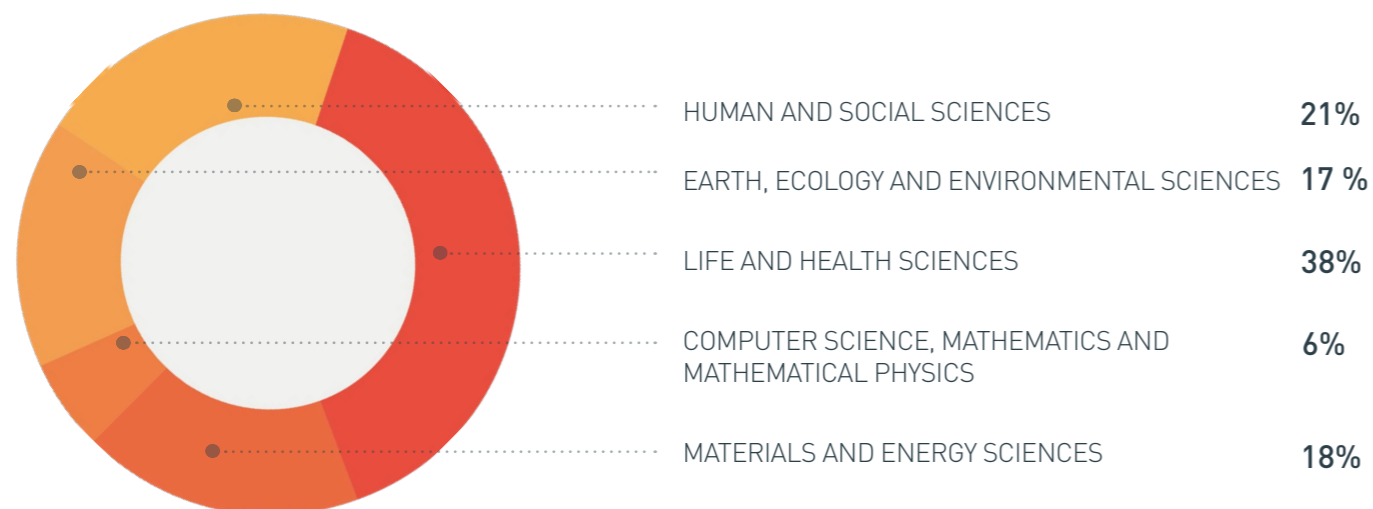
ORIGIN OF LE STUDIUM RESEARCH FELLOWS



IN THE CENTRE-VAL DE LOIRE REGION SINCE 1996

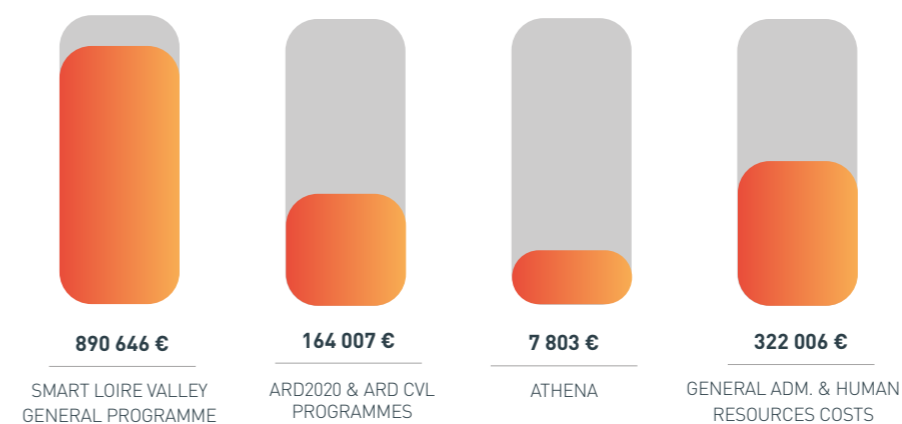


THEMATICS REPARTITION SINCE 1996



2022 FINANCIAL DATA

2022 EXPENDITURES REPARTITION



2022 FINANCIAL RESOURCES

REGION CENTRE VAL DE LOIRE	57%
EUROPEAN FUNDS	22%
UNIVERSITY OF TOURS	6%
UNIVERSITY OF ORLEANS	6%
ORLEANS METROPOLE	5%
PRIVATE CONTRIBUTIONS	2%
VARIOUS	2%

2021 EVENTS PANORAMA

2022

FEBRUARY

The English Ornamental Hermit
Prof. Gordon Campbell
Virtual meeting

MARCH

Studying drug and cosmetic delivery across the skin barrier
Dr Franciska Vidáné Erdő
Faculté des Sciences, Tours

The ocean's «itch-hikers»
Dr Maria Soledad Leonardi
Faculté des Sciences, Tours

**Europe contre Europe
Entre liberté, solidarité et puissance**
Prof. Laurent Warlouzet
Hôtel Dupanloup

APRIL

Pharmacological targeting of cathepsin C: a key therapeutic target in chronic inflammatory and auto-immune diseases
Dr Brice Korkmaz
Château d'Artigny, Montbazon

Skin Models in Cosmetic Science: Bridging Established Methods and Novel Technologies
Dr Franciska Vidáné Erdő, Prof. Emilie Munnier, Dr Franck Bonnier
Virtual meeting

'Les extravagances nécessaires': Exploring the Funding of Spectacle in Early Modern France
Dr Francesca Fantappiè
Faculté de Droit, Tours

Innate Immunity at Biomineralized Barriers
Prof. Maxwell Hincke
Faculté de Droit, Tours

MAY

H'allo Volcano ! : An interdisciplinary study on the atmospheric plume processing and impacts of Volcanic Halogen Emissions
Dr Tjarda Roberts
Hôtel Dupanloup

Strategies to identify adaptive trait variation in forest tree populations
Prof. Juan César Vilardi
Hôtel Dupanloup

Modelling tree drought vulnerability in the Andean Patagonian forest
Dr Anne-Sophie Sergent
Hôtel Dupanloup

1st Franco-Thai Seminar on Phytocosmeceutical Research and Applications
Virtual meeting

Jewishness between Latin America and Europe: Languages in Contact, Linguistic Imaginaries and Translation
Dr Cynthia Gabbay & Dr Brigitte Natanson
Hôtel Dupanloup

RNA therapeutics and Neuroscience
Dr Kathia Zaleta & Prof. Patrick Vourc'h
Virtual meeting

JUNE

Internationalisation des recherches sur la forêt en région Centre-Val de Loire
Centre INRAE Val de Loire, Orléans

Ammonia for valuable clean energy systems
Prof. Christine Rousselle
Hôtel Dupanloup

Understanding, preserving and improving the world around us
LE STUDIUM 25 Years Conference
Hôtel Dupanloup

SEPTEMBER

NaDES for biomass valorization: new insight of a green technology
Dr Duangjai Tungmunnithum, Dr Christophe Hano & Prof. Leslie Boudesocque-Delaye
Online meeting

Carbon and nitrogen status of forest soils sensitive to additional biomass harvesting
Dr Rock Ouimet
Centre INRAE Val de Loire, Nogent-sur-Vernisson

Gonadotropins in the Physiopathology: Current advances in the Mechanisms of Action
Prof. Rita Singh, Dr Pascale Crépeux
Virtual meeting

Early medieval glass production, multi-analytical techniques, to understand the dawn of a technical revolution
Dr Bernard Gratuze
Hôtel Dupanloup

Prévention des cancers par les lipides de l'alimentation : le rôle des canaux ioniques
Prof. Christophe Vandier
Hôtel de ville, Tours

Ion channels in pathological context, new methods and diagnosis tools
Dr David Crottès, Prof. Christophe Vandier & Prof. Stéphane Petoud
Hôtel de ville, Tours

Marine drug metabolism elucidating consortium
Dr Vincent Courdavault
Faculté de Pharmacie, Tours

OCTOBER

From bioelectricity to personalized therapeutic strategies in cancers
Dr David Crottès
MSH Val de Loire, Tours

A new era for medicine: the use of blood flow modelling for safer treatment of vascular disease
Dr Alberto Marzo
MSH Val de Loire, Tours

NOVEMBER

Understanding sodium batteries at the molecular level using magnetic resonance spectroscopy
Prof. Luke O'Dell
Hôtel Dupanloup

Protein function and its regulation by post-translational modifications
Dr Marcin Suskiewicz
Hôtel Dupanloup

On-line Meeting on Artificial Intelligence for Plasma Science
Prof. Feng Huang, Dr Eric Robert & Dr Augusto Stancampiano
Virtual meeting

DECEMBER

Inheritance in the occupied territories and in the area of antiterrorism operation: the experience of Ukraine
Prof. Alina Goncharova
Faculté de Droit, Tours

Molecular Modeling of Stretchable Electronics - Hard-Cation-Soft-Anion Ionic Liquids for PEDOT:PSS Conductivity Enhancement
Prof. Yun Hee Jang
Faculté de Droit, Tours

Innovier aujourd'hui pour guérir demain : diagnostics et thérapies personnalisés
Dr Jean-Michel Escoffre & Prof. Damien Lacroix
Hôtel de Ville, Tours

Cardiovascular Modelling: Basic Science to Clinical Translation
Dr Alberto Marzo & Dr Ayache Bouakaz
Hôtel de Ville, Tours

Themes in color

- CONFERENCE
- PUBLIC LECTURE
- THURSDAY
- SUMMER SCHOOL
- RENCONTRE LEONARDO
- CONSORTIUM
- WEBINAR
- EXPERT DAY
- WORKSHOP

DR MARCIN SUSKIEWICZ

Ubiquitin's Secretive Sibling: Sumo E3 Ligases & Sumo-Dependent Complex Formation In Dna Repair And Beyond

November 2021 - October 2022

In residence at: Molecular Biophysics Center (CBM) / CNRS

Host scientist: Dr Bertrand Castaing

DR JEAN-PAUL VERNIER

Impacts of Pollution, Volcanoes and Wildfires on the Earth's Middle Atmosphere

November 2021 - January 2022

In residence at: Laboratory of Physics and Chemistry of Environment and Space (LPC2E) / CNRS, University of Orléans, CNES

Host scientist: Dr Gwenaël Berthet

DR FRANCISKA VIDÁNE ERDŐ

Knowledge transfer on Raman spectroscopy and skin-on-a-chip technology to study transdermal drug delivery

January 2022 - April 2022

In residence at: Nanomedicines and Nanoprobes (NMNS), University of Tours

Host scientist: Dr Franck Bonnier

PROF. JUAN CÉSAR VILARDI

Adaptive strategies of forest trees to climate changes: Microevolution and Plasticity

April 2022 - June 2022

In residence at: BioForA, Centre INRAE Val-de-Loire / ONF

Host scientist: Dr Philippe Rozenberg

ATHENA PROGRAMME

PROF. BRITTA THÖRLE

Attitudes and language use of international exchange students during their stay in Orléans: the example of discourse markers in L2 French

October 2022 / March 2023 - July 2023

In residence at : Laboratoire Ligérien de Linguistique (LLL) / University of Orléans, CNRS, University of Tours, Bibliothèque Nationale de France

Host scientist : Dr Marie Skrovec

ARD CVL BIOPHARMACEUTICALS PROGRAMME

PROF. LIVIO CASARINI

Research Fellowship in Antibody fragments targeting ovarian GPCRs to control reproduction

November 2022 - November 2023

In residence at : Physiology of Reproduction and Behaviour (PRC) / Centre INRAE Val de Loire, CNRS, University of Tours, IFCE

Host scientist : Dr Eric Reiter

ARD CVL COSMETOSCIENCES PROGRAMME

DR DUANGJAI TUNGMUNNITHUM

Natural deep eutectic solvents (NaDES): Cosmetics in the Age of Green Technologies

September 2021 - August 2022

In residence at : Laboratoire de Biologie des Ligneux et des Grandes Cultures (LBLGC) / INRAE, Université d'Orléans

Host scientist : Dr Christophe Hano

SMART LOIRE VALLEY GENERAL PROGRAMME AWARDS - SELECTION OF CAMPAIGN 2022

LE STUDIUM VISITING RESEARCHER

PROF. MAYA BOUTAGHOU

Interdisciplinary forms of historical writings in colonial and postcolonial contexts

From: University of Virginia - USA

Host scientist: Professor Aude DERUELLE

POvoirs, LEttrés, Normes (POLEN), University of Orléans

PROF. YUN HEE JANG

Molecular modeling of stretchable electronics

From: Daegu Gyeongbuk Institute of Science and Technology (DGIST) - South Korea

Host scientist: Prof. Yves Lansac

Laboratory for materials, microelectronics, acoustics and nanotechnology (GREMAN), University of Tours, CNRS, INSA-CVL

DR ALBERTO JOSÉ FERNÁNDEZ CARRIÓN

Glass Ceramization Processing for Developing Solid-State Transparent Sodium Ion Electrolytes

From: College of Materials Science & Engineering, Guilin - China

Host scientist: Dr Dr Michael J. Pitcher

Extreme conditions and materials: high temperature and irradiation (CEMHTI), CNRS

PROF. ROBERT MARSHALL

Understanding the Radiation Environment in Near-Earth Space and its Impact on the Earth's Atmosphere with Current and Future Space Missions

From: University of Colorado Boulder - USA

Host scientist: Dr Jean-Louis Pinçon

Laboratory of Physics and Chemistry of the Environment and Space (LPC2E) University of Orléans, CNRS, CNES

PROF. EUGEN 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

Center for Advanced Studies in the Renaissance (CESR)

University of Tours, CNRS

DR PATRICIA SILVA GOLO

Exploiting the poultry red mite chemosensation for improvement of its control with entomopathogenic fungi

From: Federal Rural University of Rio de Janeiro - Brazil

Host scientist: Dr Foteini Koutroumpa

Infectiology and Public Health (ISP)

Centre INRAE Val-de Loire, University of Tours

DR MOHAMMED AKLI AYOUB

Investigating the Effects of Steroid Hormones on G Protein-Coupled Receptors in Vitro

From : United Arab Emirates University - United Arab Emirates

Host scientist : Dr Frédéric Jean-Alphonse

Reproductive Physiology and Behavior Unit (PRC) Centre INRAE Val de Loire, CNRS, University of Tours, IFCE

PROF. GEORG VON SAMSON-HIMMELSTJERNA

Drug efflux-mediated processes of anthelmintic resistance in ascarids

From : Freie Universität Berlin - Germany

Host scientist : Dr Cédric Neveu

Infectiology and Public Health (ISP)

Centre INRAE Val de Loire, University of Tours



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LE STUDIUM

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